

# Principles of Biomedical Sciences Curriculum

*This curricula and accompanying instructional materials have been developed to align with the NJSLS and in accordance with the NJ Department of Education's guidelines to include: Curriculum designed to meet grade level expectations, integrated accommodations and modifications for students with IEPs, 504s, ELLs, and gifted and talented students, assessments including benchmarks, formative, summative, and alternative assessments, a list of core instructional and supplemental materials, pacing guide, interdisciplinary connections, integration of 21<sup>st</sup> century skills, integration of technology, and integration of 21<sup>st</sup> Century Life and Career standards.*

## **About the Standards**

In 1996, the New Jersey State Board of Education adopted the state's first set of academic standards called the Core Curriculum Content Standards. The standards described what students should know and be able to do upon completion of a thirteen-year public school education. Over the last twenty years, New Jersey's academic standards have laid the foundation for local district curricula that is used by teachers in their daily lesson plans.

Revised every five years, the standards provide local school districts with clear and specific benchmarks for student achievement in nine content areas. Developed and reviewed by panels of teachers, administrators, parents, students, and representatives from higher education, business, and the community, the standards are influenced by national standards, research-based practice, and student needs. The standards define a "Thorough and Efficient Education" as guaranteed in 1875 by the New Jersey Constitution. Currently the standards are designed to prepare our students for college and careers by emphasizing high-level skills needed for tomorrow's world.

The New Jersey Student Learning Standards include Preschool Teaching and Learning Standards, as well as nine K-12 standards for the following content areas: **21st Century Life and Careers, Comprehensive Health and Physical Education, English Language Arts, Mathematics, Science, Social Studies, Technology, Visual and Performing Arts, World Languages**

<b>Lower Cape May Regional School District Principles of Biomedical Sciences Curriculum</b>	
<b>Content Area: Science</b>	
<b>Course Title: Principles of Biomedical Sciences</b>	<b>Grade level: 9-10</b>
<b>Unit 1: The Mystery</b>	<b>Dates for Units: September</b>
<b>Unit 2: Diabetes</b>	<b>Dates for Units: Oct- Nov</b>
<b>Unit 3: Sickle Cell Disease</b>	<b>Dates for Units: Dec- Jan</b>
<b>Unit 4: Heart Disease</b>	<b>Dates for Units: Feb- March</b>
<b>Unit 5: Infectious Disease</b>	<b>Dates for Units: Feb- March</b>
<b>Unit 6: Post Mortem</b>	<b>Dates for Units: April</b>
<b>Date Created: As adopted from PLTW 2018</b>	<b>Board Approved On:</b>

**Lower Cape May Regional School District Principles of Biomedical Sciences Curriculum  
Unit 1 Overview****Content Area: Science****Unit Title: The Mystery****Target Course/Grade Level: Grades 9-10****Unit Summary:**

The goal of Unit 1 is to provide the foundation and develop the theme for the course. Students are engaged by reading about a woman, Anna Garcia, who is found dead in her home. Students investigate the scene, gather evidence, and then move to the lab to analyze their findings. Through their examination of key evidence, students learn notebook organization, observation and documentation skills, and the fundamentals of experimental design. Students are introduced to the structure of DNA and investigate how basic molecular biology techniques can be used to connect suspects with a crime scene. Students also discuss the bioethics of scientific research and explore the bounds of HIPAA legislation. In each unit of the course, students obtain additional medical history information for Anna as well as details from her autopsy report as they explore the various illnesses she encountered throughout her life. Students will maintain a medical file for Anna Garcia, compile their ideas and findings over the duration of the course, and ultimately determine her cause of death in the final unit.

**Identity Lesson Summary****Lesson 1.1 Identity – Investigating the Scene**

The goal of this lesson is to lay the foundation for the course and introduce students to the use of laboratory and career journals and Inspiration® software. Students also learn how to set up an experiment and how to properly document sources. The lesson opens with the mysterious death of Anna Garcia. Students play the role of crime scene investigators to examine key information gathered from interviews of friends, family members, and people of interest. In addition students examine the scene for clues. Next they play the role of forensic scientists to analyze each piece of evidence collected from the crime scene, including hair, fingerprints, blood, and shoeprints in order to determine what happened at Anna's house and to identify potential suspects. Students will learn how to design an experiment while determining how ambient temperature affects the cooling rate of a dead body. Finally, they will design and perform an experiment to investigate how height affects bloodstain patterns. Students will use the results to identify the height that caused the bloodstain patterns found at Anna's house in order to determine whether she might have been struck standing up or as she was falling.

**Lesson 1.2 Identity – DNA Analysis**

In the last lesson, students processed and analyzed evidence found at Anna Garcia's house at the time of her death, including blood samples found near her body. In this lesson students will explore DNA in order to determine whose blood was found at the scene. Students will begin to explore the relationship between DNA, genes, and chromosomes. They will extract DNA from both plant and animal cells, investigate the structural composition of DNA by building a three-dimensional model of the molecule,

explore the methods used to analyze DNA, and then work as a forensic DNA analyst to compare the DNA found at the crime scene with the DNA obtained from each of the suspects.

### **Lesson 1.3 Identity – The Findings**

In the previous lessons, students were introduced to the case of the mysterious death of Anna Garcia. They investigated the crime scene, analyzed the evidence, and performed DNA profiling. In this lesson students will investigate autopsy procedures and will be given the first piece of Anna's autopsy report. They will put together all of the evidence collected and analyzed regarding Anna's mysterious death throughout the unit in order to draw conclusions and create a report detailing the suspected manner of death (natural, accidental, or homicide). They will learn how to properly cite sources and investigate the role that different biomedical professionals played in Anna's mysterious death investigation. Finally students will discuss the bioethics of scientific research and explore the bounds of HIPAA legislation.

#### **Interdisciplinary Connections:**

##### **R.1 - Reading**

Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

##### **R.2 - Reading**

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

##### **W.1 - Writing**

Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

##### **AS.W.5 - Writing**

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

##### **AS.W.6 - Writing**

Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

#### **21st Century Themes, Skills, and Standards:**

- 9.2.12.CAP.2: Develop college and career readiness skills by participating in opportunities such as structured learning experiences, apprenticeships, and dual enrollment programs.
- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
- 9.2.12.CAP.4: Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
- 9.2.12.CAP.5: Assess and modify a personal plan to support current interests and postsecondary plans.
- 9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.
- 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.
- 9.2.12.CAP.8: Determine job entrance criteria (e.g., education credentials, math/writing/reading

comprehension tests, drug tests) used by employers in various industry sectors.

- 9.2.12.CAP.9: Locate information on working papers, what is required to obtain them, and who must sign them.
- 9.2.12.CAP.10: Identify strategies for reducing overall costs of postsecondary education (e.g., tuition assistance, loans, grants, scholarships, and student loans).

**Learning Targets**

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS-LS1-2	Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
HS-LS1-1	All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells
HS-LS1-3	Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
HS-LS1-4, HS-LS1-5, HS-LS1-7	Use a model based on evidence to illustrate the relationships between systems or between components of a system
HS-LS1-3	Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.
HS-LS1-1	Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
<p><b>Unit Enduring Questions:</b></p> <ul style="list-style-type: none"> <li>• Changes in systems may have various causes that may not have equal effects.</li> <li>• Why Is Algebraic thinking used to</li> </ul>	<p><b>Unit Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>• Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.</li> </ul>

<p>examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth)?</p>	<ul style="list-style-type: none"> <li>• Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.</li> </ul>
<p><b>Unit Objectives:</b> <i>Students will know....</i></p> <ul style="list-style-type: none"> <li>• A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.</li> <li>• Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.</li> </ul>	<p><b>Unit Objectives:</b> <i>Students will be able to.....</i></p> <ul style="list-style-type: none"> <li>• Understand that the way an object is shaped or structured determines many of its properties and functions.</li> <li>• Understand that much of science deals with constructing explanations of how things change and how they remain stable.</li> <li>• Understand that although models can be used to predict the behavior of a system, these predictions have limited precision and reliability due to the assumptions and approximations inherent in models.</li> </ul>

<p><b>Lower Cape May Regional School District Principles of Biomedical Sciences Curriculum Unit 2 Overview</b></p>
<p><b>Content Area: Science</b></p>
<p><b>Unit Title: Diabetes</b></p>

**Target Course/Grade Level: Grades 10-12****Unit Summary:**

The goal of Unit 2 is for students to walk through Anna Garcia's diagnosis of diabetes by completing simulated laboratory tests. Given results of the tests, students can deduce the basic biology of both Type 1 and Type 2 diabetes. Students investigate the connection between insulin and glucose and discuss how feedback systems in the body regulate the function of key hormones. Students investigate the biochemical makeup of food and complete experiments to demonstrate the relationship between energy and food. As students explore diabetes, they are introduced to basic chemistry, the structure and function of macromolecules, and the relationship of these molecules to metabolic function. The causes, symptoms, treatments, and side effects of diabetes are studied as well as the lifestyle implications associated with this disease. Students examine complications related to diabetes and finally brainstorm and develop an innovation to help with the management or treatment of the disease.

**Communication Lesson Summary****Lesson 2.1 What is Diabetes?**

In this lesson the goal is for students to investigate what it means to have diabetes. Students will explore how doctors make an initial diagnosis of diabetes and characterize the disease. They will complete simulated glucose tolerance testing as well as insulin analysis on three patients, including Anna, and draw conclusions about their disease status based on your findings. By analyzing test results, they will deduce what is happening inside the body when a person has Type 1 or Type 2 diabetes. Students will further investigate the relationship between insulin and glucose and learn how to find credible sources. Students will use the design process to create a 3-D working model demonstrating how insulin works to move glucose into cells. Students will use the model to explain this process to a target audience of newly diagnosed diabetics. Students will then investigate feedback and feedback loops. Using knowledge of the insulin/glucose connection, students will diagram the specific steps in the body that function to keep blood sugar in balance.

**Lesson 2.2 The Science of Food**

The goal of this lesson is for students to investigate the science of food and look in detail at the biochemistry of macromolecules. Students will use chemical indicators to test for the presence of sugar, starch, protein, and lipids in three common food items as well as in the stomach contents of the ill-fated Anna Garcia. Students will define various terms commonly used on food labels and then analyze food labels to determine the nutritional content of the respective food items. Students will analyze Anna's diet and assess how well she was meeting her nutritional requirements. Students will then complete a series of molecular puzzles to build macromolecules and explore the biochemistry of food. They will begin to see how the body works to harness the power of what we eat through the assembly and disassembly of macromolecules. Students further explore the energy content of various foods by completing calorimetry experiments using Vernier software and a temperature probe. Students will continue to explore how food choices are vital to the health of a diabetic in the next lesson.

**Lesson 2.3 Life with Diabetes**

The goal of this lesson is for students to explore the personal side of life with diabetes. The lesson begins with students designing a "What to Expect" guide for patients confronted with a new diagnosis.

The guide should offer insight into a typical day in the life of a diabetic and should highlight daily routines, restrictions, lifestyle choices and modifications, as well as tips for coping and acceptance. Students will further examine what happens inside the body of a diabetic as they simulate how the body reacts to varying blood glucose concentrations. Students design an experiment to simulate osmosis in body cells and attempt to match details about diabetic emergencies in Anna Garcia's life with simulated blood serum from the time of these incidents. Students relate the movement of water in model cells to the symptoms that Anna experienced in each emergency situation. Students begin to understand how rapid shifts in blood sugar can have severe consequences. While most of these complications are short term if addressed quickly, there are many long term consequences of diabetes, especially if the disease is not well-controlled. Students will explore the impact that Type 1 and Type 2 diabetes can have on human body systems and visualize this impact on a graphic organizer. They will read additional information from Anna's autopsy report and analyze findings to brainstorm possible causes of death. Students will then design an innovation that helps diabetics treat, manage, or even cure their disease and present their idea to a panel offering a research grant.

**Interdisciplinary Connections:**

**R.1 - Reading**

Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

**R.2 - Reading**

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

**W.1 - Writing**

Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

**AS.W.5 - Writing**

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

**AS.W.6 - Writing**

Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others

**F.IF.4 - Interpreting Functions**

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

**S.ID.6 - Interpreting Categorical and Quantitative Data**

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.



**21st Century Themes, Skills, and Standards:**

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
- •9.4.12.CI.3: Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).

**Learning Targets**

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS.LS1.1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS.LS3.1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS-LS1-3	Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
HS-LS1-4, HS-LS1-5, HS-LS1-7	Use a model based on evidence to illustrate the relationships between systems or between components of a system
HS-LS1-3	Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.
HS-LS1-1	Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

**Unit Enduring Questions:**

- How can we use a use a model to illustrate the hierarchical organization of interacting systems that provide

**Unit Enduring Understandings:**

- Systems of specialized cells within organisms help them perform the essential

<p>specific functions within multicellular organisms.</p> <ul style="list-style-type: none"> <li>• How can we describe common diseases and disorders of each body system (such as: cancer, diabetes, dementia, stroke, heart disease, tuberculosis, hepatitis, COPD, kidney disease, arthritis, ulcers).</li> <li>• How can we identify existing and potential hazards to clients, co-workers, and self. Employ safe work practices and follow health and safety policies and procedures to prevent injury and illness.</li> </ul>	<p>functions of life.</p> <ul style="list-style-type: none"> <li>• Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.</li> <li>• human anatomy, physiology, common diseases and disorders, and medical math principles.</li> <li>• Identify the differences between subjective and objective information.</li> </ul>
<p><b>Unit Objectives:</b> <i>Students will know....</i></p> <ul style="list-style-type: none"> <li>• How to analyze basic structures and functions of human body systems (skeletal, muscular, integumentary, cardiovascular, lymphatic, respiratory, nervous, special senses, endocrine, digestive, urinary, and reproductive).</li> <li>• How to demonstrate the ability to analyze diagrams, charts, graphs, and tables to interpret healthcare results.</li> <li>• How to model verbal and nonverbal communication.</li> <li>• How to differentiate between wellness and disease.</li> <li>• Why to promote disease prevention and model healthy behaviors</li> </ul>	<p><b>Unit Objectives:</b> <i>Students will be able to.....</i></p> <ul style="list-style-type: none"> <li>• Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.</li> <li>• Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student-generated evidence.</li> <li>• Compare, integrate and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem.</li> </ul>

**Lower Cape May Regional School District Principles of Biomedical Sciences Curriculum  
Unit 3 Overview**

**Content Area: Science**

**Unit Title: Sickle Cell Disease****Target Course/Grade Level: 10-12****Unit Summary:****Unit 3: Sickle Cell Disease**

The goal of Unit 3 is for students to learn basic concepts of genetics and inheritance as they explore Anna Garcia's struggle with sickle cell disease. Students examine sickled red blood cells under a microscope and learn what life is like with the disease by reading and writing patient diary entries. They simulate the process of protein synthesis, examine the assembly of the protein hemoglobin, and demonstrate how sickle cell disease results from a mutation that alters a protein product. Students examine the structure of chromosomes and show how traits are passed through generations on the chromosomes in our cells.

**Power Lesson Summary****Lesson 3.1 The Disease**

The goal of this lesson is to introduce the students to what it means to have sickle cell disease. Students will learn about the components and function of blood in order to better understand how sickle cell disease affects the body. They will examine Anna Garcia's blood with a microscope and complete a simulated hematocrit in order to determine whether Anna's sickle cell disease was causing her other related health problems. They will learn about what it is like for a person dealing with this serious disease by reading her diary entries. Finally, they will write diary entries for a fictitious sickle cell patient. The entries will detail how the patient is feeling, describe the treatment being given, and include a narrative of all of the biomedical professionals the patient encounters during their treatment journey.

**Lesson 3.2 It's in the Genes**

The goal of this lesson is for students to investigate how DNA codes for proteins and how mutations can lead to diseases such as sickle cell anemia. Students will explore how the body uses DNA to produce proteins. They will apply their knowledge of protein synthesis to decode a secret message, investigate the effects that various mutations have on protein production, and look specifically at the genetic mutation that causes sickle cell disease. Students will use computer simulations to visualize the interactions between amino acids and how these relate to protein structure. They will recognize how changes in the b-globin protein are due to the mutation associated with sickle cell disease.

**Lesson 3.3 Chromosomes**

The goal of this lesson is for students to further explore the relationship between DNA, genes, and chromosomes. Students will investigate the role that chromosomes play in transferring genetic material from cell to cell as well as from generation to generation. Students will also explore how the genes encoding dominant and recessive traits are passed through the generations via our chromosomes.

**Lesson 3.4 Inheritance**

The goal of this lesson is for students to further study how inherited diseases are passed from parent to

child, with a focus on sickle cell disease. They will analyze the gel electrophoresis results obtained from the Restriction Fragment Length Polymorphisms (RFLPs) of Anna Garcia's family members to create a family pedigree. Next they will calculate the theoretical probability of a child inheriting sickle cell disease using Punnett squares and compare the results to experimental results. Finally, they will put it all together to analyze pedigrees. As an optional extension activity, students will simulate the effects of a high frequency of malaria on the allele frequencies of a population.

**Interdisciplinary Connections:**

**R.1 - Reading**

Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

**R.2 - Reading**

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

**W.1 - Writing**

Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

**AS.W.5 - Writing**

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

**AS.W.6 - Writing**

Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others

**21st Century Themes, Skills, and Standards:**

- 9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.CT.3: Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
- 9.4.12.CT.4: Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes.

**Learning Targets**

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS.LS1.1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS.LS1.2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS.LS3.1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS.LS3.2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS.ETS1.4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
<p><b>Unit Enduring Questions:</b></p> <ul style="list-style-type: none"> <li>● How do we apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.</li> <li>● How do we make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.</li> </ul>	<p><b>Unit Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>● Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.</li> <li>● Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.</li> <li>● Changes in systems may have various causes that may not have equal effects.</li> <li>● A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.</li> </ul>
<p><b>Unit Objectives:</b> <i>Students will know....</i></p> <ul style="list-style-type: none"> <li>● How to identify roles and responsibilities of individual members as part of the healthcare team.</li> </ul>	<p><b>Unit Objectives:</b> <i>Students will be able to.....</i></p> <ul style="list-style-type: none"> <li>● Evaluate reports based on data.</li> <li>● Understand human anatomy, physiology, common diseases and disorders, and</li> </ul>

<ul style="list-style-type: none"> <li>● And understand uses of basic word processing, spreadsheet, and database applications.</li> </ul>	<p>medical math principles</p> <ul style="list-style-type: none"> <li>● Utilize and understand information technology applications common across health professions.</li> </ul>
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<p><b>Lower Cape May Regional School District Principles of Biomedical Sciences Curriculum Unit 4 Overview</b></p>
<p><b>Content Area: Science</b></p>
<p><b>Unit Title: Heart Disease</b></p>
<p><b>Target Course/Grade Level: Grades 9-10</b></p>
<p><b>Unit Summary:</b></p> <p><b>Unit 4: Heart Disease</b></p> <p>The goal of Unit 4 is for students to examine the normal function of the human heart and investigate malfunctions in the cardiovascular system that can lead to heart disease. Students complete a dissection to tour heart anatomy and study heart function using probes and data acquisition software. They collect and analyze heart data, including heart rate, blood pressure, and EKG readings and analyze cardiac test results of Anna Garcia. Students explore the role cholesterol plays in the body. Students further their knowledge of molecular biology as they run gel electrophoresis and complete RFLP analysis to diagnose familial hypercholesterolemia. Students design models to simulate the function of a pump and design visuals to show interventions for blocked coronary vessels.</p> <p><b>Lesson 4.1 Heart Structure</b></p> <p>The goal of this lesson is for students to explore the structure and organization of the heart. In the first activity of the lesson, students will investigate the basic structure of the heart and identify the major blood vessels that bring blood in and out of the heart's main chambers. They will create a graphic organizer to help them remember the basic blood flow pattern to and from the heart and lungs .The diagrams they draw in this activity will help them identify the actual structures of the heart when they</p>

dissect a four-chambered sheep's heart in the next activity. Students will observe key structures and discuss how structure relates to function. They will also use a microscope to observe the structure of arteries and veins. At the conclusion of the lesson, students will review Anna's autopsy report and begin to postulate how problems in the cardiovascular system may have contributed to her death.

#### **Lesson 4.2 The Heart at Work**

The goal of this lesson is for students to learn how the heart works in order to understand how and why heart disease occurs. Students learn that because of a few episodes of chest pain, Anna Garcia was sent for a full cardiac workup. Students will learn about the tests used to monitor heart function and use data acquisition software and probes to study heart rate, blood pressure, and electrical activity of the heart. Students will design and conduct experiments on variables affecting heart rate and blood pressure and document their work in a formal laboratory report. At the conclusion of the lesson, students will analyze Anna's cardiac workup and investigate how the function (or dysfunction) of her heart may have played a role in her death.

#### **Lesson 4.3 Heart Dysfunction**

The goal of this lesson is for students to explore what happens inside the body when the heart is unable to function properly. Students will investigate the function of cholesterol in the body and research how this lipid can impact health. They will present the information they learn about cholesterol, LDL, and HDL. They will analyze Anna Garcia's cholesterol test results and make recommendations about her cardiac care. Students will then use DNA electrophoresis to separate and analyze DNA fragments to determine if Anna and members of her family have familial hypercholesterolemia. In the final problem of the lesson, students will explore the human heart as a pump and investigate what happens to overall health when factors such as cholesterol plaque impede flow. Students will design and build a simple pump to simulate the heart on the most basic level. Finally, students will design an experiment to simulate the effects of decreased vessel diameter on blood flow rate.

#### **Lesson 4.4 Heart Intervention**

The goal of this lesson is for students to explore what happens to the body when blood vessels fail to deliver oxygen to the tissues. Students will investigate medical procedures used to treat blocked blood vessels and prevent events such as heart attack and stroke and build a model to demonstrate one of these techniques. Students will return to both Anna's medical history documents as well as her autopsy report and brainstorm how issues of the heart may have played a role in Anna's final demise. In the final project of the lesson, students will assess risk of heart disease. They will use an online risk calculator to explore factors that increase or decrease the risk of heart attack or associated coronary disease. They will calculate risk for both Anna Garcia and a patient they have been assigned. As they design a heart disease intervention plan for their assigned patient, students will think about all they have learned in this unit and how lifestyle and the choices we make impact overall health.

**-1Interdisciplinary Connections:**

R.1 - Reading

Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

R.2 - Reading

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

W.1 - Writing

Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

AS.W.5 - Writing

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

AS.W.6 - Writing

Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others

**21st Century Themes, Skills, and Standards:**

9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content and responsibilities of careers, and other aspects of society (e.g., 6.1.12.CivicsPD.16.a).

**Learning Targets**

CPI #	Cumulative Progress Indicators (CPI) for Unit
HS.LS1.2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS.LS1.1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS.LS1.2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS.LS3.1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.



HS.LS3.2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS.ETS1.4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
HS-LS2-8	Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives.
HS-LS2-7	Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction).
HS-LS2-7	When evaluating solutions, it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts.
HS-LS3-1, HS-LS3-2	Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.
<p><b>Unit Enduring Questions:</b></p> <ul style="list-style-type: none"> <li>• Why is it important to be able to Identify basic levels of organization of the human body</li> </ul> <p>a. Chemical b. Cellular c. Tissue d. Organs e. Systems f. Organism</p>	<p><b>Unit Enduring Understandings:</b></p> <p>Understand human anatomy, physiology, common diseases and disorders, and medical math principles.</p>
<p><b>Unit Objectives:</b></p> <p><i>Students will know....</i></p> <p>a. Skeletal (bone anatomy, axial and appendicular skeletal bones, functions of bones, ligaments, types of joints) b. Muscular (microscopic anatomy of muscle tissue, types of muscle, locations of skeletal muscles, functions of muscles, tendons, directional movements) c. Integumentary (layers, structures and functions of skin)</p>	<p><b>Unit Objectives:</b></p> <p><i>Students will be able to.....</i></p> <ul style="list-style-type: none"> <li>• Analyze basic structures and functions of human body systems (skeletal, muscular, integumentary, cardiovascular, lymphatic, respiratory, nervous, special senses, endocrine, digestive, urinary, and reproductive).</li> <li>• Understand human anatomy, physiology, common diseases and disorders, and medical math principles.</li> </ul>

<p>d. Cardiovascular (components of blood, structures and functions of blood components, structures and functions of the cardiovascular system, conduction system of the heart, cardiac cycle)</p> <p>e. Lymphatic (structures and functions of lymphatic system, movement of lymph fluid)</p> <p>f. Respiratory (structures and functions of respiratory system, physiology of respiration)</p> <p>g. Nervous (structures and functions of nervous tissue and system, organization of nervous system)</p> <p>h. Special senses (structures and functions of eye,</p>	<ul style="list-style-type: none"> <li>• Describe common diseases and disorders of each body system (such as: cancer, diabetes, dementia, stroke, heart disease, tuberculosis, hepatitis, COPD, kidney disease, arthritis, ulcers).</li> <li>• Describe biomedical therapies as they relate to the prevention, pathology, and treatment of disease.</li> </ul> <p>a. Gene testing  b. Gene therapy  c. Human proteomics  d. Cloning  e. Stem cell research</p>
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**Lower Cape May Regional School District Principles of Biomedical Sciences Curriculum  
Unit 5 Overview**

**Content Area: Science**

**Unit Title: Infectious Disease**

**Target Course/Grade Level: Grades 9-10**

**Unit Summary:**

**Unit 5: Infectious Disease**

The goal of Unit 5 is to introduce students to microbiology and infection. Students follow the spread of a simulated epidemic in order to conduct a thorough examination of the agents of disease. Students use clues from their investigation of Anna Garcia’s medical history to deduce that she was suffering from a bacterial infection. Through a series of laboratory investigations, students learn the fundamentals of aseptic technique, complete visual identification of bacterial morphology, use the Gram stain to examine bacterial cell structure, and analyze the results of metabolic tests to pinpoint the particular bacterium at the heart of the illness. Students explain the functioning of the human immune system in a visual project and explore how this system is designed to protect against invaders.

**Protection Lesson Summary  
Lesson 5.1 Infection**

The goal of this lesson is for students to play the role of medical detectives in order to investigate Anna’s mystery infection. Ultimately, they will need to identify the exact pathogen responsible for Anna’s illness. Students will demonstrate the transmission of an unknown infectious agent from person to person and use deductive reasoning to determine “patient zero.” They will investigate a variety of diseases caused by infectious agents and use this information to determine the tests needed to fill in missing pieces from Anna’s medical history. They will use aseptic technique to isolate bacterial colonies from four samples and then complete a gross examination of the colonies from Anna’s sample. They will create bacterial smears on microscope slides and perform a Gram stain on three types of bacteria, including the bacteria isolated from Anna’s sample. They will look at the stained samples under the microscope, identify the morphology of the bacteria, and determine whether the bacteria are Gram positive or Gram negative. They will use biochemical test results and bacteria identification flowcharts to identify the unknown bacterial species infecting Anna. Finally, students will design a board game or a children’s book that showcases how the immune system works to fight infection.

**Interdisciplinary Connections:**

R.1 - Reading

Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

R.2 - Reading

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

W.1 - Writing

Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

AS.W.5 - Writing

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

AS.W.6 - Writing

Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others

**21st Century Themes, Skills, and Standards:**

- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience (e.g., S-ID.B.6b, HS-LS2-4)

**Learning Targets**

CPI #

**Cumulative Progress Indicators (CPI) for Unit**

HS.ETS1.2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS.LS1.1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS.LS1.2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS.LS3.1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS.LS3.2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
HS.ETS1.4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
<p><b>Unit Enduring Questions:</b></p> <ul style="list-style-type: none"> <li>• Why is it important to know basic computer troubleshooting procedures (such as: restart, check power supply, refresh browser, check settings)?</li> <li>• When writing arguments to support claims in an analysis of substantive topics or texts, why is it important to use valid reasoning and relevant and sufficient evidence?</li> <li>• Why should we evaluate reports based on data?</li> </ul>	<p><b>Unit Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>• When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.</li> <li>• Changes in systems may have various causes that may not have equal effects.</li> <li>• Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.</li> <li>• Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.</li> </ul>

<p><b>Unit Objectives:</b>  <i>Students will know....</i></p> <ul style="list-style-type: none"> <li>• Examples of healthcare teams</li> <li>• Responsibilities of team members</li> <li>• Benefits of teamwork</li> <li>• How to apply effective techniques for managing team conflict (negotiation, assertive communication, gather the facts, clear expectations, mediation).</li> <li>• strategies for prevention of disease:             <ol style="list-style-type: none"> <li>a. Routine physical exams</li> <li>b. Medical, dental, and mental health screenings</li> <li>c. Community health education outreach programs</li> <li>d. Immunizations</li> <li>e. Stress management</li> <li>f. Avoid risky behaviors</li> </ol> </li> </ul>	<p><b>Unit Objectives:</b>  <i>Students will be able to.....</i></p> <ul style="list-style-type: none"> <li>• Describe common diseases and disorders of each body system (such as: cancer, diabetes, dementia, stroke, heart disease, tuberculosis, hepatitis, COPD, kidney disease, arthritis, ulcers).</li> </ul> <ol style="list-style-type: none"> <li>a. Etiology</li> <li>b. Pathology</li> <li>c. Diagnosis</li> <li>d. Treatment</li> <li>e. Prevention</li> </ol>

<p><b>Lower Cape May Regional School District Principles of Biomedical Sciences Curriculum          Unit 6 Overview</b></p>
<p><b>Content Area: Science</b></p>
<p><b>Unit Title: Post Mortem</b></p>
<p><b>Target Course/Grade Level: Grades 9-10</b></p>
<p><b>Unit Summary:</b></p> <p><b>Unit 6: Post Mortem</b></p> <p>The goal of Unit 6 is for students to put together all they have learned throughout the course to determine Anna Garcia’s cause of death. Students will investigate the structure and function of key human body systems and relate the illnesses in the course to a breakdown in these systems. Students will begin to recognize the coordination and interconnections of the body systems required to maintain homeostasis, a precursor to the theme of the Human Body Systems (HBS) course.</p>

**Lesson 6.1 Analyzing Anna**

This lesson is the culminating unit of the course. Students will put together all they have learned throughout the course to determine Anna Garcia’s cause of death. Throughout the course they have been compiling an Anna Garcia file with any information they have learned about her and her case. In this final lesson, students will investigate the structure and function of key human body systems and relate all of the ways Anna’s various illnesses affected each body system, potentially resulting in her premature death. In the final activity of the course, students will receive one final autopsy report and put together all they know to determine Anna’s cause of death. They will think about the interventions or innovations that may have saved Anna that day and reflect on the power of prevention in keeping the body well and safe from harm.

**Interdisciplinary Connections:**

R.1 - Reading

Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

R.2 - Reading

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

W.1 - Writing

Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

AS.W.5 - Writing

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

AS.W.6 - Writing

Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others

**21st Century Themes, Skills, and Standards:**

- 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
- 9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)
- 9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience (e.g., S-ID.B.6b, HS-LS2-4)

**Learning Targets**

CPI #

Cumulative Progress Indicators (CPI) for Unit

HS.LS1.2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS.ETS1.2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS.LS1.1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS.LS3.1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
<p><b>Unit Enduring Questions:</b></p> <ul style="list-style-type: none"> <li>● Why do we ask questions?</li> </ul> <p>-that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information.</p> <p>-that arise from examining models or a theory, to clarify and/or seek additional information and relationships.</p> <p>-to determine relationships, including quantitative relationships, between independent and dependent variables.</p> <p>-to clarify and refine a model, an explanation, or an engineering problem.</p>	<p><b>Unit Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>● One should select appropriate tools to collect, record, analyze, and evaluate data. Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated.</li> <li>● One should analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.</li> <li>● One should construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.</li> </ul>
<p><b>Unit Objectives:</b> <i>Students will know....</i></p> <ul style="list-style-type: none"> <li>● How to apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.</li> </ul>	<p><b>Unit Objectives:</b> <i>Students will be able to.....</i></p> <ul style="list-style-type: none"> <li>● Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.</li> </ul>

<ul style="list-style-type: none"> <li>● Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.</li> <li>● Much of science deals with constructing explanations of how things change and how they remain stable.</li> </ul>	<ul style="list-style-type: none"> <li>● Construct, use, and/or present an oral and written argument or counterarguments based on data and evidence.</li> <li>● Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible. Communicate scientific and/or technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically).</li> </ul>
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**Lower Cape May Regional School District Principles of Biomedical Sciences Curriculum  
Evidence of Learning**

**Specific Formative Assessments Utilized in Daily Lessons:**

- Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.
- Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

**Summative Assessment Utilized throughout Units:**

- Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
- Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

**Modifications for ELL's, Special Education, 504, and Gifted and Talented Students:**

- Teacher tutoring
- Peer tutoring
- Cooperative Learning Groups
- Modified Assignments
- Differentiated Instruction



- Response to Intervention ([www.help4teachers.com](http://www.help4teachers.com))
- Follow all IEP and 504 modifications

**Teacher Notes:**

- As required by the NJ Department of Education, teachers in all content areas will integrate the 21st Century Life and Careers Standards. As the NJDOE indicates, “Providing New Jersey students with the life and career skills needed to function optimally within this dynamic context is a critical focus and organizing principle of K-12 public education. New Jersey has both an obligation to prepare its young people to thrive in this environment, and a vested economic interest in grooming an engaged citizenry made up of productive members of a global workforce that rewards innovation, creativity, and adaptation to change.” The links below indicate the CPIs for grade ranges and need to be addressed throughout the units of study:  
[Life and Career Standards](#)
- As indicated in the NJSLS, standards and interdisciplinary connections will be integrated throughout content area curriculum.

**Project-based Learning Tasks:**

- As per PLTW web-based site

**Vocabulary:**

- In-text vocabulary should be incorporated into every unit. Word journals, vocabulary walls, and/or various other activities should be utilized by the instructor to teach vocabulary.

**The Research Process:**

- The research process must be integrated within each course curriculum. Student will be provided with opportunities to investigate issues from thematic units of study. As the NJSLS indicate, students will develop proficiency with MLA or APA format as applicable.

**Technology:**

- Students must engage in technology applications integrated throughout the curriculum.
- PLTW website with interactive videos and assignments

**Resources:**

Ancillary resources and materials used to deliver instruction are included below:

- Logger Pro 3
- Vernier Sensors

- Dissection Materials: Heart, Kidney
- 3 D Molecular Design Models
- Inspiration and Lucid Chart Concept Mapping Platforms
- PLTW website

### **Differentiation Strategies**

Differentiation strategies can require varied amounts of preparation time. High-prep strategies often require a teacher to both create multiple pathways to process information/demonstrate learning and to assign students to those pathways. Hence, more ongoing monitoring and assessment is often required. In contrast, low-prep strategies might require a teacher to strategically create process and product choices for students, but students are allowed to choose which option to pursue given their learning profile or readiness level. Also, a low-prep strategy might be focused on a discrete skill (such as vocabulary words), so there are fewer details to consider. Most teachers find that integration of one to two new low-prep strategies and one high-prep strategy each quarter is a reasonable goal.

### **Low Prep Strategies (add to list as needed)**

<b>Varied journal prompts, spelling or vocabulary lists</b>	Students are given a choice of different journal prompts, spelling lists or vocabulary lists depending on level of proficiency/assessment results.
<b>Anchor activities</b>	Anchor activities provide meaningful options for students when they are not actively engaged in classroom activities (e.g., when they finish early, are waiting for further directions, are stumped, first enter class, or when the teacher is working with other students). Anchors should be directly related to the current learning goals.
<b>Choices of books</b>	Different textbooks or novels (often at different levels) that students are allowed to choose from for content study or for literature circles.
<b>Choices of review activities</b>	Different review or extension activities are made available to students during a specific section of the class (such as at the beginning or end of the period).
<b>Homework options</b>	Students are provided with choices about the assignments they complete as homework. Or, students are directed to specific

	homework based on student needs.
<b>Student-teacher goal setting</b>	The teacher and student work together to develop individual learning goals for the student.
<b>Flexible grouping</b>	Students might be instructed as a whole group, in small groups of various permutations (homogeneous or heterogeneous by skill or interest), in pairs or individual. Any small groups or pairs change over time based on assessment data.
<b>Varied computer programs</b>	The computer is used as an additional center in the classroom, and students are directed to specific websites or software that allows them to work on skills at their level.
<b>Multiple Intelligence or Learning Style options</b>	Students select activities or are assigned an activity that is designed for learning a specific area of content through their strong intelligence (verbal-linguistic, interpersonal, musical, etc.)
<b>Varying scaffolding of same organizer</b>	Provide graphic organizers that require students to complete various amounts of information. Some will be more filled out (by the teacher) than others.
<b>Think-Pair-Share by readiness, interest, and/or learning profile</b>	Students are placed in predetermined pairs, asked to think about a question for a specific amount of time, then are asked to share their answers first with their partner and then with the whole group.
<b>Mini workshops to re-teach or extend skills</b>	A short, specific lesson with a student or group of students that focuses on one area of interest or reinforcement of a specific skill.
<b>Orbitals</b>	Students conduct independent investigations generally lasting 3-6 weeks. The investigations “orbit” or revolve around some facet of the curriculum.
<b>Games to practice mastery of information and skill</b>	Use games as a way to review and reinforce concepts. Include questions and tasks that are on a variety of cognitive levels.
<b>Multiple levels of questions</b>	Teachers vary the sorts of questions posed to different students based on their ability to handle them. Varying questions is an excellent way to build the confidence (and motivation) of students who are reluctant to contribute to class discourse. Note: Most teachers would probably admit that without even thinking about it they tend to address particular types of questions to particular students. In some cases, such tendencies may need to be corrected. (For

	example, a teacher may be unknowingly addressing all of the more challenging questions to one student, thereby inhibiting other students' learning and fostering class resentment of that student.)
<b>High Prep Strategies (add to list as needed)</b>	
<b>Cubing</b>	Designed to help students think about a topic or idea from many different angles or perspectives. The tasks are placed on the six sides of a cube and use commands that help support thinking (justify, describe, evaluate, connect, etc.). The students complete the task on the side that ends face up, either independently or in homogenous groups.
<b>Tiered assignment/ product</b>	The content and objective are the same, but the process and/or the products that students must create to demonstrate mastery are varied according to the students' readiness level.
<b>Independent studies</b>	Students choose a topic of interest that they are curious about and wants to discover new information on. Research is done from questions developed by the student and/or teacher. The researcher produces a product to share learning with classmates.
<b>4MAT</b>	Teachers plan instruction for each of four learning preferences over the course of several days on a given topic. Some lessons focus on mastery, some on understanding, some on personal involvement, and some on synthesis. Each learner has a chance to approach the topic through preferred modes and to strengthen weaker areas
<b>Jigsaw</b>	Students are grouped based on their reading proficiency and each group is given an appropriate text on a specific aspect of a topic (the economic, political and social impact of the Civil War, for example). Students later get into heterogeneous groups to share their findings with their peers, who have read about different areas of study from source texts on their own reading levels. The jigsaw technique allows you to tackle the same subject with all of your students while discreetly providing them the different tools they need to get there.
<b>Multiple texts</b>	The teacher obtains or creates a variety of texts at different reading levels to assign strategically to students.
<b>Alternative assessments</b>	After completing a learning experience via the same content or process, the student may have a choice of products to show what has been learned. This differentiation creates possibilities for students who excel in different modalities over others (verbal versus visual).

<p><b>Modified Assessments</b></p>	<p>Assessments can be modified in a variety of ways – for example by formatting the document differently (e.g. more space between questions) or by using different types of questions (matching vs. open ended) or by asking only the truly essential questions.</p>
<p><b>Learning contracts or Personal Agendas</b></p>	<p>A contract is a negotiated agreement between teacher and student that may have a mix of requirements and choice based on skills and understandings considered important by the teacher. A personal agenda could be quite similar, as it would list the tasks the teacher wants each student to accomplish in a given day/lesson/unit. Both Learning contracts and personal agendas will likely vary between students within a classroom.</p>
<p><b>Compacting</b></p>	<p>This strategy begins with a student assessment to determine level of knowledge or skill already attained (i.e. pretest). Students who demonstrate proficiency before the unit even begins are given the opportunity to work at a higher level (either independently or in a group).</p>
<p><b>Literature circles</b></p>	<p>Flexible grouping of students who engage in different studies of a piece of literature. Groups can be heterogeneous and homogeneous.</p>
<p><b>Learning Centers</b></p>	<p>A station (or simply a collection of materials) that students might use independently to explore topics or practice skills. Centers allow individual or groups of students to work at their own pace. Students are constantly reassessed to determine which centers are appropriate for students at a particular time, and to plan activities at those centers to build the most pressing skills.</p>
<p><b>Tic-Tac-Toe Choice Board (sometimes called “Think-Tac-Toe”</b></p>	<p>The tic-tac-toe choice board is a strategy that enables students to choose multiple tasks to practice a skill, or demonstrate and extend understanding of a process or concept. From the board, students choose (or teacher assigns) three adjacent or diagonal. To design a tic-tac-toe board: - Identify the outcomes and instructional focus - Design 9 different tasks - Use assessment data to determine student levels - Arrange the tasks on a tic-tac-toe board either randomly, in rows according to level of difficulty, or you may want to select one critical task to place in the center of the board for all students to complete.</p>
<p><b>Curriculum development Resources/Instructional Materials:</b></p>	
<p>List or Link Ancillary Resources and Curriculum Materials Here:</p> <ul style="list-style-type: none"> <li>● PLTW website</li> </ul>	

**Board of Education Approved Text(s)**

- PLTW website