HS Principles of the Biomedical Sciences
Science

Course Description
Students investigate various health conditions including heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases. They determine the factors that led to the death of a fictional person, and investigate lifestyle choices and medical treatments that might have prolonged the person's life. The activities and projects introduce students to human physiology, medicine, and research processes. This course provides an overview of all the courses in the Biomedical Sciences program and lays the scientific foundation for subsequent courses. This course is designed for 10th, 11th, and 12th grade students.

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Course Rationale
Throughout the Principles of Biomedical Sciences course, students acquire strong teamwork and communication practices, and develop organizational, critical-thinking, and problem-solving skills. The Principles of Biomedical Sciences course complements traditional science courses and can serve as the foundation for STEM-centered or specialized academies. The program is designed to prepare students to pursue a post-secondary education and careers in the biomedical sciences.

Enduring Understandings
1. That all sources need to be evaluated objectively, medical professionals are bound by an ethical code, and the human body is made up of many systems that work in conjunction with one another to perform a series of specialized tasks.
2. The human heart is a four-chambered pump that transports blood throughout the body and can be analyzed and monitored through the use of technology.
3. Diabetes is a disease that is affected by improper regulation of insulin in the body and can affect the daily life of the patient as well as the extended family.
4. Sickle Cell Disease can cause a variety of health issues and is a genetic disorder carried through DNA which is constantly being replicated and can mutate to cause complications in a patient.
5. Cholesterol is a necessary molecule in the body and is measured in two forms, and DNA can be segmented, replicated, and sourced from several body fluids to track and identify disease.
6. Bacteria are living organisms that can be helpful or harmful while viruses are non-living organisms that affect DNA; through public health education and basic preventative health measures, the spread of diseases can be slowed or prevented.
7. Many medical interventions exist and should be carefully selected for each individual patient, and their adaptation and evolution are driven by technology.
8. Medical research is an essential component to improve healthcare and is often funded through the grant writing process.

Board Approval Date
6/26/2014

Course Details
Unit: Human Body Systems
Duration: 2 Week(s)
Unit Overview
This unit will discuss the various systems of the body and how they work together, the ethics of the healthcare profession, and evaluating sources to determine bias and accuracy.

Enduring Understandings
That all sources need to be evaluated objectively to ensure there is no bias and claims are accurate.
Medical professionals are bound by an ethical code to maintain patient confidentiality.
The human body is made up of many systems that work in conjunction with one another to perform a series of specialized tasks.

Essential Questions
How do you know if a cited source is unbiased and accurate?
Why is it important that physicians and medical professionals are required to maintain patient confidentiality?
How are the systems of the human body connected and what specialized functions are tied to each system?

Example Assessment Items
Given sample sources within a topic, then students will correctly identify biased and unbiased sources regarding the topic.
Given the requirements found within the Health Insurance Portability and Accountability Act (HIPAA), students will be able to summarize the law and identify appropriate and inappropriate healthcare practices as they reference HIPAA.
Having discussed the human body systems, students will correctly draw and identify the systems of the body as they overlap and create a graphic organizer that shows the interconnectedness of two or more body systems.

Academic Vocabulary
Health Insurance Portability and Privacy Act
Confidentiality
Bias
Ethics/Ethical

Topic: The Mystery Duration: 11 Day(s)

Description
1. The human body is composed of multiple body systems working together to maintain good health.
2. Each human body system is composed of specific organs that interact to complete specialized functions in the body.
3. Determining the cause of death involves the investigation of many aspects of the medical condition of a victim, the internal and external examination of the body, the chemical and microscopic analysis of tissues and body fluids, and may involve many different biomedical professionals.
4. Healthcare professionals are bound by laws and ethical standards to maintain the confidentiality of patients.
5. It is important to evaluate a source of information to insure the information is accurate and unbiased; all sources used for information should be properly cited in presentations and reports.
6. Plagiarism invalidates the work of the person who copied the words, and deprives the original author of credit.

Learning Targets
The student will construct a life-size human body poster, showing the location of major systems in the human body and the organs that comprise them.
The student will work as a team member to create a visual and oral presentation, containing picture and text, to explain the major features and functions of a body system.
The student will produce a concept map of a body system.
The student will make a concept map showing the interconnections between two body systems.
The student will write a summary of the Health Insurance Portability and Accountability Act (HIPAA).

Unit: Heart Attack Duration: 3 Week(s)

Unit Overview
This unit includes the structure and function of the human heart and blood.

Enduring Understandings
The human heart is a 4-chambered pump that transports blood throughout the body.
The heart's function and activity can be analyzed and monitored through the use of technology.
The origin of human blood and its function in the human body.

Essential Questions
Why does the heart need four chambers to effectively pump blood throughout the body?
How and in what ways are we able to monitor heart function using technologies?
How is blood manufactured by the body and where? Why is blood essential to our health and survival?

Example Assessment Items
Dissect a sheep's heart and accurately identify the various parts and tissues and describe their functions.

Use the experimental design process to create and carry out an experiment affecting blood pressure and heart rate and use the various heart monitoring technologies to gather data and support the findings.

Identify the various parts of the blood in a diagram and then be able to write about the necessity of human blood to survival.
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**Grade(s) 10th - 12th, 1 Credit**

**Elective Course**

### Topic: What Is A Pump

**Description**

1. A pump is a machine that moves a fluid from one location to another.
2. There are multiple ways to construct a pump.

**Learning Targets**

The student will build a pump that successfully moves 150 mL of water from one location to another.

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### Topic: The Structure of the Human Heart

**Description**

1. The human heart is a four-chambered living pump designed to provide the force needed to transport blood through all the tissues of the body.
2. The four-chambered design of the heart allows it to handle both oxygenated blood from the lungs and de-oxygenated blood from the body without mixing the two types of blood.
3. The human heart has different types of tissue which vary in characteristics.
4. A tissue is a group of similar cells designed to carry out a specific function.

**Learning Targets**

The student will create two dimensional drawings of the human heart labeling all important structures.

The student will dissect a sheep’s heart, accurately identifying and describing the function of the specified structures.

The student will compare and contrast the characteristics of the different cardiac tissue types.

The student will explain how the design of the four-chambered heart allows the heart to pump both oxygenated and un-oxygenated blood without mixing.

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### Topic: The Heart at Work

**Description**

1. Heartbeat is caused by the contraction of cardiac muscle cells resulting in the movement of blood from the heart to the arteries and the rest of the body.
2. Heart rate is the number of heart contractions per unit of time, usually per minute.
3. Heart rate, EKG, and blood pressure measurements are indicators of a person’s medical condition.
4. Internal and external factors affect heart function including heart rate, EKG, and blood pressure.
5. Blood pressure is a measure of the force put on the vascular walls by the blood as it is pushed by the cardiac muscles through the vascular system.
6. The electrical activity of the heart can be measured and recorded by an electrocardiogram (EKG or ECG).

**Learning Targets**

The student will demonstrate the use of technology as an important tool in the Biomedical Sciences by using various probes and data acquisition software to collect cardiovascular data.

The student will use the Experimental Design Process to create and carry out experiments on blood pressure and heart rate.

The student will collect and analyze EKG data.

The student will investigate factors that can impact heart rate and blood pressure.

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### Topic: Blood-The River of Life

**Description**

1. Blood is liquid connective tissue composed of red cells, white cells and platelets suspended in liquid plasma.
2. Red cells, erythrocytes, contain large amounts of hemoglobin and are essential for transporting oxygen to all body cells.
3. White cells, leukocytes, are responsible for fighting infection.
4. Platelets are cell fragments that are necessary for blood to clot.
5. All blood cells originate in the bone marrow.
6. Blood is the major transport mechanism for substances that must be distributed through the body, including gases, molecules, nutrients, and hormones.
7. The body must continually replenish blood cells.

**Learning Targets**

The student will identify, sketch and measure red and white blood cells viewed under a microscope.

The student will identify and describe the functions of the major components of human blood.
The student will demonstrate an understanding of the differences between cells, tissues and organs.

The student will use and explain mathematical procedures to estimate size of objects viewed under a microscope.

The student will explain the importance of blood to human survival.

Unit: Diabetes  Duration: 4 Week(s)

Unit Overview
In this unit we will discuss the chemical makeup of food, how macromolecules work within our body, the causes behind Type I and Type II diabetes, and how living with diabetes can affect not only the patient but their family as well.

Enduring Understandings
- Diabetes is a disease that is affected by improper regulation of insulin in the body and can affect the daily life of the patient as well as the extended family.

Essential Questions
- How is Type I different from Type II diabetes and what role does diet play in the regulation of Type I vs. Type II diabetes?
- Why does our body need both enzymes and co-enzymes and what purposes do they serve?
- How can one individual's disease (diabetes) affect an entire family?

Example Assessment Items
- Describe the differences between Type I and Type II diabetes.
- Use the Daily Reference Intake (DRI) and explain its importance to good nutrition.
- Create a detailed outline or graphic organizer showing an understanding of the structure and function of enzymes.
- Design a nutritionally complete menu for a diabetic teenager.

Academic Vocabulary
- Homeostasis
- Type I Diabetes
- Type II Diabetes
- Enzymes
- Co-Enzymes

Topic: What Is In Our Food  Duration: 6 Day(s)

Description
1. Food labels are a useful way to determine which nutrients and what percentages of their daily values are present in a food.
2. Foods are composed of molecules and macromolecules, which in turn are made of atoms.
3. The chemical bonds formed between atoms are sources of energy, and the energy is released when the bonds are broken.
4. Homeostasis depends upon many different chemical reactions.
5. Water is an essential component of human bodies and has unique properties including the ability to dissolve many molecules and compounds.

Learning Targets
- The student will analyze food labels for nutritional content.
- The student will explain the term Dietary Reference Intake and its importance to good nutrition.
- The student will build and analyze molecular models and diagrams of atoms, molecules and simple compounds.
- The student will describe the role of chemical bonding in chemical reactions and the transfer of energy.
- The student will explain the process of calorimetry and how it is used to measure the amount of energy in a food.
- The student will explain why water is an essential component of human bodies.

Topic: Macromolecules  Duration: 3 Day(s)

Description
1. Foods contain macromolecules which are broken down and reassembled for use in the human body.
2. Macromolecules are classified into four groups, proteins, carbohydrates, lipids, and nucleic acids, based on their structure.
3. The different classes of macromolecules perform different functions in the body.
4. Macromolecules within the same classification have great variability because of the multiple ways their components can be arranged, and a macromolecule's function is dependent on the specific arrangement of the components.
5. Chemical indicators can be used to identify specific molecules.

Learning Targets
- The student will build models of carbohydrates, proteins and lipids.
- The student will differentiate between the classes of macromolecules in terms of their structures and functions.
- The student will give examples of different foods that contain each of these types of nutrients.
The student will explain the role of indicators in identifying chemical compounds.
The student will design a graphic organizer to summarize the results of a food identification activity.

**Topic:** Molecules Working Together  
**Duration:** 2 Day(s)

**Description**
1. Catalysts facilitate chemical reactions by reducing the energy needed for the reaction to occur.
2. Enzymes are usually proteins and act as catalysts in the human body.
3. Enzymes are designed to be highly specific, and the structure of the enzyme’s active site determines the structure of the substrate it acts upon.
4. Co-enzymes are needed for some enzymes to function, and many vitamins are co-enzymes.

**Learning Targets**
The student will create a detailed outline demonstrating an understanding of the structure and function of enzymes.
The student will create a concept map illustrating the information in the outline describing the structure and function of enzymes.
The student will demonstrate an understanding of both Lock and Key Model and Induced Fit Model of enzyme function by creating and explaining 3-D model of how enzymes link to substrates.
The student will explain the importance of enzymes on maintaining homeostasis in the human body.
The student will describe the function of co-enzymes and give examples of co-enzymes found in food.

**Topic:** The Diabetes Connection  
**Duration:** 7 Day(s)

**Description**
1. The human body uses both positive and negative feedback mechanisms to maintain homeostasis.
2. Insulin is the protein that regulates the transfer of glucose into body cells and it is part of a feedback system that maintains the level of glucose in the blood.
3. Diabetes is a disorder caused by insufficient insulin or the inability of the insulin to function properly.
4. Diabetes is a serious health issue in the U.S., with long term impacts on individuals, families, and communities.

**Learning Targets**
The student will explain how feedback systems are used by the human body to maintain homeostasis.
The student will create a 3-D working model that demonstrates the role of insulin in transferring glucose from blood into cells.
The student will explain the causes, symptoms, effects, and treatments of both Type I and Type II diabetes.
The student will demonstrate an understanding of the dietary requirements and restrictions of people who have diabetes.
The student will demonstrate an understanding of the ways in which diabetes can impact one's daily life.
The student will describe behaviors that could help prevent the onset of Type II diabetes.

**Topic:** Life with Diabetes  
**Duration:** 2 Day(s)

**Description**
1. Diabetes not only affects the individual, but it also impacts the family, friends and associates of the people with this disorder.
2. All carbohydrates, not just simple sugars, must be closely monitored in the daily lives of people with diabetes.
3. The dietary guidelines for individuals who have diabetes are healthy for all people.

**Learning Targets**
The student will demonstrate an understanding of the lifestyle implications living with diabetes involves.
The student will plan a menu that is nutritionally complete and appropriate for a diabetic teenager.

**Unit:** Sickle Cell Disease  
**Duration:** 3 Week(s)
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Unit Overview
This unit discusses what Sickle Cell Disease is and how it is caused, how diseases and genetic information are carried through chromosomes, and how DNA represents different traits and can undergo mutations.

Enduring Understandings
Sickle Cell Disease can cause a variety of health issues and is a genetic disorder carried through DNA which is constantly being replicated and can mutate to cause complications in a patient.

Essential Questions
How does Sickle Cell Disease affect a person’s health?
How does DNA carry information?
Why is it necessary for DNA to replicate? How can mutations arise from this process?

Example Assessment Items
Create a chart correctly detailing the symptoms and complications of sickle cell trait to sickle cell disease.
Create and analyze a pedigree chart showing the passage of genetic traits through three or more generations.
Summarize and present information on syndromes associated with chromosomal abnormalities.
Create and present PowerPoint presentations on an assigned disease caused by a genetic mutation.

Academic Vocabulary
Sickle Cell Disease
Anemia
Chromosomes
Mutations

Topic: What Is Sickle Cell Disease
Duration: 3 Day(s)

Description
1. Cells need oxygen in order to function properly, and the hemoglobin protein in red blood cells transports oxygen to the cells.
2. People with deformed hemoglobin experience a variety of health issues.
3. Changes to the structure of a protein can change its ability to function properly.
4. The incidence of a particular disease varies between different countries.

Learning Targets
The student will use proper microscope technique to examine and record their observations of normal and sickle red blood cells in their lab journal.
The student will use appropriate internet research techniques to obtain information on the symptoms and complications of the sickle cell trait and anemia.
The student will prepare a chart comparing the symptoms and complications of sickle cell trait to sickle cell disease.
The student will write a letter to a peer which explains the relationship between the symptoms of anemia and cell energetics.

Topic: What Causes Sickle Cell Disease?
Duration: 4 Day(s)

Description
1. Chromosomes in reproductive cells carry traits through the generations.
2. The expression of a trait through the generations of a family can be visualized using a pedigree.
3. Genetic diseases are passed from parents to children before birth and are not contagious.
4. Changes in the genetic material may cause changes in the traits of an organism.

Learning Targets
The student will use proper laboratory techniques to create chromosome spreads of human HeLa cells.
The student will use proper techniques to examine, count, and measure chromosomes from HeLa cells and properly document data.
The student will create and analyze pedigree charts to illustrate passage of a trait through at least three generations.
The student will calculate the probability of a trait appearing in offspring.

Topic: How Do Chromosomes Carry Information?
Duration: 5 Day(s)

Description
1. Deoxyribonucleic Acid (DNA) is the genetic material for cells and organisms.
2. DNA from all living organisms has the same basic structure—the differences are in the sequences of the nucleotides.
3. Genes, segments of DNA sequence, code for traits.
4. Each chromosome contains numerous genes.

Learning Targets
The student will build a model of the DNA molecule and be able to use appropriate vocabulary to describe its structure.
The student will use appropriate laboratory methods to isolate DNA from plant and animal cells.
Topic: What Is The DNA Code?  
Duration: 3 Day(s)

Description
1. The sequence of nucleotides in DNA determines the sequence of amino acids in a protein.
2. The genetic code is universal.
3. The sequence of amino acids in a protein determines the protein's 3-dimensional shape.
4. Proteins have multiple structural levels.
5. A protein's shape is not constant; it changes depending on its environment.

Learning Targets
- The student will identify the exons, coding regions, of a gene by comparing the DNA code to the amino acid sequence of the protein.
- The student will work in teams to build accurate 3-dimensional models of the B-globin protein.
- The student will design a protein with a specific function by specifying the sequence of nucleotides in the protein's gene.

Topic: Mistakes Happen  
Duration: 3 Day(s)

Description
1. Chromosomal abnormalities cause multiple, often morbid complications and can be detected by karyotyping.
2. Humans have two copies of each of the 23 different chromosomes.
3. Many diseases are caused by mutations in genes.
4. Changing a single amino acid in a protein can change the properties of a protein and its 3-dimensional shape.

Learning Targets
- The student will complete and analyze karyotypes.
- The student will summarize and present information on syndromes associated with chromosomal abnormalities.
- The student will assemble models of specified amino acids.
- The student will create and present PowerPoint presentations on assigned diseases which are caused by a genetic mutation.

Unit: Hypercholesterolemia  
Duration: 1 Week(s)

Unit Overview
This unit discusses Cholesterol as it relates to body functions and HDL and LDL and how molecular biology techniques can be used to diagnose disease.

Enduring Understandings
Cholesterol is a necessary molecule in the body and is measured in two forms, and DNA can be segmented, replicated, and sourced from several body fluids to track and identify disease.

Essential Questions
Why is cholesterol necessary for human body function and what is the difference between HDL and LDL?
How are we able to pull genetic information from human fluids and make them useable for testing and sequencing?

Example Assessment Items
Create an informative poster or brochure on HDL and LDL and how it is associated with the risk for heart disease. Separate DNA fragments by gel electrophoresis and use the results to correctly diagnose the presence of familial hypercholesterolemia mutation.

Academic Vocabulary
- Cholesterol
- High Density Lipoproteins (HDL)
- Low Density Lipoproteins (LDL)
- Hypercholesterolemia
- Electrophoresis
- Polymerase Chain Reaction (PCR)

Topic: Cholesterol  
Duration: 2 Day(s)

Description
1. There are many types of fat or lipid molecules and each has different physical properties and functions in the body.
2. Cholesterol is a lipid and is necessary for the proper functioning of cells and for maintaining a healthy body.
3. Cholesterol is transported in the blood by protein complexes called high density lipoprotein (HDL) and low density lipoprotein (LDL); the measurement of these complexes may indicate a person's risk for heart disease.

Learning Targets
The student will create a poster or brochure informing other students about HDL and LDL and how these molecules are associated with the risk for heart disease.

**Topic:** Molecular Biological Techniques for Diagnosing Disease  
**Duration:** 3 Day(s)

**Description**
1. DNA from numerous sources including blood and saliva can be amplified and analyzed.
2. The Polymerase Chain Reaction (PCR) exponentially increases the number of DNA molecules.
3. Restriction Fragment Length Polymorphism allows for genetic diseases and disorders to be diagnosed by analysis of DNA samples without DNA sequencing.
4. DNA gel electrophoresis separates DNA fragments based on size and is used in Restriction Fragment Length Polymorphism analysis.

**Learning Targets**
- The student will calculate the amplification of DNA during the polymerase chain reaction.
- The student will create a graph of the amplification rate.
- The student will use proper laboratory techniques to separate DNA fragments by gel electrophoresis.
- The student will analyze the results of the gel electrophoresis to correctly diagnose the presence of the familial hypercholesterolemia mutation.

**Unit:** Infectious Diseases  
**Duration:** 2 Week(s)

**Unit Overview**
This unit discusses the differences and traits of bacteria and viruses as well as the role of Public Health in preventing the spreading of disease.

**Enduring Understandings**
Bacteria are living organisms that can be helpful or harmful while viruses are non-living organisms that affect DNA; through public health education and basic preventative health measures, the spread of diseases can be slowed or prevented.

**Essential Questions**
- How can bacteria be both helpful and harmful?
- How is it that viruses, a non-living organism, can significantly impact the human body?
- How can public health initiatives help prevent the spread of disease?

**Example Assessment Items**
- Perform and analyze a test of antibiotic efficiency using pour plates and antibiotic discs.
- Build an accurate, labeled, and scaled model of a virus particle and explain how it functions in relation to human DNA.
- Design and present a public health awareness brochure or poster to inform people about the cause, symptoms, and prevention of an infectious disease.

**Academic Vocabulary**
- Bacteria
- Bacteriophage
- Virus
- Infection
- Antibiotics

**Topic:** Bacteria  
**Duration:** 4 Day(s)

**Description**
1. Many different types of bacteria exist and only a few cause disease.
2. Bacteria are classified by their reaction to the Gram stain, shape, and metabolism.
3. Antibiotics can be used to treat bacterial infections, but the choice of antibiotic depends on the type of bacteria causing the infection.
4. Many strains of bacteria are developing resistance to antibiotics.

**Learning Targets**
- The student will use proper aseptic technique to sample and transfer bacterial cells to microscope slides.
- The student will use proper Gram staining and microscope techniques to stain and observe bacteria.
- The student will perform and analyze a test of antibiotic efficiency using pour plates and antibiotic discs.

**Topic:** Public Health Campaign  
**Duration:** 2 Day(s)
**Description**
1. Public education can help prevent the spread of disease.
2. Infectious diseases are spread in a wide variety of ways.
3. Basic personal preventive measures including hand washing, surface cleaning, and using tissues can prevent the spread of many diseases.

**Learning Targets**
The student will design and produce a Public Health Awareness Campaign to inform people about the cause, symptoms, and prevention of an infectious disease.

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**Topic:** Viruses  
**Duration:** 2 Day(s)

**Description**
1. Viruses are non-living particles that can infect cells and cause disease.
2. Antibiotics have no effect on viruses and are ineffective treatments for viral diseases.
3. Viruses are very specific and must be able to attach to a cell to be able to infect it.
4. Viruses contain genetic material that can mutate causing a change in the characteristics of the virus, including allowing the virus to attach to new types of cells.

**Learning Targets**
The student will use proper research techniques to find information from a variety of sources about the structure of viruses.
The student will build an accurate, labeled, and scaled model of a virus particle.
The student will produce an accurate and informative PowerPoint presentation about the symptoms, prevalence, prevention, treatment, and the global economic and social impact of an infectious disease caused by a virus.

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**Unit:** Grant Proposal  
**Duration:** 1 Week(s)

**Unit Overview**
This unit explores the necessity and process behind grant writing to fund scientific research.

**Enduring Understandings**
Medical research is an essential component to improve healthcare and is often funded through the grant writing process.

**Essential Questions**
How has medical research improved the quality of life?  
How does the process of writing a grant help or hinder scientific research?  
Why is continued medical research necessary?

**Example Assessment Items**
Identify an aspect of a disease or medical condition in need of research.  
Prepare a detailed grant proposal requesting funds for a research project to impact a specific aspect of a disease or medical condition and present it to a panel of their peers for approval.  
Be able to evaluate grant projects, including their own, on a common rubric.

**Academic Vocabulary**
Grant  
Proposal  
Research

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**Topic:** Grant Proposal  
**Duration:** 5 Day(s)

**Description**
1. Medical research is an essential component in the quest to increase longevity and improve quality of life.  
2. Medical research has led to the improved quality of medical care.  
3. The necessity for medical research continues to be an important aspect of modern society.  
4. Medical research is funded through the grant process.  
5. A grant is a detailed proposal describing all aspects of a research project and is used to acquire funds to support research work.

**Learning Targets**
The student will use consensus to identify a medical condition or disease of interest.  
The student will identify an aspect of the disease or medical condition in need of research.  
The student will prepare a detailed grant proposal requesting funds for a research project to impact a specific aspect of the disease or medical condition.  
The student will use consensus as a decision making strategy on the team.  
The student will present the grant proposal in the form of an oral presentation.
Unit: Medical Interventions

Unit Overview
This unit discusses the various approaches for disease and medical intervention and the uniqueness of each procedure or process as it relates to patient care.

Enduring Understandings
Many medical interventions exist and should be carefully selected for each individual patient, and their adaptation and evolution are driven by technology.

Essential Questions
Why is it necessary to customize interventions for each patient?
How does technology play a role in the development of new medical interventions?

Example Assessment Items
Create a visual product that demonstrates the steps or stages in the development, trial, and approval of medical interventions.
Identify the new technologies created because of or used with specific medical interventions.

Academic Vocabulary
Medical interventions
Technology

Topic: Medical Interventions

Description
1. The field of biomedical sciences includes all sciences related to the prevention of disease and the development of effective treatments.
2. A wide variety of medical interventions are available to prevent and treat disease.
3. Not all patients respond the same way to a medical intervention, and the physician should carefully select the best treatment for each patient.
4. Development of treatment and prevention methods is directly related to engineering principles and technology development.
5. The need for medical interventions drives the development, improvement, and application of technology.
6. The availability of technology drives the development, improvement, and application of medical interventions.

Learning Targets
The student will be able to analyze the effect of replacing an enzyme on the ability of a living cell (yeast) to complete a chemical reaction.
The student will be able to create a product (e.g. game, comic book, or cartoon) that demonstrates the steps or stages in the development, trial, and approval of medical interventions.
The student will be able to research, categorize, and summarize the medical interventions that prevent or treat an assigned disease.
The student will be able to present and explain the modes of action of the researched medical interventions to the class.

Unit: English Language Arts within Science and Technology Content

Unit Overview
The following unit is aligned with Common Core and focused on the importance of reading and writing in the content areas. This unit is specifically focused on science and technology.

Enduring Understandings
Reading scientific pieces include various elements that are different than in other contents.
Writing scientific pieces has various elements that are different than in other contents.

Essential Questions
How do reading scientific texts vary from other content areas?
How to you express your idea and knowledge differently in scientific writings?

Topic: English Language Arts within Science and Technology Content

Learning Targets
The student will cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
The student will write arguments focused on discipline-specific content.
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- Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.
- Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from or supports the argument presented.

The student will write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

The student will write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

The student will produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

The student will develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

The student will use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.

The student will conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

The student will gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.