Davison Community Schools
ADVISORY CURRICULUM COUNCIL
Phase II
Marc Pittenger, Matt Lobban
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Microbiology

Course Essential Questions (from Phase I report):
Microbiology Big Ideas

Big Idea 1 – Living organisms display the characteristics of life.

What does it mean to be alive?

Big Idea 2 – Microbiology is the study of all cellular and acellular microorganisms (microbes) in the microscopic range. These include bacteria, algae, fungi, viruses, viroids, prions, and protozoa.

What is microbiology?

Big Idea 3 – Microorganisms are a part of the human environment and therefore important to human health and activities. The study of microorganisms provides insight into life processes in all forms of life.

Why study microbiology?

Big Idea 4 – Microorganisms, cellular and viral, can interact with human/nonhuman hosts and their environments in beneficial, neutral, and detrimental ways.

How do microorganisms interact with human/nonhuman hosts and their environments?

Big Idea 5 –The presence of microorganisms and the development of new technology to study microorganisms has shaped and changed the scope of history.

How has the presence of microorganisms and the development of new technology to study microorganisms shaped and changed the scope of history?

Phase II Curriculum

Unit 1: History and Scope of Microbiology

Essential Questions:	Essential Understandings:
▼ What is microbiology? ▼ Why study microbiology? ▼ Why are microorganisms useful for conducting research? ▼ How have scientists contributed to our current knowledge of microbiology and the germ theory of disease?	∇ Microbiology is the study of all microorganisms (microbes) in the microscopic range. These include bacteria, algae, fungi, viruses, viroids, prions, and protozoa. ∇ Microorganisms are a part of the human environment and therefore important to human health and activities. The study of microorganisms provides insight into life processes in all forms of life. ∇ Microorganisms have a simple cell structure, can be found in large numbers, reproduce rapidly, and are relatively inexpensive. ∇ Controlled experiments and technological advancements have led to the development of the germ theory of disease, which states that microorganisms can invade other organisms and cause disease.

Curriculum Standards- DOK noted where applicable with Standards

American Society for Microbiology Curriculum Guidelines for Undergraduate Microbiology Education

Impact of Microorganisms

- ∇ 24. Microbes are essential for life as we know it and the processes that support life (e.g., in biogeochemical cycles and plant and/or animal microbiota.
- ∇ 25. Microorganisms provide essential models that give us fundamental knowledge about life processes.
- ∇ 26. Humans utilize and harness microorganisms and their products.
- ∇ 27. Because the true diversity of microbial life is largely unknown, its effects and potential benefits have not been fully explored.

Scientific Thinking

- ∇ 28. Ability to apply the process of science.
  a. Demonstrate and ability to formulate hypotheses and design experiments based on the scientific method.
  b. Analyze and interpret results from a variety of microbiological methods and apply these methods to analogous situations.
- ∇ 30. Ability to communicate and collaborate with other disciplines.
  a. Effectively communicate fundamental concepts of microbiology in written and oral format.
  b. Identify credible scientific sources and interpret and evaluate the information therein.
- ∇ 31. Ability to understand the relationship between science and society to discuss ethical issues in microbiology.

Microbiology Laboratory Skills

- ∇ 36. Use appropriate microbiology lab equipment and methods.
- ∇ 37. Practice safe microbiology, using appropriate protective and emergency procedures.

LEARNING TARGETS

Knowledge/Content **I Know** …	**Skills/Processes** **I Can** …
I know microbiology is the study of cellular and acellular microorganisms such as bacteria, algae, fungi, viruses, viroids, prions, and protozoa. I know microorganisms are a part of the human environment and are therefore important to human health. Microorganisms are essential to the web of life, are beneficial in the synthesis of food products and antibiotics, and in removing toxic substances from the environment (bioremediation). I know microorganisms have a simple structure, are found in large numbers, reproduce rapidly, and are relatively inexpensive, which makes them ideal subjects for experimental research.	I can describe the scientific discipline of microbiology. I can explain how microorganisms interact with human/nonhuman hosts and their environments in beneficial, neutral, and detrimental ways. I can justify why microorganisms are useful for experimental research. I can compare and contrast prokaryotic and eukaryotic cells and list examples of each cell type. I can investigate whether something is alive or not.

I know the similarities and differences between prokaryotic and eukaryotic cells and examples of living things with each cell type. I know the characteristics of living things and the definition of what it means to be alive. I know the six kingdoms of living things and why viruses are considered by most to be nonliving. I know various career fields in microbiology and what they study. I know the history of microbiology and how scientists and the advancement of technology contributed to our current knowledge of microbiology and the germ theory of disease. I know common root words encountered in microbiology. I know proper laboratory safety protocol and techniques.	I can justify why viruses are considered by many scientists to be nonliving entities. I can describe various career fields in microbiology and explain what they study. I can explain the importance of scientific contributions and the advancement of technology to our current knowledge of microbiology and the germ theory of disease. I can create microbiology media (agar plates, agar slants, broth) from a given media recipe. I can define common root words encountered in microbiology. I can practice safe microbiology, using appropriate protective and emergency procedures. I can use appropriate microbiological lab equipment and methods. I can heat fix a bacteria sample and perform a Gram stain procedure.

Phase III Textbook/Materials

Phase IV Summative Assessment Evidence

Common Summative Unit Assessments:	**Agreed Upon Interim Summative Assessments:** (*identifies Performance Task)

Phase V Learning Plan

Phase II Curriculum

Unit 2: Microscopy, Staining, and Laboratory Techniques

Essential Questions:	Essential Understandings:
▼ How can the structure and function of microorganisms be revealed through the use of microscopy? ▼ What stain techniques may be used to identify structures and functions of microorganisms? ▼ How can knowledge about the structure and function of microorganisms be used for scientific research?	∇ Bright field, phase contrast, fluorescent, and electron microscopy may be used to determine the structure and function of microorganisms. ∇ Stain techniques such as the Gram stain, negative stain, acid-fast stain, endospore stain, and capsule stain may be used to identify structures and functions of microorganisms. ∇ Knowledge of structure and function of microorganisms may be used in the development of new antimicrobials, food products, and bioremediation techniques.

Curriculum Standards- DOK noted where applicable with Standards

American Society for Microbiology Curriculum Guidelines for Undergraduate Microbiology Education

Cell Structure and Function

- ∇ 6. The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).

Microbiology Laboratory Skills

- ∇ 32. Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
- ∇ 33. Use pure culture and selective techniques to enrich for and isolate microorganisms.
- ∇ 34. Use appropriate methods to identify microorganisms (media-based, molecular, and serological).
- ∇ 36. Use appropriate microbiology lab equipment and methods.
- ∇ 37. Practice safe microbiology, using appropriate protective and emergency procedures.

LEARNING TARGETS

Knowledge/Content I Know …	Skills/Processes I Can …
I know a streak plate is used to isolate pure cultures of bacteria from a mixed culture. I know the parts of a compound light microscope. I know the standard scientific metric prefixes and base units of length, mass, volume, and time. I know the total magnification power of a	I can perform a streak plate technique to isolate bacteria species from a mixed culture to obtain pure cultures. I can properly prepare and use all objectives of a compound light microscope to view slides of living and nonliving specimens. I can make metric conversions.

microscope is determined by the product of the ocular lens and the objective lens. I know a Gram stain reveals cell morphology and information about cell wall composition in bacteria. I know a negative stain reveals cell morphology of bacteria against a dark background. I know an acid-fast stain reveals mycolic acid (lipids) in the bacteria cell wall and is used to identify pathogenic bacteria that cause the diseases tuberculosis and leprosy. I know an endospore stain reveals spore-forming bacteria. I know a capsule stain reveals the presence of a capsule outside of the cell wall in bacteria. I know proper laboratory safety protocol and techniques.	I can calculate the total magnification power of a microscope. I can estimate the approximate size of an object under a microscope. I can practice safe microbiology, using appropriate protective and emergency procedures. I can use appropriate microbiological lab equipment and methods. I can perform a Gram stain from a written procedure. I can investigate bacteria cell morphology and cell wall composition using a Gram stain. I can perform a negative stain from a written procedure. I can investigate bacteria cell morphology using a negative stain. I can perform a Ziehl-Neelsen acid-fast stain from a written procedure. I can investigate bacteria cell wall composition using an acid-fast stain. I can perform an endospore stain from a written procedure. I can investigate the presence of bacteria endospores using an endospore stain. I can perform a capsule stain from a written procedure. I can investigate the presence of a bacteria capsule using a capsule stain.
Phase III Textbook/Materials	
Phase IV Summative Assessment Evidence	

Common Summative Unit Assessments:	**Agreed Upon Interim Summative Assessments:** (*identifies Performance Task)
Phase V Learning Plan	

Phase II Curriculum

Unit 3: Characteristics of Prokaryotic and Eukaryotic Cells

Essential Questions:

- ▼ How are prokaryotic and eukaryotic cells alike and different?
- ▼ What are the differences between Gram-positive, Gram-negative, and acid-fast bacteria.
- ▼ How is it possible that eukaryotic cells, organelles, and metabolic pathways could have evolved from prokaryotic cells?

Essential Understandings:

- ∇ Prokaryotic and eukaryotic cells both contain a plasma membrane, genetic material, and ribosomes. Unlike eukaryotic cells, prokaryotic cells do not have a nucleus and lack membrane-bound organelles.
- ∇ Gram-positive bacteria have a thick layer of peptidoglycan in their cell wall, Gram-negative bacteria have a thin layer of peptidoglycan, and acid-fast bacteria have mycolic acid (lipids) that make up their cell wall.
- ∇ The endosymbiotic theory proposed by Lynn Margulis states that the organelles of eukaryotic cells arose from prokaryotic cells that had developed a symbiotic relationship with the eukaryote-to-be.

Curriculum Standards- DOK noted where applicable with Standards

American Society for Microbiology Curriculum Guidelines for Undergraduate Microbiology Education

Evolution

- ∇ 1. Cells, organelles (e.g., mitochondria and chloroplasts) and all major metabolic pathways evolved from early prokaryotic cells.
- ∇ 2. Mutations and horizontal gene transfer, with the immense variety of microenvironments, have selected for a huge diversity of microorganisms.

Cell Structure and Function

- ∇ 8. Bacteria and Archaea have specialized structures (e.g., flagella, endospores, and pili) that often confer critical capabilities.
- ∇ 9. While microscopic eukaryotes (for example, fungi, protozoa and algae) carry out some of the same processes as bacteria, many of the cellular properties are fundamentally different.

Information Flow and Genetics

- ∇ 16. Although the central dogma is universal in all cells, the processes of replication, transcription, and translation differ in Bacteria, Archaea, and Eukaryotes.

LEARNING TARGETS

Knowledge/Content **I Know** …	**Skills/Processes** **I Can** …
I know the similarities and differences between prokaryotic and eukaryotic cell types.	I can compare and contrast prokaryotic and eukaryotic cell types.
I know the common prokaryotic (bacteria) cell shapes (coccus, bacillus, spirillum, spirochete, and vibrio) and arrangements (single, diplo-, strepto-, tetrad, sarcinae, and staphylo-).	I can construct visual representations of Gram-positive, Gram-negative, and acid-fast bacteria cell walls.
I know the cell wall components of Gram-positive, Gram-negative, and acid-fast bacteria.	I can construct visual representations of prokaryotic cell shapes and arrangements.
I know the flagella arrangement patterns (atrichous, monotrichous, amphitrichous,	I can compare and contrast Gram-positive, Gram-negative, and acid-fast bacteria cell structures.

lophotrichous, and peritrichous) and how flagella are used for locomotion in prokaryotes. I know attachment pili (fimbriae) increase the pathogenicity of bacteria and are used by bacteria to adhere to surfaces. I know conjugation pili are used by bacteria to exchange genetic information between different organisms to develop resistance to antimicrobials. I know the effects of the antibiotic penicillin on the synthesis of peptidoglycan in the cell walls of Gram-positive and Gram-negative bacteria. I know the postulates of the endosymbiotic theory and how it is used to explain how eukaryotic cells, organelles, and metabolic pathways could have evolved from prokaryotic cells.	I can construct visual representations of prokaryotic flagella arrangement patterns. I can explain how attachment pili and conjugation pili increase the pathogenicity of bacteria and allow them to develop resistance to antimicrobials. I can describe the mode of action of the antibiotic penicillin and how it affects the synthesis of peptidoglycan in the cell walls of Gram-positive and Gram-negative bacteria. I can explain why penicillin has little to no effect on acid-fast bacteria and eukaryotic cells. I can justify how eukaryotic cells, organelles, and pathways could have evolved from prokaryotic cells using the postulates of the endosymbiotic theory.

Phase III Textbook/Materials

Phase IV Summative Assessment Evidence

Common Summative Unit Assessments:	**Agreed Upon Interim Summative Assessments:** (*identifies Performance Task)

Phase V Learning Plan

Phase II Curriculum

Unit 4: Growth and Culturing of Bacteria

Essential Questions:

- ▼ What are the phases of growth for a standard bacterial growth curve?
- ▼ How are the pour plate, spread plate, and streak plate techniques used to count colonies of microorganisms?
- ▼ What factors affect the growth of microorganisms?

Essential Understandings:

- ∇ The standard bacterial growth curve includes a lag, logarithmic/exponential, stationary, and decline/death phase.
- ∇ A pour plate mixes microorganisms in melted agar, a spread plate even distributes microorganisms across an agar plate, and a streak plate isolates pure cultures from a mixed culture to obtain a viable count of microbial colonies.
- ∇ Microbial growth is affected by pH, temperature, oxygen/carbon dioxide, osmotic pressure, and available nutrition.

Curriculum Standards- DOK noted where applicable with Standards

American Society for Microbiology Curriculum Guidelines for Undergraduate Microbiology Education

Evolution

- ∇ 4. The traditional concept of species is not readily applicable to microbes due to asexual reproduction and the frequent occurrence of horizontal gene transfer.

Metabolic Pathways

- ∇ 11. Bacteria and Archaea exhibit extensive, and often unique, metabolic diversity (e.g., nitrogen fixation, methane production, anoxygenic photosynthesis).
- ∇ 12. The interactions of microorganisms among themselves and with their environment are determined by their metabolic abilities (e.g., quorum sensing, oxygen consumption, nitrogen transformations).
- ∇ 13. The survival and growth of any microorganism in a given environment depends on its metabolic characteristics.
- ∇ 14. The growth of microorganisms can be controlled by physical, chemical, mechanical, or biological means.

Microbial Systems

- ∇ 20. Microorganisms are ubiquitous and live in diverse and dynamic ecosystems.
- ∇ 21. Most bacteria in nature live in biofilm communities.
- ∇ 22. Microorganisms and their environments interact with and modify each other.
- ∇ 23. Microorganisms, cellular and viral, can interact with human and nonhuman hosts in beneficial, neutral, and detrimental ways.

Scientific Thinking

- ∇ 29. Ability to use quantitative reasoning (e.g., mathematical reasoning and graphing skills) to solve problems in microbiology.

Microbiology Laboratory Skills

- ∇ 35. Estimate the number of microorganisms in a sample (using, for example, direct count, viable plate count, and spectrophotometric methods).

LEARNING TARGETS

Knowledge/Content **I Know** …	**Skills/Processes** **I Can** …
I know prokaryotes reproduce asexually by binary fission.	I can construct visual representations of asexual reproduction by binary fission in prokaryotes.
I know the phases of growth (lag,	I can represent the phases of bacteria growth

logarithmic/exponential, stationary, and decline/death) for a standard bacterial growth curve. I know why bacteria at the center of a colony grow more slowly and die off more rapidly than bacteria cells at the edges of a colony. I know a colony forming unit (CFU) is a single microorganism that can give rise to a colony. I know a pour plate technique mixes microorganisms in melted agar and is used to measure the number of microorganisms per milliliter or number of microorganisms per gram of media. I know a spread plate technique is used to evenly distribute microorganism colonies across an agar plate to obtain a viable count. I know a streak plate technique is used to isolate a pure culture from a mixed culture of microorganisms. I know the three characteristics used to describe colony morphology (form, elevation, and margin) of microorganisms. I know how factors such as pH, temperature, oxygen/carbon dioxide, osmotic pressure, and nutrition affect bacteria growth. I know a selective medium is a medium which encourages the growth of some microorganisms and suppresses the growth of others. I know a differential medium is a medium with a component that causes an observable change in the medium (color or pH) when a particular chemical reaction occurs, making it possible to distinguish between microorganisms. I know a microbial sample may be diluted in order to achieve a viable plate count of the number of microorganisms in the original sample.	using a line graph. I can explain why bacteria at the center of a colony grow more slowly and die off more rapidly than bacteria cells at the edges of a colony. I can count/calculate the number of CFUs on an agar plate. I can perform the pour plate technique to measure CFUs/mL or CFUs/g in a microbial sample. I can perform the spread plate technique to evenly distribute microorganism colonies across an agar plate to obtain a viable count. I can perform a streak plate technique to isolate a pure culture from a mixed culture of microorganisms. I can describe and classify bacteria colonies according to form, elevation, and margin. I can recognize agar colony morphology, agar slant characteristics, and liquid broth characteristics. I can classify microorganisms according to colony morphology (form, elevation, and margin). I can classify microorganisms according to preference for factors such as pH, temperature, oxygen/carbon dioxide, osmotic pressure, and nutritional needs. I can analyze a growth medium to determine if it is a selective and/or differential medium. I can mathematically calculate aliquot, diluent, dilution factor, and concentration factor in a serial dilution. I can design, conduct, and revise a serial dilution experiment to achieve a viable plate count of the number of microorganisms in an original sample.
Phase III Textbook/Materials	

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Phase V Learning Plan

Phase II Curriculum

Unit 5: Sterilization, Disinfection, and Antimicrobials

Essential Questions:	**Essential Understandings:**
▼ How do different antimicrobials affect microorganisms? ▼ What are the advantages and disadvantages to prescribing broad-spectrum and narrow-spectrum antibiotics? ▼ Why is it necessary to keep developing new antimicrobials? ▼ How do bacteria become resistant to antimicrobials?	∇ Antimicrobials affect microorganisms by inhibiting cell wall (peptidoglycan) synthesis, disrupting cell membranes, inhibiting protein synthesis, inhibiting nucleic acid synthesis, and acting as antimetabolites. ∇ Broad-spectrum antibiotics may be used against a wide range of taxonomic groups of microorganisms, but destroy many of the host's normal microflora. Narrow-spectrum antibiotics only destroy some of the host's normal microflora, but only target a narrow range of taxonomic groups. ∇ New antimicrobials must be synthesized at a rate that exceeds microbial resistance in order to prevent the spread of disease among living organisms. ∇ Bacteria acquire resistance to antimicrobials when (1) they are missing the target structure the antimicrobial attacks, (2) they genetically inherit resistance, (3) they inactivate the antimicrobial, and (4) when the antimicrobial cannot penetrate the cell membrane.

Curriculum Standards- DOK noted where applicable with Standards

American Society for Microbiology Curriculum Guidelines for Undergraduate Microbiology Education

Evolution

∇ 3. Human impact on the environment influences the evolution of microorganisms (e.g., emerging diseases and the selection of antibiotic resistance).

Cell Structure and Function

∇ 7. Bacteria have unique cell structures that can be targets for antibiotics, immunity and phage infection.

Information Flow and Genetics

∇ 15. Genetic variations can impact microbial functions (e.g., in biofilm formation, pathogenicity and drug resistance).

LEARNING TARGETS

Knowledge/Content **I Know** …	**Skills/Processes** **I Can** …

I know sterilization is the removal of all microorganisms in a material or on an object. I know disinfection is the reduction of microorganisms in a material or on an object to the point in which they pose no danger. I know the names and functions of common antimicrobials. I know that bacteriostatic antimicrobials are agents that inhibit growth of microorganisms and bactericidal antimicrobials are agents that kill microorganisms. I know an autoclave machine is used to achieve complete sterilization of laboratory tools. I know the temperature, pressure, and time at which an autoclave machine should be set at to achieve complete sterilization. I know examples of broad-spectrum and narrow-spectrum antibiotics. I know advantages and disadvantages to using broad-spectrum and narrow-spectrum antibiotics. I know the dangers of administering an antibiotic late during a serious Gram-negative bacterial infections. I know the modes of action of antimicrobials. I know ways in which bacteria acquire resistance to antimicrobials. I know the attributes of an ideal antimicrobial. I know that the minimum inhibitory concentration (MIC) of an antimicrobial is the minimum concentration of antimicrobial (µg/mL) needed to inhibit microbial growth. I know that a Kirby-Bauer report is used to report microorganisms' resistance/susceptibility to antimicrobial agents.	I can describe the difference between sterilization and disinfection and list examples of each. I can predict the effects of antimicrobials on various groups of microorganisms. I can describe the functions of common antimicrobials. I can describe the difference between bacteriostatic and bactericidal antimicrobials. I can use an autoclave machine to sterilize laboratory tools. I can explain the advantages and disadvantages to using broad-spectrum and narrow-spectrum antibiotics. I can explain why it is dangerous to administer antibiotics late during a serious Gram-negative bacterial infection. I can describe the modes of action of antimicrobials. I can explain methods in which bacteria acquire resistance to antimicrobials. I can describe the attributes of an ideal antimicrobial. I can use a table to determine the minimum inhibitory concentration (MIC) of an antimicrobial needed to treat a microbial infection. I can design and conduct an experiment to analyze the effectiveness of antimicrobials against various types of microorganisms. I can interpret a Kirby-Bauer report to determine a microorganism's resistance/susceptibility to antimicrobial agents.
Phase III Textbook/Materials	

Phase IV Summative Assessment Evidence	
Common Summative Unit Assessments:	**Agreed Upon Interim Summative Assessments:** (*identifies Performance Task)
Phase V Learning Plan	

Phase II Curriculum

Unit 6: Host-Microbe Relationships and Epidemiology

Essential Questions:	Essential Understandings:
▼ What types of symbiotic relationships exist between living organisms? ▼ What types of organisms cause disease? ▼ How are diseases classified and how do they spread? ▼ What are the stages of an infectious disease? ▼ How would the world respond to a pandemic crisis?	∇ Symbiotic relationships such as mutualism, commensalism, parasitism, and antagonism occur between living organisms. ∇ Microorganisms such as viruses, viroids, prions, bacteria, protists (protozoa), fungi, and helminths (worms) are capable of causing disease. ∇ Diseases are classified according to the causative agent, signs and symptoms, mode of transmission, frequency, and distribution. ∇ The stages of an infectious disease include the (1) incubation period, (2) prodromal phase, (3) illness/invasive phase, (4) acme phase, (5) decline phase, and (6) convalescence period. ∇ The emergency plan in response to a pandemic would depend upon several factors such as (1) cause of disease, (2) morbidity rate, (3) mortality rate, (4) incubation period of disease, (5) treatment available, (6) frequency, (7) distribution of disease, etc…

Curriculum Standards- DOK noted where applicable with Standards

American Society for Microbiology Curriculum Guidelines for Undergraduate Microbiology Education

Cell Structure and Function

∇ 10. The replication cycles of viruses (lytic and lysogenic) differ among viruses and are determined by their unique structures and genomes.

Information Flow and Genetics

∇ 18. The synthesis of viral genetic material and proteins is dependent on host cells.

LEARNING TARGETS

Knowledge/Content I Know …	Skills/Processes I Can …
I know the types of symbiotic relationships (mutualism, commensalism, parasitism, and antagonism) that occur between living organisms. I know the classification of infectious and noninfectious diseases. I know a hospital-acquired infection is called a nosocomial infection. I know epidemiology is the study of all factors of diseases and how they spread within a population.	I can describe types of symbiotic relationships (mutualism, commensalism, parasitism, and antagonism) that occur between living organisms and list examples of each. I can classify infectious and noninfectious diseases according to how they are acquired. I can describe a nosocomial infection. I can describe the job responsibilities of an epidemiologist. I can explain how communicable diseases are spread from one host to another.

I know etiology is the study of cause of disease in a population. I know communicable diseases can be spread from one host to another and noncommunicable diseases cannot be spread from one host to another. I know a sign is an observable effect of a disease; a symptom is an effect of a disease felt by the infected person; and a syndrome is a group of signs and symptoms that occur together. I know the stages of an infectious disease (incubation period, prodromal phase, illness/invasive phase, acme phase, decline phase, and convalescence period). I know the incidence rate of a disease is the number of new disease cases contracted within a set population during a specific period of time (usually expressed as number of new cases per 100,000 people per year). I know the prevalence rate of a disease is the total number of people infected within the population at any time (includes both old and newly diagnosed cases). I know the morbidity rate of a disease is the number of individuals affected by a disease during a set period in relation to the total number in the population (usually expressed as number of cases per 100,000 people per year). I know the mortality rate of a disease is the number of deaths due to a disease in a population during a specific period in relation to the total population (usually expressed as number of deaths per 100,000 people per year). I know classification of diseases based on frequency and geographic distribution (endemic, epidemic, pandemic, and sporadic disease patterns). I know common portals of entry for a disease. I know direct (horizontal and vertical) and indirect contact modes of disease transmission.	I can investigate the signs and symptoms of a disease. I can represent the stages of an infectious disease using a line graph. I can predict which stage of disease a patient is in based on a description of signs and symptoms. I can calculate the incidence rate, prevalence rate, morbidity rate, and mortality rate of a disease. I can classify an infectious disease based on the frequency and distribution of disease. I can describe common portals of entry for a disease. I can explain direct and indirect contact modes of disease transmission. I can construct visual representations of the lysogenic and lytic cycles of viruses. I can explain how various diseases are caused by microorganisms.

I know the lysogenic and lytic life cycles of viruses. I know the locations and jobs of the Center for Disease Control (CDC) and World Health Organization (WHO). I know how various diseases are caused by microorganisms.	

Phase III Textbook/Materials

Phase IV Summative Assessment Evidence

Common Summative Unit Assessments:	**Agreed Upon Interim Summative Assessments:** (*identifies Performance Task)

Phase V Learning Plan