Science Department
Microbiology Curriculum

Scope and Sequence

Number of Weeks - approximate (based upon 56 minute periods in rotating blocks)	Unit
6 weeks	Introduction to Microbiology
8 weeks	Bacteria and Bacterial Growth
8 weeks	Invading Microbes and the Immune Response
8 weeks	Controlling the Invasion: Microbes

Unit 1	
Introduction to Microbiology	
Summary and Rationale	
The unit is an introduction to the concepts of microbiology. Students will learn about influential scientists and their discoveries that led to the establishment of microbiology. Also students will learn the concepts of chemistry that are critical to the understanding of microbiology, such as pH and organic molecular chemistry. In addition, students will become experts at important microscopic and staining techniques. Students will become familiar with the tools of microbiology, conduct experiments, and analyze data.	
Recommended Pacing	
6 weeks	
Standards	
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect the carrying capacity of ecosystems at different scales
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions
HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem
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-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment
HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait
HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species
HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity
Interdisciplinary Connections	
NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.R2	Determine the central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
RI.11-12.1 RI.9-10.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence
MP.2	Reason abstractly and quantitatively

MP.4	Model with mathematics
HSN.Q.A.1	Use units as a way to understand problems and to guide the solution of mult-istep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
HSN.Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
Technology Integration	
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge
8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment

Instructional Focus	
Enduring Understandings:	**Essential Questions:**
Microorganisms have always been influencing people's lives, but it took the contributions of several scientists and the development of the microscope as a tool before their importance was realized.	How were microorganisms discovered? How does the microscope work? What techniques are used to visualize microorganisms? What chemical concepts are used to stain microorganisms, determine the identity of a microorganism, and control microorganisms?
Evidence of Learning (Assessments)	
Unit 1 Benchmark: Intro to Micro Formative assessment Lab write ups Projects	
Objectives (SLO)	
Students will know: Life comes from life – biogenesis. Some diseases are caused by microorganisms. Diseases can be spread from one person to another. Microscopes allow us to see microorganisms. Every contagious disease is caused by one specific microorganism.	Students will be able to: Understand the progression of contagious disease from one specific microorganism. Identify the manner in which disease is spread from person to person. Identify ways to help stop the spread of transmission of disease (physical only...IE handwashing, cover mouth when coughing or sneezing) Understand and articulate the difference between diseases that are caused by microbes and those that are not. Identify diseases caused by microbes and those that are not.

Suggested Resources/Technology Tools
Analyze several objects on the stereomicroscope to evaluate its use in microbiology and to become familiar with its usage. Analyze both salt crystals and human blood cells on the compound microscope to evaluate its use in microbiology and to become familiar with its usage. Analyze wheat rust fungus on both the stereomicroscope and the compound microscope and make complete and labeled drawings. Predict which common solutions are acids and which are bases and how these solutions relate to microorganisms. Analyze microorganisms using the wet mount and negative staining techniques. Analyze microorganisms using the dry preparation and simple staining techniques. Analyze different forms of cyanobacteria, green algae on the compound microscope. Microbiology Activity and Information Resources Microbiology Teaching Resource Famous Microbiologists and Contributions
Modifications
Teachers can choose from any of the suggested modifications that follow based upon teaching style, instructional method and needs of individual students. **General Modifications for students struggling to learn:** ● Focus on building relationships in the classroom. ● Control the stressors for the student and manage alternate pathways for completion of assignments. ● Provide feedback utilizing a growth mindset and praise what is done correctly based upon effort, attitude and strategy. ● Boost engagement with material by providing opportunities of differentiation, group work and alternative assignments/assessments where appropriate. **ELL** ● Provide additional wait time for student responses to questions to allow students the ability to undergo the process of translation between languages, composition of response and attempted response. ● Simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase to allow ELL students to hear the sentence and try to comprehend it. ● Rephrase idioms and teach their meanings as when learning a new language, translations are often very literal. IE “Take a stab at it.” Ensure students understand what is meant. ● Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading questions about the main idea and offer help utilizing key words. ● Allow the use of Google Translate where appropriate. ● Utilize bilingual reading texts provided by the STC program. **G/T** Utilize differentiation in the areas of acceleration, enrichment, and grouping. Examples include, but are not limited to: ● interdisciplinary and problem-based assignments with planned scope and sequence ● advance, accelerated, or compacted content ● abstract and advanced higher-level thinking ● allowance for individual student interests ● assignments geared to development in areas of affect, creativity, cognition, and research skills ● complex, in-depth assignments ● diverse enrichment that broadens learning ● variety in types of resources ● internships, mentorships and independent study where applicable

504/IEP

Modifications and accommodations must be aligned to stated plan and uphold expectations of the plan lawfully. Every student requires a different set of accommodations based upon need. Examples specific to science practice include, but are not limited to:

- Note taker or lab assistant
- Group lab assignments
- Use of scribe
- Adjustable tables and lab equipment within reach
- Classrooms, labs and field trips in accessible locations
- Additional time and separate room for test taking
- Additional time for in-class assignments
- Additional time in lab
- Visual and tactile instructional demonstrations

21st Century Learning Standard Connections

Please select all standards that apply to this unit of study:

- ✓ Act as a responsible and contributing citizen and employee.
- ✓ Apply appropriate academic and technical skills.
- ✓ Attend to personal health and financial well being.
- ✓ Communicate clearly and effectively and with reason.
- ✓ Consider the environmental social and economic impacts of decisions.
- ✓ Demonstrate creativity and innovation.
- ✓ Employ valid and reliable research strategies.
- ✓ Utilize critical thinking to make sense of problems and persevere in solving them.
- ✓ Model integrity, ethical leadership, and effective management.
- ✓ Plan education and career paths aligned to personal goals.
- ✓ Use technology to enhance productivity.
- ✓ Work productively in teams while using cultural global competence.

Suggestions on integrating these standards can be found at: http://www.state.nj.us/education/cccs/2014/career/9.pdf

LINKS TO CAREERS:

https://www.asm.org/Articles/2018/November/Careers-in-Microbiology-and-the-Microbial-Sciences

Unit 2

Bacteria and Bacterial Growth

Summary and Rationale

The unit is an introduction to bacteria and how they grow. Students will compare and contrast the structure of different bacteria, including their shapes and physical characteristics, and special structures that certain bacteria have. Students will also learn about bacterial growth and what factors affect it. In addition, students will learn how to work aseptically in the lab and how to estimate the number of bacteria in a sample (serial dilutions).

Recommended Pacing	
8 weeks	
Standards	
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-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect the carrying capacity of ecosystems at different scales
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions
HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem
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-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment
HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait
HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species

HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity
Interdisciplinary Connections	
NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
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NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence
MP.2	Reason abstractly and quantitatively
MP.4	Model with mathematics
HSN.Q.A.1	Use units as a way to understand problems and to guide the solution of mult-istep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
HSN.Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
Technology Integration	
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge
8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment

Instructional Focus	
Enduring Understandings:	**Essential Questions:**
Bacteria can be dangerous and cause disease, but if we understand their needs and how they grow, we can control them.	What do bacteria look like? Are there different kinds of bacteria? How do bacteria grow and does it relate to human illness? How do I experiment with bacteria? Can I find out how many bacteria are in a sample?

Evidence of Learning (Assessments)

Unit 2 Benchmark: Bacteria and Bacterial Growth
Formative assessment
Lab write ups
Projects

Objectives (SLO)

Students will know:	Students will be able to:
Bacteria come in different shapes and have different structures. These differences help us to identify them. Experimenting with bacteria requires a scientist to work aseptically. Microorganisms are all around us, on virtually every surface – even on you. Bacterial populations grow in specific stages that relate to phases of sickness in us. Serial dilution is a method of determining how many bacteria are in a sample.	Make accurate observations of microorganisms. Identify major bacteria. Illustrate the different parts of bacterial structures. Identification of the steps of aseptic technique. Articulate the signs that an aseptic environment has been breached. Identify microbial sources, specific to bacteria. Identify the bacteria present on the human body naturally, its role and the benefits and drawbacks of hosting them. Study growth trends in bacteria and understand how to look at specific stages to determine illness and infection. Study cases where infection was misidentified and identify probably and possible causes as to why the misidentification occurred. Perform serial dilutions with appropriate laboratory methods to identify the number of bacteria in a sample. Articulate the role of serial dilution in identifying infection and invasion of bacteria in a host.

Suggested Resources/Technology Tools

Compare and contrast the different shapes of bacteria and relate them to diseases (Bacterial Morphology Lab).
Compare and contrast the special structures that some bacteria have and what evolutionary advantages they afford them (Bacterial Structure Lab).
Preparation of nutrient agar to support bacterial growth and pouring of bacterial growth plates (Agar Lab).
Evaluate the air in different areas of Nutley High School for microbial content (Ambient Microorganisms Lab).
Analyze different objects around Nutley High School for microbial growth (Environmental Organisms Lab).
Distinguish between different bacterial colonies using the streak plate technique (Isolation of Bacteria Lab).
Graph and analyze the different phases of bacterial growth (Bacterial Growth Curves Lab).
Identify bacterial needs based on growth conditions.
Determine the number of bacteria in an unknown sample (Serial Dilution Lab).
Microbiology Activity and Information Resources
Microbiology Teaching Resource
Bacteria are Everywhere Activity Options for differentiation of activity higher and lower in readiness level.
Biology Activity Resource - Cornell
Microbiology Resource Support - Standards Based
www.khanacademy.org - articles, videos and supports for micro

Modifications

Teachers can choose from any of the suggested modifications that follow based upon teaching style, instructional method and needs of individual students.

General Modifications for students struggling to learn:

- Focus on building relationships in the classroom.
- Control the stressors for the student and manage alternate pathways for completion of assignments.
- Provide feedback utilizing a growth mindset and praise what is done correctly based upon effort, attitude and strategy.
- Boost engagement with material by providing opportunities of differentiation, group work and alternative assignments/assessments where appropriate.

ELL

- Provide additional wait time for student responses to questions to allow students the ability to undergo the process of translation between languages, composition of response and attempted response.
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- Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading questions about the main idea and offer help utilizing key words.
- Allow the use of Google Translate where appropriate.
- Utilize bilingual reading texts provided by the STC program.

G/T

Utilize differentiation in the areas of acceleration, enrichment, and grouping. Examples include, but are not limited to:

- interdisciplinary and problem-based assignments with planned scope and sequence
- advance, accelerated, or compacted content
- abstract and advanced higher-level thinking
- allowance for individual student interests
- assignments geared to development in areas of affect, creativity, cognition, and research skills
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LINKS TO CAREERS: *https://www.asm.org/Articles/2018/November/Careers-in-Microbiology-and-the-Microbial-Sciences*

Unit 3	
Invading Microbes and the Immune Response	
Summary and Rationale	
The unit is an introduction to infectious diseases, the human immune system, and disorders of the immune system. Students will learn about pathogenicity, different methods of infection, and portals of entry into the human body as well as the identity of and role that red and white blood cells play. Students will further examine the manner the human body uses to fight off infection and treatments to assist the body in the process.	
Recommended Pacing	
8 weeks	
Standards	
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-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect the carrying capacity of ecosystems at different scales
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
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HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment
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Interdisciplinary Connections	
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Technology Integration	
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8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment

Instructional Focus	
Enduring Understandings:	**Essential Questions:**
Microorganisms cause many deadly infectious diseases, but the human immune system is an amazing and fierce protector of our health. The body will defend itself against invasion without our knowledge or will; the process is automatic.	How does the human body get “sick”? Why does the human body react to invaders in the manner it does? Are allergies a sickness? Why do allergies and invasion of microbes both cause immune response? Why do we consider the immune system the defender of our bodies? What happens when the immune system fails?

Evidence of Learning (Assessments)

Unit 3 Benchmark: Invading Microbes and the Immune Response
Formative assessment
Lab write ups
Projects

Objectives (SLO)

Students will know:	Students will be able to:
Infectious diseases are still a major problem in the world. A contagious disease is a competition between your body's immune system and a microorganism.. Most diseases follow the same stages which correlate to the growth phases of bacteria. They are many portals through which microorganisms can enter your body. The immune system protects your body by fighting off and remembering microorganisms. The immune system has both nonspecific and specific parts. The immune system can malfunction with results as varied as allergies, autoimmune disorders, and the complete absence of a functioning immune system	Identify and understand the workings of all parts of the immune system. Display the process of the interaction between microbes and the immune system, specifically noting what happens when the immune system is successful and when it is not. Articulate how the parts of the immune system interact and work together to fight invasion of microbes. Utilize appropriate laboratory processes to examine microbes. Utilize appropriate laboratory methods to examine lymph nodes. Identify major diseases that are being fought in the world, especially those considered epidemic or pandemic in nature.

Suggested Resources/Technology Tools

Compare and contrast normal red blood cells and sickled red blood cells and their differentiated response to disease and microbial invasion.
Compare and contrast the different white blood cells and their functions in the human immune system.
Analyze the lymph node on both the stereomicroscope and the compound microscope and make complete and labeled drawings.
Assign job titles and job descriptions to the different parts of the human immune system.
Microbiology Activity and Information Resources
Microbiology Teaching Resource
www.khanacademy.org
The Adaptive Immune System
Standards Based Resources and Activities
Immunology Lesson/Activity

Modifications

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G/T

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- complex, in-depth assignments
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- ✓ Demonstrate creativity and innovation.
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- ✓ Utilize critical thinking to make sense of problems and persevere in solving them.
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Unit 4	
Controlling the Invasion: Microbes	
Summary and Rationale	
In this unit, students will utilize their new knowledge of the needs and methods of operation of microbes in order to explore and understand ways to control them. Students will utilize various methods such as temperature, pressure, and chemical means to control the spread of microbes. Students will expand the exploration of antibiotic and antimicrobial usage from the human body and treatment of disease outward to utilization of this concept in our foods and other places in our world.	
Recommended Pacing	
8 weeks	
Standards	
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HSN.Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.

Technology Integration	
8.1	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge
8.2	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment

Instructional Focus	
Enduring Understandings:	**Essential Questions:**
Microorganisms are a deadly foe, but we do have physical, chemical, and medicinal ways of controlling them.	How can we control the spread of microbes? What tools are effective in assisting to control the spread of microbes? Are there benefits and/or drawbacks to methods of microbial control? How are microbes controlled and limited beyond the human body? How have humans interfered in nature's natural control systems for microbes? Have the actions of humans changed the manner in which we control microbes? How? Why?
Evidence of Learning (Assessments)	
Unit 4 Benchmark: Controlling the Invasion: Microbes Formative assessment Lab write ups Projects	
Objectives (SLO)	
Students will know: Bacteria can be controlled by physically removing from the environment, something they need to survive (eg. water). Bacteria can be controlled by adding certain chemicals to their environment that are inhibitory (eg. Chlorine). Most bacterial infections can be cured with the use of antibiotics but struggles are increasing as our usage of antibiotics has caused resistance. Antibiotics only work on bacteria, NOT viruses, there are other classes of medications such as antivirals and antifungals for other cases of microbe invasion. Many of our food processes are actually in place to control microorganisms.	Students will be able to: Make accurate observations of ways of controlling bacterial growth. Perform laboratory explorations with appropriate techniques of streaking plates, incubation procedure, examination of microbe growth, etc. Chart microbe growth rates. Analyze data to determine how growth curves change when inhibitory agents are used. Draw conclusions about the efficacy of inhibitory agents based upon laboratory results. Articulate the current challenges of control of microbes due to overuse and availability of agents to inhibit their spread. Articulate the effects of antimicrobial agents in foods and other products of human usage. Discuss possible reasons why diseases continue to be able to be widespread and why that can differ based upon the

	characteristics of the human environment (IE - developing vs. developed nations).

Suggested Resources/Technology Tools

Predict how different temperatures affect bacterial growth (Bacterial Growth Lab).
Compare and contrast different types of food and which organisms grow on them (Sources of Food Infection Lab).
Predict whether hand washing with water alone, soap and water, or hand sanitizer is most effective against microorganisms (Disinfectants Lab) - **Make connection with recent bans on triclosan and other antibacterials**
Predict which brand of mouthwash will be the most effective against microorganisms (Oral Antiseptics Lab)
Predict which antibiotics will work with which bacteria types (Antibiotics Lab).
Explore a foodborne illness and what may have caused it. (Project)
Microbiology Activity and Information Resources
Microbiology Teaching Resource
www.khanacademy.org

Modifications

Teachers can choose from any of the suggested modifications that follow based upon teaching style, instructional method and needs of individual students.

General Modifications for students struggling to learn:

- Focus on building relationships in the classroom.
- Control the stressors for the student and manage alternate pathways for completion of assignments.
- Provide feedback utilizing a growth mindset and praise what is done correctly based upon effort, attitude and strategy.
- Boost engagement with material by providing opportunities of differentiation, group work and alternative assignments/assessments where appropriate.

ELL

- Provide additional wait time for student responses to questions to allow students the ability to undergo the process of translation between languages, composition of response and attempted response.
- Simplification of sentence structure and repetition of questions/sentences exactly as stated before trying to rephrase to allow ELL students to hear the sentence and try to comprehend it.
- Rephrase idioms and teach their meanings as when learning a new language, translations are often very literal. IE “Take a stab at it.” Ensure students understand what is meant.
- Use directed reading activities. Ensure preview of text before assigned/read, provide pre-reading questions about the main idea and offer help utilizing key words.
- Allow the use of Google Translate where appropriate.
- Utilize bilingual reading texts provided by the STC program.

G/T

Utilize differentiation in the areas of acceleration, enrichment, and grouping. Examples include, but are not limited to:

- interdisciplinary and problem-based assignments with planned scope and sequence
- advance, accelerated, or compacted content
- abstract and advanced higher-level thinking
- allowance for individual student interests
- assignments geared to development in areas of affect, creativity, cognition, and research skills
- complex, in-depth assignments
- diverse enrichment that broadens learning
- variety in types of resources
- internships, mentorships and independent study where applicable

504/IEP

Modifications and accommodations must be aligned to stated plan and uphold expectations of the plan lawfully. Every student requires a different set of accommodations based upon need. Examples specific to science practice include, but are not limited to:

- Note taker or lab assistant
- Group lab assignments
- Use of scribe
- Adjustable tables and lab equipment within reach
- Classrooms, labs and field trips in accessible locations
- Additional time and separate room for test taking
- Additional time for in-class assignments
- Additional time in lab
- Visual and tactile instructional demonstrations

21st Century Learning Standard Connections

Please select all standards that apply to this unit of study:

- ✓ Act as a responsible and contributing citizen and employee.
- ✓ Apply appropriate academic and technical skills.
- ✓ Attend to personal health and financial well being.
- ✓ Communicate clearly and effectively and with reason.
- ✓ Consider the environmental social and economic impacts of decisions.
- ✓ Demonstrate creativity and innovation.
- ✓ Employ valid and reliable research strategies.
- ✓ Utilize critical thinking to make sense of problems and persevere in solving them.
- ✓ Model integrity, ethical leadership, and effective management.
- ✓ Plan education and career paths aligned to personal goals.
- ✓ Use technology to enhance productivity.
- ✓ Work productively in teams while using cultural global competence.

Suggestions on integrating these standards can be found at: http://www.state.nj.us/education/cccs/2014/career/9.pdf

LINKS TO CAREERS:

https://www.asm.org/Articles/2018/November/Careers-in-Microbiology-and-the-Microbial-Sciences