PATERSON PUBLIC SCHOOLS

Paterson – A Promising Tomorrow
Together We Can

SCIENCE

Grade 8: Unit 2

FOSS Human Systems Interactions

Course Philosophy/Description

The students in the eighth grade Science course will develop a conceptual understanding of Science topics using hands-on instruction, interactive notebooking, observations of and interactions with natural phenomena and the use of engineering and design processes to identify problems, plan, test and revise possible solutions. In Life Science, students will explore the interaction of human body systems to maintain stability, how growth and development can be affected by genetic factors in sexually reproducing organisms, and how organisms have changed over time due to environmental and genetic factors both by examining the fossil record and examining structural similarities between organisms. In Physical Science, students will explore wave motion, as well as how the force of gravity affects the kinetic energy of an object on Earth's surface. In Earth Science, students will explore Earth's place in the Universe, as well as the unique characteristics of other celestial bodies.

Teachers may choose from a variety of instructional approaches that are aligned with Teachers may choose from a variety of instructional approaches that are aligned with 3 dimensional learning to achieve this goal. These approaches include: 3 dimensional learning to achieve this goal. These approaches include:

Inquiry Kit Instruction (modified)	Challenge Based Instruction	5 E Instructional Model (BSCS)	Culturally Relevant Instruction
Project-Based Instruction	Tinkering Pedagogy	Learning Progressions	Knowledge Integration
Model-based Reasoning	Place-based Instruction	Meaningful Expertise Instruction	Emergent Investigations (RSS)

ESL Framework

This ESL framework was designed to be used by bilingual, dual language, ESL and general education teachers. Bilingual and dual language programs use the home language and a second language for instruction. ESL teachers and general education or bilingual teachers may use this document to collaborate on unit and lesson planning to decide who will address certain components of the SLO and language objective. ESL teachers may use the appropriate leveled language objective to build lessons for ELLs which reflects what is covered in the general education program. In this way, whether it is a pull-out or push-in model, all teachers are working on the same Student Learning Objective connected to the New Jersey Student Learning Standards. The design of language objectives are based on the alignment of the World-Class Instructional Design Assessment (WIDA) Consortium's English Language Development (ELD) standards with the New Jersey Student Learning Standards (NJSLS). WIDA's ELD standards advance academic language development across content areas ultimately leading to academic achievement for English learners. As English learners are progressing through the six developmental linguistic stages, this framework will assist all teachers who work with English learners to appropriately identify the language needed to meet the requirements of the content standard. At the same time, the language objectives recognize the cognitive demand required to complete educational tasks. Even though listening and reading (receptive) skills differ from speaking and writing (expressive) skills across proficiency levels the cognitive function should not be diminished. For example, an Entering Level One student only has the linguistic ability to respond in single words in English with significant support from their home language. However, they could complete a Venn diagram with single words which demonstrates that they understand how the elements compare and contrast with each other or they could respond with the support of their home language (L1) with assistance from a teacher, para-professional, peer or a technology program.

http://www.state.nj.us/education/modelcurriculum/ela/ELLOverview.pdf

	Grade Eight Pacing Chart	
	Please note that pacing is based upon 240 minutes per 6 day cycle.	
	Student Learning Objective	**Instruction**
Unit 1	Course Introduction with Engineering and Design Practices	10 days
Unit 2	FOSS Human Systems Interactions	36 days
Unit 3	FOSS Heredity & Adaptations	36 days
Unit 4	FOSS Planetary Science	40 days
Unit 5	FOSS Waves	36 days
	New Jersey Student Learning Assessment Science Review	10 days
	Final Project	10 days

Unit Summary

Life is a complex of interactions; human life is no exception. The basis of the human body is the cell. Associations of cells work together to form tissues, which form organs. Organs work together to perform specific functions in organ systems. And finally, the array of organ systems make up a human body.

Middle school students are prepared to explore how organ systems interact to support each and every cell in the body. What happens when the body is attacked by an invader or an organ system malfunctions? How do cells get the resources they need to live? How do cells gain access to the energy stored in energy-rich compounds? How do systems support the human organism as it senses and interacts with the environment?

These questions inspire students to find out more, and may spawn a lifetime of learning about their body systems and the environmental factors that affect them. Questions like these have the potential to help students understand and appreciate what may be of highest importance to them, themselves.

Student Learning Objectives

Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. *[Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]* (**MS-LS1-1**)

Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. *[Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.]* [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.*]* (**MS-LS1-3**)

Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. *[Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]* (**MS-LS1-7**)

Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. *[*Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.*]* (**MS-LS1-8**)

Learning Objective and Standard	Essential Questions	Sample Activities	Content Related to DCI's	Resources
Investigation 1 Part 1: Human Body Structural Levels Students gather evidence to support a claim regarding the type of illness that is affecting a patient. **MS-LS1-1, MS-LS1-3**	What is a human body made of?	• Multicellular organisms are complex systems composed of organ systems, which are made of organs, which are made of tissues, which are made of cells. • Cells are made of cell structures, which are made of molecules, which are made of atoms.	**Benchmark Assessment** *Entry-Level Survey* Students are presented with a patient who has symptoms that could lead to a number of diagnoses. They determine a course of learning that begins with confirming the levels of complexity in a multicellular organism. **Embedded assessment:** Science notebook entry	Online Activities: "Levels of Complexity" "Structural Levels Cards" Video*:* *Doctor Interview 1*
Investigation 1 Part 2: Systems Research Students gather further evidence to support their claim by investigating the interaction of	How do human organ systems interact?	• Multicellular organisms are complex systems composed of organ systems, which are made of organs, which	Students continue their research to determine a diagnosis by focusing on human organ systems. They learn about how one organ system	Science Resources Book: "Human Organ Systems" "Disease Information"

Learning Objective and Standard	Essential Questions	Sample Activities	Content Related to DCI's	Resources
body systems to support life processes. **MS-LS1-3**		are made of tissues, which are made of cells. • Cells are made of cell structures, which are made of molecules, which are made of atoms. • The human body is a system of interacting subsystems.	interacts with other organ systems in the body to support life processes. They pool their learning with the rest of the class. They conclude by making a tentative diagnosis of the patient, arguing their case to other students. They learn additional information that allows them to make a conclusive diagnosis. **Embedded assessment:** Science notebook entry	Online Activities: "Human Body Structural Levels" Structural Levels Cards" Video*:* *Doctor Interview 2*
Investigation 2 Part 1: Food and Oxygen Students construct a model to explain how oxygen and energy enter and are transported through the body to areas where they are needed. **MS-LS1-3**	How do cells in the human body get the resources they need?	• The human body is a system of interacting subsystems. • The respiratory system supplies oxygen and the digestive system supplies energy (food) to the cells in the body. • The circulatory system carries food and oxygen	Students participate in an exercise activity to think about how the cells in the human body get oxygen and energy (food). They watch video clips and manipulate an online activity to add detail to their ideas. They construct a model to illustrate the pathways	Online Activity: "Human Cardiovascular System" Videos: *Digestive and Excretory Systems*

Learning Objective and Standard	Essential Questions	Sample Activities	Content Related to DCI's	Resources
		to the cells in the body and carries waste products to the excretory/respiratory systems for disposal.	that oxygen and energy (food) take from the external environment to a muscle in the leg. **Embedded assessment:** Response sheet	*Circulatory and Respiratory Systems*
Investigation 2 Part 2: Aerobic Cellular Respiration Students develop a model for aerobic cellular respiration that describes how substances move into, through and out of cells. **MS-LS1-3, MS-LS1-7**	How does the energy in food become energy that cells can use?	• The human body is a system of interacting subsystems. • The respiratory system supplies oxygen and the digestive system supplies energy (food) to the cells in the body. • The circulatory system carries food and oxygen to the cells in the body and carries waste products to the excretory/respiratory systems for disposal. • Aerobic cellular respiration is the process by which	Students model the substances and steps in aerobic cellular respiration. They summarize the entire process, demonstrating how substances get to the cells, what happens at the cells and how substances depart from the cells to be removed from the body. **Embedded assessment:** Performance assessment	Science Resources Book: "Aerobic Cellular Respiration" Videos: *Digestive and Excretory Systems*

Learning Objective and Standard	Essential Questions	Sample Activities	Content Related to DCI's	Resources
		energy stored in food molecules is converted into usable energy for a cell.	**Benchmark Assessment:** *Investigations 1–2 I-Check*	
Investigation 3 Part 1: The Sense of Touch Students compare evidence of touch sensitivity to determine which area of the body has more receptors. **MS-LS1-3, MS-LS1-8**	How does the sense of touch work in humans?	• Sensory receptors respond to an array of mechanical, chemical and electromagnetic stimuli.	Students think about how humans sense the environment around them and then turn their attention to the sense of touch. They compare touch sensitivity between fingertips and knuckles to learn about pressure receptors and receptive fields. **Embedded assessment:** Science notebook entry	Science Resources Book: "Sensory Receptors" "Touch" "Hearing" Online Activities: "Touch Menu"
Investigation 3 Part 2: Sending a Message	How do messages travel to and from the brain?	• Sensory information is transmitted electrically to the brain along neural pathways for processing and response.	Students consider the stimulus/response phenomenon. They develop a model to explain how messages are transmitted along	Science Resources Book: "Sensory Activity Brain Map"

Learning Objective and Standard	Essential Questions	Sample Activities	Content Related to DCI's	Resources
Students develop a model to explain how messages are sent through the nervous system**.** **MS-LS1-3, MS-LS1-8**			neurons and across synapses, to and from the brain. **Embedded assessment:** Response sheet	"Brain Messages" "Neurotransmission" Online Activities: "Brain: Synapse Function" "Brain: Neuron Growth"
Investigation 3 Part 3: Other Senses Students compare smell and sight receptors. **MS-LS1-3, MS-LS1-8**	How are senses alike and how are they different?	• Sensory receptors respond to an array of mechanical, chemical and electromagnetic stimuli. • Sensory information is transmitted electrically to the brain along neural pathways for processing and response.	Students explore the sense of smell by identifying scents, and the sense of sight by testing reaction time. They read about chemical receptors and photoreceptors and consider how their eyes are designed to interpret electromagnetic information. **Embedded assessment:** Science notebook entry	Science Resources Book: "Sensory Receptors" "Smell and Taste" "Sight" Online Activities: "Smell Menu" "Vision Menu" "Reaction Timer"
Investigation 3 Part 4: Learning and Memory	How do humans learn and form memories?	• Neural pathways change and grow as information	Students use mirror drawing to explore the	Science Resources Book:

Learning Objective and Standard	Essential Questions	Sample Activities	Content Related to DCI's	Resources
Students gather evidence of improved short term memory and look for patterns to determine which strategies were most successful. **MS-LS1-8**		is acquired and stored as memories.	connection between hand-eye coordination, learning and memory. They use various combinations of sensory input to memorize a list of objects. They look for patterns to determine strategies for improving short-term memory. **Embedded assessment:** Science notebook entry **Benchmark Assessment:** *Investigation 3 I-Check*	"Memory and Your Brain" Video: *How Memory Works*

Vocabulary

Investigation 1: Systems Connections
abnormal
alveoli
artery
autonomic nervous system
bone marrow
capillary
cardiac muscle
cartilage
cell
central nervous system
circulatory system
digestive system
endocrine system
enzyme
epiglottis
excretory system
fatigue
gland
heart
homeostasis
hormone
interneuron

joint
metabolism
motor neuron
muscular system
nervous system neuron
osteoblast
pain
peripheral nervous system
peristalsis
plasma
platelet
receptor
red blood cell
respiratory system
saliva
sensory neuron
sensory receptor
skeletal muscle
skeletal system
smooth muscle
spinal cord
stimulus
symptom

tendon
vein
white blood cell

Investigation 2: Supporting Cells
aerobic cellular respiration
glucose
photosynthesis

Investigation 3: The Nervous System
amygdala
axon
cell body
cerebral cortex
chemoreceptor
cone
dendrite
electromagnetic
hippocampus
interneuron
mechanoreceptor

motor neuron

neuron
neurotransmitter
photoreceptor
pressure
reaction time
rod
sense of hearing
sense of sight
sense of smell
sense of taste
sense of touch
sensory neuron
sensory receptor
stimulus
synapse
temporal lobe

Final Project

Develop a presentation to report out on findings from Investigation 1: Final Diagnosis or Investigation 3 Part 4:Learning & Memory

Field Trip Ideas
• Liberty Science Center

What It Looks Like in the Classroom

Within this unit, students will use informational text and models to support their understanding that the body is a system of interacting subsystems. Instruction should begin with students understanding that the cell is a specialized structure that is a functioning system. Students will need to understand that different types of cells have different functions; therefore, each cell system is specialized to perform its particular function. Building on this understanding, students learn that different types of cells serve as subsystems for larger systems called tissues. Groups of specialized tissues serve as subsystems for organs that then serve as subsystems for body systems such as the circulatory, excretory, digestive, respiratory, muscular, and nervous systems. Students need to understand how each body system interacts with other body systems. Emphasis is on the conceptual understanding that each system and subsystem is specialized for particular body functions; it does not include the mechanisms of one body system independent of others.

As part of their investigation of how body systems are interrelated, students should use variables to represent two quantities that describe how the inputs or outputs of one system change in relationship to another. They should write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable; analyze the relationship using graphs and tables; and relate these to the equation. For example, students can find the relationship between increased activity of the muscular system and the related increase in the activity of the circulatory or respiratory system and express this relationship as an equation.

Students will demonstrate their understanding of this concept by writing an argument, supported by evidence, to support an explanation of how the body is a system of interacting subsystems. As part of their preparation for this written argument, students will read science resources and analyze the evidence used to support arguments in these resources. While gathering evidence, it is important that students connect to the nature of science by demonstrating scientific habits. They should be sure to display intellectual honesty by ensuring that whenever they cite specific textual information and quote or paraphrase the data and conclusions of others, they avoid plagiarism and providing basic bibliographic information for sources.

Students will deepen their understanding of subsystems by gathering and synthesizing information about sensory receptors. Students will understand that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. Each sensory receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. Each response can be examined as a cause-and-effect relationship that can be used to predict response to stimuli in natural systems. Each step in the stimulus/response pathway can be connected to students' previous study of systems and subsystems. For example, the nervous system includes receptors that are subsystems that respond to stimuli by sending messages to the brain.

Using multiple appropriate sources, students will read and synthesize information and will assess the credibility, accuracy, and possible bias of publications and methods used, and describe how the information they read is or is not supported by evidence. For example, students could

What It Looks Like in the Classroom

participate in class discussions in which they can investigate whether information they have read in publications agree with scientific findings or seem to be biased in order to advertise a product or support a position.

Differentiated Instruction

Teacher Note: Teachers identify the modifications that they will use in the unit.

Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tools such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.

Interdisciplinary Connections

English Language Arts/Literacy
- Cite specific textual evidence to support analysis of science and technical texts.**RST.6-8.1**
- Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. **RST.6-8.2**
- Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.**RI.6.8**
- Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources **WHST.6-8.1**
- Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. **WHST.6-8.2**
- Draw evidence from informational texts to support analysis, reflection, and research. **WHST.6-8.9**
- Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.) **WHST.6-8.7**
- Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. **RI.6.8**
- Write arguments focused on discipline content. (MS-LS1-3) **WHST.6-8.1**
- Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.) **WHST.6-8.8**

Mathematics
- Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. **6.SP.A.2**
- Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. **6.EE.C.9**

Educational Technology Standards

8.1.8.A.1, 8.1.8.B.1, 8.1.8.C.1, 8.1.8.D.1, 8.1.8.E.1, 8.1.8.F.1

Technology Operations and Concepts - Create professional documents (e.g., newsletter, personalized learning plan, business letter or flyer) using advanced features of a word processing program.

Creativity and Innovation - Synthesize and publish information about a local or global issue or event on a collaborative, web-based service.

Communication and Collaboration - Participate in an online learning community with learners from other countries to understand their perspectives on a global problem or issue, and propose possible solutions.

Digital Citizenship - Model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics.

Research and Information Literacy - Gather and analyze findings using data collection technology to produce a possible solution for a content-related or real-world problem.

Critical Thinking, Problem Solving, Decision Making - Use an electronic authoring tool in collaboration with learners from other countries to evaluate and summarize the perspectives of other cultures about a current event or contemporary figure.

Career Ready Practices

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

- **CRP1. Act as a responsible and contributing citizen and employee** Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

  Example: Participate as an active an ethical member of class discussions and projects. Teacher can explore how decision making and behaviors can impact the broader community in specific science related examples, such as limiting littering, choosing to recycle, etc.

- **CRP4. Communicate clearly and effectively and with reason.** Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

  Example: Students can develop and present well supported arguments via short presentations, during group work and gallery walks.

- **CRP5. Consider the environmental, social and economic impacts of decisions.**
  Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

  Example: Participate as an active an ethical member of class discussions and projects. Teacher can explore how decision making and behaviors can impact the broader community in specific science related examples, such as limiting littering, choosing to recycle, etc.

- **CRP6. Demonstrate creativity and innovation.**

  Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern

Career Ready Practices

which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

Example: Engineering tasks provide many opportunities for students to use creative and innovative approaches.

- **CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.** Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

  Example: Gather evidence to support a claim and identify reasoning that is being applied.

- **CRP11. Use technology to enhance productivity.** Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

  Example: Utilize Google Apps for Education suite to access and complete assignments. The teacher can use Google Classroom to identify age and subject appropriate resource materials that can be linked directly. A variety of apps or web based platforms (Tellagami, PowToons, Glogster, Padlet) can be used to generate multimedia content.

- **CRP12. Work productively in teams while using cultural global competence.** Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

  Example: Students must be given regular opportunities to work with groups in a variety of settings for discussion, projects, etc.

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

6- Reaching	• Specialized or technical language reflective of the content areas at grade level • A variety of sentence lengths of varying linguistic complexity in extended oral or written discourse as required by the specified grade level • Oral or written communication in English comparable to proficient English peers
5- Bridging	• Specialized or technical language of the content areas • A variety of sentence lengths of varying linguistic complexity in extended oral or written discourse, including stories, essays or reports • Oral or written language approaching comparability to that of proficient English peers when presented with grade level material.
4- Expanding	• Specific and some technical language of the content areas • A variety of sentence lengths of varying linguistic complexity in oral discourse or multiple, related sentences or paragraphs • Oral or written language with minimal phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written connected discourse, with sensory, graphic or interactive support
3- Developing	• General and some specific language of the content areas • Expanded sentences in oral interaction or written paragraphs • Oral or written language with phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written, narrative or expository descriptions with sensory, graphic or interactive support
2- Beginning	• General language related to the content area • Phrases or short sentences • Oral or written language with phonological, syntactic, or semantic errors that often impede of the communication when presented with one to multiple-step commands, directions, or a series of statements with sensory, graphic or interactive support
1- Entering	• Pictorial or graphic representation of the language of the content areas • Words, phrases or chunks of language when presented with one-step commands directions, WH-, choice or yes/no questions, or statements with sensory, graphic or interactive support

Language Development Supports For English Language Learners
To Increase Comprehension and Communication Skills

Environment
- Welcoming and stress-free   - Respectful of linguistic and cultural diversity   - Honors students' background knowledge   - Sets clear and high expectations   - Includes routines and norms   - Is thinking focused vs. answer seeking   - Offers multiple modalities to engage in content learning and to demonstrate understanding   - Includes explicit instruction of specific language targets   - Provides participation techniques to include all learners   - Integrates learning centers and games in a meaningful way   - Provides opportunities to practice and refine receptive and productive skills in English as a new language   - Integrates meaning and purposeful tasks/activities that: ○ Are accessible by all students through multiple entry points   ○ Are relevant to students' lives and cultural experiences   ○ Build on prior mathematical learning   ○ Demonstrate high cognitive demand   ○ Offer multiple strategies for solutions   ○ Allow for a language learning experience in addition to content

Sensory Supports*	Graphic Supports*	Interactive Supports*	Verbal and Textual Supports
- Real life objects (realia) or concrete objects - Physical models - Manipulatives - Pictures & photographs - Visual representations or models such as diagrams or drawings - Videos & films - Newspapers or magazines - Gestures - Physical movements - Music & songs	- Graphs - Charts - Timelines - Number lines - Graphic organizers - Graphing paper	- In a whole group - In a small group - With a partner such as *Turn-and-Talk* - In pairs as a group (first, two pairs work independently, then they form a group of four) - In triads - Cooperative learning structures such as *Think Pair Share* - Interactive websites or software - With a mentor or coach	- Labeling - Students' native language - Modeling - Repetitions - Paraphrasing - Summarizing - Guiding questions - Clarifying questions - Probing questions - Leveled questions such as *What? When? Where? How? Why?* - Questioning prompts & cues - Word Banks - Sentence starters - Sentence frames - Discussion frames - Talk moves, including *Wait Time*

*from *Understanding the WIDA English Language Proficiency Standards. A Resource Guide, 2007 Edition.*. Board of Regents of the University of Wisconsin System, on behalf of the WIDA Consortium—www.wida.us.

BUILDING EQUITY IN YOUR TEACHING PRACTICE

How do the essential questions highlight the connection between the big ideas of the unit and equity in your teaching practice?

CONTENT INTEGRATION	KNOWLEDGE CONSTRUCTION	PREJUDICE REDUCTION	EQUITABLE PEDAGOGY	EMPOWERING SCHOOL CULTURE
Teachers use examples and content from a variety of cultures & groups.	Teachers help students understand how knowledge is created and influenced by cultural assumptions, perspectives & biases.	Teachers implement lessons and activities to assert positive images of ethnic groups & improve intergroup relations.	Teachers modify techniques and methods to facilitate the academic achievement of students from diverse backgrounds.	Using the other four dimensions to create a safe and healthy educational environment for all.
This unit / lesson is connected to other topics explored with students. There are multiple viewpoints reflected in the content of this unit / lesson. The materials and resources are reflective of the diverse identities and experiences of students. The content affirms students, as well as exposes them to experiences other than their own.	This unit / lesson provides context to the history of privilege and oppression. This unit / lesson addresses power relationships. This unit / lesson help students to develop research and critical thinking skills. This curriculum creates windows and mirrors* for students.	This unit / lesson help students question and unpack biases & stereotypes. This unit / lesson help students examine, research and question information and sources. The curriculum encourage discussion and understanding about the groups of people being represented. This unit / lesson challenges dominant perspectives.	The instruction has been modified to meet the needs of each student. Students feel respected and their cultural identities are valued. Additional supports have been provided for students to become successful and independent learners. Opportunities are provided for student to reflect on their learning and provide feedback.	There are opportunities for students to connect with the community. My classroom is welcoming and supportive for all students? I am aware of and sensitive to the needs of my students and their families. There are effective parent communication systems established. Parents can talk to me about issues as they arise in my classroom.

Developed by Karla E. Vigil. Adapted with permission from James A. Banks CULTURAL DIVERSITY AND EDUCATION: FOUNDATIONS CURRICULUM, AND TEACHING (6th edition), New York: Routledge, 2016, page 5 and Gordon School Institute on Multicultural Practice.

Culturally Relevant Pedagogy Examples

- **Everyone has a Voice: Create a classroom environment where students know that their contributions are expected and valued.**

  Example: Norms for sharing are established that communicate a growth mindset for mathematics. All students are capable of expressing mathematical thinking and contributing to the classroom community. Students learn new ways of looking at problem solving by working with and listening to each other.

- **Run Problem Based Learning Scenarios:** Encourage scientifically productive discourse among students by presenting problems that are relevant to them, the school and /or the community.

  Example: Using a Place Based Education (PBE) model, students explore science concepts while determining ways to address problems that are pertinent to their neighborhood, school or culture.

- **Encourage Student Leadership:** Create an avenue for students to propose problem solving strategies and potential projects.

  Example: Students can deepen their understanding of engineering criteria and constraints by creating design challenges together and deciding if the problems fit the necessary criteria. This experience will allow students to discuss and explore their current level of understanding by applying the concepts to relevant real-life experiences.

- **Present New Concepts Using Student Vocabulary:** Use student diction to capture attention and build understanding before using academic terms.

  Example: Teach science vocabulary in various modalities for students to remember. Use multi-modal activities, analogies, realia, visual cues, graphic representations, gestures, pictures and cognates. Directly explain and model the idea of vocabulary words having multiple meanings. Students can create the Word Wall with their definitions and examples to foster ownership.

APPENDIX F – Science and Engineering Practices in the NGSS

Science and Engineering Practices

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. *[Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]* (**MS-LS1-1**)

Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. *[Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.]* [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.*]* (**MS-LS1-3**)

Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. *[Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]* (**MS-LS1-7**)

Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. *[*Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.*]* (**MS-LS1-8**)

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations • Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1) **Obtaining, Evaluating, and Communicating Information** • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS1-8) **Engaging in Argument from Evidence** • Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3)	**LS1.A: Structure and Function** • All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1) • In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3) **LS1.C: Organization for Matter and Energy Flow in Organisms** • Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)	**Scale, Proportion, and Quantity** • Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1) **Systems and System Models** • Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems. (MS-LS1-3) **Cause and Effect** • Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8) **Energy and Matter** • Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7) - *Connections to Engineering, Technology and Applications of Science* **Interdependence of Science, Engineering, and Technology**

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
	LS1.D: Information Processing ● Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8) **PS3.D: Energy in Chemical Processes and Everyday Life** ● Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)	● Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1) ***Connections to Nature of Science*** **Science is a Human Endeavor** ● Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)