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Unit Title: Ecosystem Dynamics 7.5

Stage 1: Desired Results

Standards & Indicators:

NJSLS for Science

MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services. MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Science and Engineering Practices (SEP)

Asking Questions and Defining Problems: This unit intentionally develops this practice. This unit is anchored by a complex socioscientific issue. Students' initial questions on the DQB lead them to investigate simple fixes to a complex problem. The first lesson set serves to complicate the problem for them, culminating in defining the problem more clearly in Lesson 6. As in earlier units, students define a design problem that can be solved through the development of a system, but here their focus is designing a system that is limited by both scientific and social factors.

Mathematics and Computational Thinking: This unit intentionally develops this practice. While students have applied other mathematical concepts to analyze phenomena in earlier units, here students calculate ratios of orangutans to land area to understand population density. They also characterize and use graphical representations of populations over time to draw conclusions about resource availability and population sizes. They use mathematical representations using graphs to support that stable populations experience ups and downs from year to year, which is different from a representation of an unstable population. The lesson 10 assessment on Monarch butterflies allows for assessment of this practice.

Constructing Explanations and Designing Solutions: This practice is key to the sensemaking in this unit. Students apply science ideas to construct explanations for how approaches to agriculture work to support orangutans and people. Students apply science ideas to design land-use systems, and optimize these systems to both support orangutans and be financially viable for people. Students consider the benefits and trade-offs of different designs for stakeholders.

The following practices are also key to the sensemaking in the unit:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Scientific Information

Disciplinary Core Ideas (DCI)

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LS2.A. Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. Students investigate how organisms (see Lessons 8) and populations of organisms (Lessons 7, 9-12) depend on interactions with other populations particularly as they search for food resources. Students focus on plant interactions with non-living factors in Lesson 3.

LS2.A. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. Students investigate competition between orangutans in a simulation in Lesson 8 and circle back to competition in Lesson 13.

LS2.A. Growth of organisms and population increases are limited by access to resources. Students build these ideas through simulations and additional case studies across Lessons 8-11.

LS2.A. Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. Students model different interactions in the rainforest and oil palm systems, including predation, competition, and mutualism between orangutans and fruit tree populations (see Lessons 11-13).

LS2.C. Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. Students model different disruption scenarios and predict how those disruptions would shift populations. Students hear from farmers about the strategies they employ to protect themselves from disruptions (see Lessons 13, 15, 16).

LS2.C. Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. Students compare rainforest systems to oil palm systems in terms of the biodiversity found in each system (see Lesson 13). Students learn that farmers are interested in supporting biodiversity in Lesson 14.

LS4.D. Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. Students figure out that people engage with different ways to grow food compared to monocrop in order to obtain different benefits, or services (see Lessons 15-16).

ESS3.C. Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. Students focus on understanding the problem, which involves humans altering the biosphere in ways that negatively impact orangutans (Lessons 2-4) and alterations in their own communities (Lessons 5). Students also encounter ways humans farm for food that positively support biodiversity in Lesson 14.
ETS1.A. The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. Students use criteria and constraints, based on the science and engineering ideas developed in the unit, with a particular attention to what land-use strategies work for different stakeholders and the limits of their application. Students make their first pass at criteria and constraints in

Lesson 6 and revisit them to make them more precise in Lesson 17. Students evaluate design based on criteria and constraints in Lesson 18.

Crosscutting Concepts (CCC)

Cause and Effect: This crosscutting concept is key to the sensemaking in this unit. Cause and effect is a lens students apply throughout the unit, focusing on establishing cause and effect relationships in order to predict phenomena. Students use cause and effect in the context of natural systems and in their designs for land-use systems.

System and System Models: This crosscutting concept is key to the sensemaking in this unit. Students develop system models to allow them to understand the different components and interactions occurring within the system. They discuss limitations of their system models for representing the complexity of the real-world systems (e.g., simulations representing limited components and interactions).

Stability and Change: This unit intentionally develops this crosscutting concept as students engage with a new aspect focusing on how the stability of a system in dynamic equilibrium such as the orangutan population depends on mechanisms that are in balance. Stability and change is a consistent lens students apply throughout the unit as they make sense of small changes in the system that have large impacts, as well as sudden and gradual changes over time. They look to stabilize orangutan populations and farmers income in their final designs**.**

The following crosscutting concept is also key to the sensemaking in the unit:

- Patterns

Career Readiness, Life Literacies and Key Skills		
Standard	**Performance Expectations**	**Core Ideas**
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.	
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).	Multiple solutions often exist to solve a problem.
9.4.8.DC.1	Analyze the resource citations in online materials for proper use.	Detailed examples exist to illustrate crediting others when incorporating their digital artifacts in one's own work.
9.4.8.DC.2	Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).	
9.4.8.DC.7	Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.	Digital communities are used by individuals to share information, organize, and engage around issues and topics of interest.

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9.4.8.DC.8	Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).	Digital technology and data can be leveraged by communities to address effects of climate change.
9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).	Sources of information are evaluated for accuracy and relevance when considering the use of information.
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.	

Central Idea/Enduring Understanding: Lesson 1: How could buying candy affect orangutan populations in the wild? Lesson 2: Can we replace palm oil with something else? Lesson 3: Can we grow oil palm trees somewhere else so that we're not cutting down tropical rainforests? Lesson 4: Why do people cut down tropical rainforests when they know it is harmful to the animals that live there? Lesson 5: How have changes in our community affected what lives here? Lesson 6: If palm oil is not going away, how can we design palm farms to support orangutans and farmers? Lesson 7: How many orangutans typically live in the tropical rainforest? Lesson 8: Why do orangutans need so much forest space? Lesson 9: Would planting more rainforest fruit trees help the orangutan population increase? Lesson 10: How do changes in the amount of resources affect populations?	**Essential/Guiding Question:** How does changing an ecosystem affect what lives there?
Content: **Open Sci Ed Unit 7.5 Lessons 1-10** Lesson 1 Phenomena/Design Problem: Buying candy in the United States could lead to the death of orangutans in Indonesia. Lesson 2 Phenomena/Design Problem: Vegetable oils require land and produce different yields of oil. Lesson 3 Phenomena/Design Problem:	**Skills(Objectives):** Found on each lesson "what will students do?" 1.A Develop an initial system model to describe a phenomenon in which changes to one living component of an ecosystem (cause) affect the other living parts of the ecosystem (effect). 1.B Ask questions that arise from initial observations of populations in an ecosystem to help seek additional information about the parts of the ecosystem and how they interact. 2.A Define a pattern of design problems for systems that provide food resources that humans need (cause) but

Oil palm grows best in equatorial regions because of the nonliving conditions suitable for plant growth, which is the same reason that tropical rainforests are found in these locations. Lesson 4 Phenomena/Design Problem: Interviews with people who work to grow oil palms in developing countries reveal that this practice, though harmful to animals like orangutans, provides them with a way to make money to support themselves, their families, and their communities. Lesson 5 Phenomena/Design Problem: Some plants and animals seem to be doing OK, even with changes humans have made in our community, but others are missing altogether. Lesson 6 Phenomena/Design Problem: Palm farms that grow a single crop do not function well for tropical rainforest animals, leading to declines in these populations. Lesson 7 Phenomena/Design Problem: Orangutans at different times in 4 different protected areas show stable populations, with about 1-3 orangutans per 1 square km. Lesson 8 Phenomena/Design Problem: Orangutans compete for food resources in three different environmental conditions. Lesson 9 Phenomena/Design Problem: Orangutan population sizes increase when resources are plentiful and decrease when resources are limited. Lesson 10 Phenomena/Design Problem: The loss of short and tallgrass prairies to soybean oil production in the Midwest of the United States has caused declines in local monarch butterfly populations.	transform the land and the biosphere once occupied by native plants and animals (effect). 3.A Define a problem in which oil palm is dependent upon the same environmental interactions with nonliving factors as other tropical rainforest plants (pattern). 4.A Define a new criterion for a solution to more sustainably grow oil palm in ways that protect the tropical rainforest ecosystem but that also recognize the needs of local farmers, who are part of the palm oil production system. 5.A Ask questions to clarify and/or refine a model for explaining how (patterns in) human activities have altered the biosphere and changed habitats locally and in Indonesia. 6.A Define a problem that can be solved through designing a palm farm that will maintain the stability of orangutan populations and support farmers who depend on the farms for their livelihoods (criteria). 7.A. Apply mathematical concepts (ratio) to find patterns in numerical relationships about the number of orangutans that can live in a 1 km or 100 hectare area. 8.A Carry out a series of investigations using a simplified computer simulation (system model) to produce data about how individual orangutans compete with each other for food resources in three different environmental conditions to answer a question about forest space. 8.B Analyze measures of central tendency and range in class-constructed histograms to make claims about how populations of orangutans responded to three different environmental conditions and the ways in which the environmental conditions contributed to the stability of the population or changes in the population. 9.A Collect data from an investigation to draw conclusions about how stable populations of orangutans fluctuate over time based on resource availability. 9.B Use mathematical representations to draw conclusions about trends in orangutan population sizes over time, depending upon resource availability. 10.A Analyze and interpret data to draw conclusions about how changes in resource availability affect populations in the short and long term.

Interdisciplinary Connections:

ELA/Literacy -NJSLS

RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text.

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RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information.
RI.CT.7.8. Analyze and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) how two or more authors writing informational texts about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.

W.IW.7.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

SL.PE.6.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6* topics, texts, and issues, building on others' ideas and expressing their own clearly.

SL.PI.7.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

Mathematics -NJSLS

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship.
6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems.
6.RP.A.3.c Find a percent of a quantity as a rate per 100.
6.RP.A.3.d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
6.NS.B.2 Fluently divide multi-digit numbers using the standard algorithm.
6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values.
6.SP.A.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
6.SP.A.2 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.B.5.c Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern, with reference to the context in which the data were gathered.

Stage 2: Assessment Evidence

Performance Task(s):	**Other Evidence:**
Building towards: 1.B Ask questions that arise from initial observations of populations in an ecosystem to help seek additional information about the parts of the ecosystem and how they interact.	Classwork Personal digital responses (Kahoot, Quizizz, Quizlet, etc.) Homework Scientific inquiry analysis Quizzes Common Formative Assessments Tests Summative Unit Assessments

Stage 3: Learning Plan

Learning Opportunities/Strategies:	**Resources:**
● Students create a model food web.	- Open Sci Ed - Content Vocabulary - MiniLabs

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- Students will utilize topic specific vocabulary to support core concepts and further understand the essential question
- Students present a predator vs. prey relationship
- Students dissect an owl pellet
- Students interact in a demonstration to simulate the ebb and flow of populations utilizing a random selection of beads.

Teaching Scientific Practices

- Guide students through appropriate laboratory techniques (safety, accuracy, frequency, data collection, etc.)
- Students will utilize the engineering and design process to ask questions, plan and carry out investigations, refine models, design solutions, construct explanations, and design solutions.

Literacies

- Use reading strategies to read non-fiction text (preview, question, reflect, highlight, recite, review, utilize text structure, etc.)
- Digital tools - utilize features available on ebooks such as highlighting, bookmarking, linking to more information, etc.
- Digital literacy - Find and evaluate digital sources. Communicate clearly using digital platforms

Questioning - Present guiding leveled questions to students. See differentiation section for specific questions.

Formative assessment response modalities

- Teacher/student question discussion
- Thumbs up/thumbs down
- Rate yourself on understanding on a fist to five scale
- Google Forms
- Digital polling devices (Kahoot, Quizizz, etc.)
- Exit tickets/responses
- Whiteboards

Learning Strategies

- Think, Pair, Share
- Direct instruction
- Jigsaw
- Cooperative groups
- Discussion in class and discussion boards
- Socratic Seminar

- Content Practice worksheets
- Math Skills
- Enrichment
- Challenge
- Lesson Quizzes
- Kessler Science
- Labs
- Key Concept Builder activities
- Chapter Tests
- Online quiz
- Online Standardized Test Practice
- YouTube videos
- BrainPop videos
- Flocabulary
- Newsela
- Readworks.org
- Scholastic Science World magazine
- Planet Earth “Caves”
- Edulastic
- IXL

LGBT and Disabilities Resources:

- LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth
- LGBTQ+ Books

DEI Resources:

- Learning for Justice
- GLSEN Educator Resources
- Supporting LGBTQIA Youth Resource List
- Respect Ability: Fighting Stigmas, Advancing Opportunities
- NJDOE Diversity, Equity & Inclusion Educational Resources
- Diversity Calendar

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Learning Management - Google Classroom - share information with students, post assignments, collect feedback - Google Docs & Google Slides - creation and presentation tools	

Differentiation

*Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Page Keeley Science Probes Interactive Science notebooks - higher level of Costa's questions created Scaffolded guiding questions - above level Less structure provided for assignments / assessments Heterogeneous grouping Research independently or collaboratively with minimal teacher guidance Laboratory investigations designed and carried out by students	Interactive Science notebooks Scaffolded guiding questions - on level Provide challenging tasks with support to allow students to experience success Moderate amount of scaffold on assignments Heterogeneous grouping Laboratory investigations designed by students with teacher assistance and carried out by students	Interactive Science notebooks - templates provided by teacher Scaffolded guiding questions - below level Break down assignments into smaller tasks Structured, predictable classroom Graphic organizers/Study guides provided Copy of class notes/presentation provided to student Utilize student's best personal learning modality (auditory, visual, kinesthetic) Heterogeneous grouping Laboratory investigations provided by teacher for students to carry out	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

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Unit Title: 6.6 Cells & Systems

Stage 1: Desired Results

Standards & Indicators:

NJSLS for Science

MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
MS-LS1-2.* Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
MS-LS1-3.* Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
MS-LS1-8.* Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

Science and Engineering Practices (SEP)

Developing and Using Models: This unit intentionally develops this practice. While students engage in aspects of the modeling practice they have explored in prior units, this is a different context. This is the first biological system context that students investigate in the program, and is their first experience tying physical mechanisms to phenomena that occur in living things. Beginning in Lesson 1, students are developing a model for healing. They revise this model throughout the unit, and use their elaborated model to explain how the body heals from an injury (Lesson 12). In Lessons 2 through 6, the class develops a model of the structure and function of the different parts of the body. In Lesson 8, students apply what they have figured out about the different parts of the body to develop a model for how skin heals from a scrape at the cellular level. In Lessons 9 through 11, students continue to revise the healing model to include what is happening at the cellular level.

Planning and Carrying Out Investigations: This practice is key to the sensemaking in this unit. Students plan and carry out investigations across multiple lessons to help figure out how healing occurs. Students watch a demonstration of a chicken wing dissection in Lesson 2. They brainstormed how they would revise this dissection to “injure” the chicken wing in a similar manner to the injury the student in Lesson 1 had incurred. In Lesson 4, students carry out an investigation using microscopes to look at a blood sample. In Lesson 7, students plan for an investigation that could provide evidence as to whether other things in our world are made of cells. In Lesson 11, students carry out an investigation to figure out if things, like food particles, can get into an onion cell.

Analyzing and Interpreting Data: This unit intentionally develops this practice. While students have engaged with this practice in earlier units, in this unit students analyze different kinds of data (including images at different scales) in a different type of context, living things. Students identify the macro-level functions of skin, bone, and muscle, and figure out that the microscopic structures (cells) in blood and nerves support the functions of those body parts. Students analyze and interpret observational data, videos, and images to provide evidence that cell growth occurs. Students analyze second-hand data from an investigation of E.coli to collect evidence that the bacteria need food to make more cells and the more food the bacteria are provided, the more the bacteria make more cells.

Engaging in Argumentation: This practice is key to the sensemaking in this unit. Students engage in argumentation many times throughout the unit as they explain what is happening in the body for it to heal. In Lesson 2, they argue orally for the interactions between the bone and muscle and skin for a part of the body to function. In Lesson 7, students argue from evidence whether the living things they analyzed are made of cells or not. In Lesson 10, students argue for what human cells need to grow and make more cells and argue for what bacteria need to grow and make more of themselves. In Lesson 12, students argue from evidence for what caused the different healing events on the

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Healing Timeline from Lesson 1. In Lesson 13, students argue for whether the healing process is similar or different from the growth process and why.

The following practices are also key to the sensemaking in the unit:

- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Obtaining, Evaluating, and Communicating Information

Disciplinary Core Ideas (DCI)

LS1.A: 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). Through investigations including a dissection and bacteria lab (Lessons 2, 10), analyzing medical images and videos (Lessons 3, 5, 8, 9) looking at slides under the microscope (Lessons 4, 5, 6, 7, 9, 10) and reading informational texts (3, 4, 5, 10), students figure out that our body is made up of cells. Throughout these lessons, in addition to investigating different parts of our body to figure this out, students also look at parts of mammalian (cat blood, ox nerve, pig kidney, rat liver) and non-mammalian animals (green anole, sea star) and plants (tomato, mustard plant) and figure out that not only humans, but all living things are made of cells. In Lesson 10, when students investigate what cells need to grow through analyzing data from a bacteria lab, they figure out that bacteria, which are made of only one cell, are living things. Students read about other single celled organisms and figure out that all living things are made of cells, either one cell or many.

LS1.A: Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. By lesson 4, students have figured out through looking at a blood sample under the microscope that our blood is made up of different small structures called red blood cells, white blood cells, and platelets. In Lessons 5 and 6, they discover that nerves, bone, skin and muscle are also made up of cells. Through comparing the structures of these different types of cells, students notice that they all have definite shapes with an outer structure or boundary, the cell membrane. By Lesson 11 students figure out that the cell membrane is actually porous and lets things such as food get into the cell to make more cells during the healing process, and lets other things out of the cell that the cell doesn't need, like waste. Other structures of the cell will be discovered in future units: OpenSciEd Unit 7.4: Where does food come from, and where does it go next? (Maple Syrup Unit) - mitochondria and chloroplasts; and OpenSciEd Unit 8.5: Why are living things different from one another? (Muscles Unit)- nucleus and chromosomes.

LS1.A: 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. Students begin developing a poster in Lesson 2 called Our Body as a System, by adding the skin, bone, and muscle to this poster as those are the structures that were injured for the student they hear about in Lesson 1. At this point in the unit, students are still at the macroscopic level of analysis of these parts of the body. They analyze images of the muscular, skeletal, and skin system of the body to figure out where else in the body these structures are found and add this to the poster.At the end of this lesson, students are beginning to think about the body as a system. As students continue investigating through Lessons 3, 4, 5 and 6, they figure out that each of these parts of the body are made up of smaller parts, the smallest being the cell. At the end of Lesson 6, students have added to the poster the macroscopic and microscopic levels of each of these parts and figured out that there are multiple systems within the body. In addition, they have figured out that the cells that make up the different parts of the body interact with the cells around them (tissues) so that the larger structure in the body can function. Students will figure out by Lesson 12, that the different systems in the body interact and work together when our body goes through the healing process. Students will continue to build on this idea of the multiple systems and subsystems (tissues and organs) interacting

for our body to be able to carry out specific functions in the 7th grade unit: OpenSciEd Unit 7.3: How do things inside our bodies work together to make us feel the way we do? (Inside Our Bodies Unit).

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.

Crosscutting Concepts (CCC)

Scale, Proportion, and Quantity: This crosscutting concept is key to the sensemaking in this unit. Students use different spatial scales to observe and make sense of phenomena, from macroscopic (parts of the body, systems within the body) to the microscopic (cell level). They also consider different temporal scales (4 months of healing for the student in Lesson 1 to the quick timelapse in Lesson 8) to figure out what the body is made of and how the different structures in the body are interconnected (ie: cells are part of tissues).

Systems and System Models: This crosscutting concept is key to the sensemaking in this unit. Beginning in Lesson 2, the class develops a poster titled Our Body as a System. Students incrementally revise and extend the systems model poster in the next four lessons as they figure out more about the different systems and subsystems within our body ranging from our body as a whole down to the system of the cell.

Structure and Function: This crosscutting concept is key to the sensemaking in this unit. As students figure out how parts of the body heal, they investigate the way different parts are structured, how these parts function and how the way these parts are structured is related to the function of the part. Students look at structures both macroscopically in the body as well as microscopically down to the cell. Students figure out that the different parts of the body are made of cells that are unique in shape and composition to that part of the body and that the structure of the cell is related to the structure and function of the part of the body the cell comes from.

The following crosscutting concepts are also key to the sensemaking in this unit:

- Patterns
- Cause and Effect

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.	
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).	Multiple solutions often exist to solve a problem.
9.4.8.DC.1	Analyze the resource citations in online materials for proper use.	Detailed examples exist to illustrate crediting others when incorporating their digital artifacts in one's own

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9.4.8.DC.2	Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).	work.
9.4.8.DC.7	Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.	Digital communities are used by individuals to share information, organize, and engage around issues and topics of interest.
9.4.8.DC.8	Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).	Digital technology and data can be leveraged by communities to address effects of climate change.
9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).	Sources of information are evaluated for accuracy and relevance when considering the use of information.
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.	

Central Idea/Enduring Understanding:	**Essential/Guiding Question:**
Lesson 1: What happened in the student's foot so they could walk again? Lesson 2: What do our bones, skin, and muscles do for us? Lesson 3: How can medical images and diagrams help us figure out more about the structures in our body? Lesson 4: Why is there blood in all of these places in the body? Lesson 5: What do nerves do, and why are they in different parts of the body? Lesson 6: What will we see if we look at skin, bone, and muscle with the microscope, too? Lesson 7: Are all things made of cells? Lesson 8: What happened as the skin on top of the foot healed? Lesson 9: What is happening at the site of an injury to fill the gap? Lesson 10: What do cells need to grow and make more of themselves?	How do living things heal?
Content: **Open Sci Ed Unit 6.6 Lessons 1-10** Lesson 1 Phenomena/Design Problem: A middle school student injured his foot and could not walk. Over the next 4 months, the foot healed and the student could walk again. Lesson 2 Phenomena/Design Problem:	**Skills(Objectives):** 1.A Obtain information from images and doctor's notes to identify patterns between the relationship of important events (effect) and the evidence of interacting subsystems healing (cause). 1.B Develop an initial model of the healing process that occurs within and between multiple interacting systems and subsystems and restores the foot's function.

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A chicken wing shows the interactions between skin, muscle, and bone during movement. When the bone in the wing is damaged and broken, it cannot function the same as in an uninjured wing. Lesson 3 Phenomena/Design Problem: Medical images and scientific diagrams can be cross-referenced to identify structures within the body. Lesson 4 Phenomena/Design Problem: A blood sample that looks homogenous when newly drawn separates into distinct layers after being left to stand. When viewed with a microscope, blood smears from humans and other mammals contain three different round components. Lesson 5 Phenomena/Design Problem: Nerve cells branch out all over the body to create a system that allows signals to travel throughout the body, including to and from the brain. Lesson 6 Phenomena/Design Problem: Slides of human skin, bone, and muscle samples look different when viewed with a microscope, but each is composed of smaller structures arranged in repeating patterns. Lesson 7 Phenomena/Design Problem: We analyze multiple microscopic images of some living and non-living things as data to determine whether they are all made of cells. Lesson 8 Phenomena/Design Problem: A time-lapse video of skin healing after a bike crash shows the formation of new skin over time Lesson 9 Phenomena/Design Problem: A gap in skin, muscle, or bone is filled in by the formation of new cells from old cells of the same type, but what do cells need in order to make more cells? Lesson 10 Phenomena/Design Problem: Bacteria, an organism made of one cell, make more of themselves when given nutrients. The more nutrients, the more the bacteria cells make.	1.C Ask questions that arise from observations of injuries to multiple subsystems that result in the loss of function of the foot (larger complex system). 2.A Analyze and interpret data to highlight the interactions between subsystems (skin, muscle, bone) within the larger system (foot or wing). 2.B Revise the experimental design and conduct an investigation to predict the change in function of the chicken wing (effect) when parts are injured (cause). 3.A Critically read and interpret scientific texts (images and diagrams) adapted for classroom use to describe patterns to figure out that blood and nerves are present in skin, muscle, and bone of a human body. 4.A Collect data at different scales to answer scientific questions about the components found in blood. 4.B Critically read scientific text to make sense of patterns within structures we observe in the blood related to their function in the body. 5.A Gather and synthesize information from scientific text and other sources to describe the basic structure of nerves and nerve cells and explain how its structure supports both the function of those cells within the nervous system and the interactions that occur between nerves and other parts of the body (e.g., skin, bone, muscle). 6.A Analyze and interpret observational data of microscopic structures of skin, bone, and muscle, relating those structures to the functions of those parts of the body. 7.A Plan an investigation and construct an argument using evidence from the microscopic scale that all things are not made of cells. 7.B Develop a model at a zoomed-in scale to describe what changes happen to the structure and function of skin cells at the time of injury. 8.A Develop a model to predict how the interacting systems and subsystems of groups of skin cells work together to form or repair new tissues and organs. 9.A Analyze and interpret data from a video and microscopic images at varying spatial and time scales to conclude that new cells come from old cells following a predictable pattern of repeated steps.

	10.A Analyze and interpret data for patterns to identify the relationship between the amount of food (cause) and the amount of bacteria made (effect) to provide evidence that cells need food to grow and make more of themselves. 10.B Construct a written argument using cause-and-effect relationships to conclude that the cells that make up multicellular organisms need food to make more cells, as do the cells of unicellular organisms.

Interdisciplinary Connections:

ELA/Literacy -NJSLS

RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text.
RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information.
RI.CT.7.8. Analyze and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) how two or more authors writing informational texts about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.

W.IW.7.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

SL.PE.6.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6* topics, texts, and issues, building on others' ideas and expressing their own clearly.

SL.PI.7.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

Mathematics -NJSLS

6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities
6.RP.A.3.C: Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

Stage 2: Assessment Evidence

Performance Task(s):	Other Evidence:
- Human body systems One Pager Aligning with AVID strategies -Frog Dissection	Classwork Personal digital responses (Kahoot, Quizizz, Quizlet, etc.) Homework Scientific inquiry analysis Quizzes Common Formative Assessments Tests Summative Unit Assessments

Stage 3: Learning Plan

Learning Opportunities/Strategies:	Resources:
● Students will create the human body a system at a time in a body journal	- Content Vocabulary - MiniLabs - Content Practice worksheets - Math Skills

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- Students will utilize topic specific vocabulary to support core concepts and further understand the essential question
- Mystery Science Theater
- Microscope Lab
- Lens Lab
- Organelle Factory activity

Teaching Scientific Practices

- Guide students through appropriate laboratory techniques (safety, accuracy, frequency, data collection, etc.)
- Students will utilize the engineering and design process to ask questions, plan and carry out investigations, refine models, design solutions, construct explanations, and design solutions.

Literacies

- Use reading strategies to read non-fiction text (preview, question, reflect, highlight, recite, review, utilize text structure, etc.)
- Digital tools - utilize features available on ebooks such as highlighting, bookmarking, linking to more information, etc.
- Digital literacy - Find and evaluate digital sources. Communicate clearly using digital platforms

Questioning - Present guiding leveled questions to students. See differentiation section for specific questions.

Formative assessment response modalities

- Teacher/student question discussion
- Thumbs up/thumbs down
- Rate yourself on understanding on a fist to five scale
- Google Forms
- Digital polling devices (Kahoot, Quizizz, etc.)
- Exit tickets/responses
- Whiteboards

Learning Strategies

- Think, Pair, Share
- Direct instruction
- Jigsaw
- Cooperative groups
- Discussion in class and discussion boards
- Socratic Seminar

Learning Management

- Enrichment
- Challenge
- Lesson Quizzes
- Kessler Science
- Labs
- Key Concept Builder activities
- Chapter Tests
- Online Quiz
- Online Standardized Test Practice
- YouTube Videos
- BrainPop Videos
- Flocabulary
- Newsela
- Readworks.org
- Scholastic Science World magazine
- Planet Earth “Caves”
- Edulastic
- IXL

LGBT and Disabilities Resources:

- LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth
- LGBTQ+ Books

DEI Resources:

- Learning for Justice
- GLSEN Educator Resources
- Supporting LGBTQIA Youth Resource List
- Respect Ability: Fighting Stigmas, Advancing Opportunities
- NJDOE Diversity, Equity & Inclusion Educational Resources
- Diversity Calendar

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- Google Classroom - share information with students, post assignments, collect feedback - Google Docs & Google Slides - creation and presentation tools	

Differentiation

*Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Page Keeley Science Probes Interactive Science notebooks - higher level of Costa's questions created Scaffolded guiding questions - above level Less structure provided for assignments / assessments Heterogeneous grouping Research independently or collaboratively with minimal teacher guidance Laboratory investigations designed and carried out by students	Interactive Science notebooks Scaffolded guiding questions - on level Provide challenging tasks with support to allow students to experience success Moderate amount of scaffold on assignments Heterogeneous grouping Laboratory investigations designed by students with teacher assistance and carried out by students	Interactive Science notebooks - templates provided by teacher Scaffolded guiding questions - below level Break down assignments into smaller tasks Structured, predictable classroom Graphic organizers/Study guides provided Copy of class notes/presentation provided to student Utilize student's best personal learning modality (auditory, visual, kinesthetic) Heterogeneous grouping Laboratory investigations provided by teacher for students to carry out	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

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Unit Title: 8.5 Genetics

Stage 1: Desired Results

Standards & Indicators:

NJSLS for Science

MS-LS1-5.* Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.
MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
MS-LS4-5. Gather and synthesize information about technologies that have changed the way humans influence the inheritance of desired traits in organisms.
MS-LS1-2.* Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. MS-LS1-4.* Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.

Science and Engineering Practices (SEP)

Obtaining, Evaluating, and Communicating Information: This unit intentionally develops this practice. Students work with a new element (evaluating competing accounts in Lesson 9) and gradually become more independent in their use of all the other elements of this practice. Throughout the unit students obtain and evaluate information from a variety of sources, including articles, audio interviews, videos, charts, graphs, and images. They have formal and informal opportunities to communicate information orally and in writing. To support their use of this practice, in Lesson 3 students co-construct a version of the checklist tool they've used in prior units and use it in Lessons 6, 10, 13, 14, and 15 with opportunities to obtain, evaluate, and communicate increasingly complex information. Students are formally assessed on this practice in Lesson 10, and then they reflect on their use of this practice in a self assessment in Lesson 14.

Using Mathematics and Computational Thinking: This unit intentionally develops the practice of using mathematics and computational thinking. Students calculate the probability of offspring phenotypes from various parental crosses in Lessons 8, 10, 14, and 16. In Lesson 8 students take note that the series of ordered steps they're using is an algorithm (an element of this practice they have not used previously).

Developing and Using Models: Modeling is key to the sensemaking in this unit. Although no new elements of this practice are introduced, students use models to make sense of and explain almost every aspect of what they figure out in this unit. Students have frequent opportunities to develop models with a partner, in small groups, or as a class when they are making sense of new science ideas. Students then use models independently to explain those science ideas and relationships on assessments in Lessons 7, 10, and 17. These models represent multiple cause-and-effect relationships at multiple scales, and as such this unit offers a comprehensive opportunity to practice developing and using models to explain complex phenomena.

The following practices are also key to the sensemaking in the unit:

- Asking questions and defining problems
- Planning and carrying out investigations
- Constructing explanations and designing solutions

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Disciplinary Core Ideas (DCI)

LS1.B. Genetic factors as well as local conditions affect the growth of the adult plant. Students specifically investigate the combination of local environmental effects and genetic influences on plant growth in Lessons 13, 15, and 17. In Lesson 3, students investigate environmental effects on musculature and the combination of environmental effects with genetic influences on other trait variations in Lessons 15 and 16. Students are focused on determining how genetic factors influence the growth of organisms in Lessons 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14. This DCI element is shared with OpenSciEd Unit 7.3: How do things inside our bodies work together to make us feel the way we do? (Inside Our Bodies Unit).

LS1.B. Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. Transferring genetic information via sexual reproduction is the focus of Lesson 5 specifically (in animals) and Lesson 13 (in plants), where students also encounter asexual reproduction, and they continue to explore how organisms reproduce asexually in Lesson 14.

LS3.A. Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. Students investigate cattle karyotypes in Lesson 5 and then connect chromosomes to genes, alleles, and proteins in Lesson 6, where they also encounter an example of genetic modification that resulted in changes to the myostatin protein, thereby affecting the structure of animals' musculature. Students continue to explore the gene-to-protein-to-trait story in Lessons 7 and 8, where they hear about the original mutation that led to a new allele, which gave rise to heavy musculature.

LS3.A. Variations of inherited traits between parent and offspring arise from genetic differences that result from the sub-set of chromosomes (and therefore genes) inherited. Students contrast the phenotypes of parents and offspring in Lesson 5 and connect those differences to chromosomes (genes) in Lesson 6. In Lesson 14, students specifically contrast the variation between parent and offspring due to sexual reproduction with the inheritance of identical genetic information due to asexual reproduction.

LS3.B. In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others are harmful, and some are neutral to the organism. Students are introduced to the natural mutation that leads to extra-big muscles in Lesson 8, and they explore the benefits and drawbacks of this mutation in Lesson 9. In Lesson 16 students encounter other examples of mutations and again consider their effects and how rare they are.

LS3.B. In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. In Lesson 5, students discover that sex cells contain single copies of chromosomes, and these combine so offspring have two sets of chromosomes. They connect genes and alleles to this pattern in Lesson 6, and in Lesson 8 students use their understanding of random assortment along with probability calculations, and Punnett squares to determine the chances of possible genotypic outcomes of various parent crosses.

LS4.B. In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. Students explore selective breeding in Lessons 9 (in animals) and 13 (in plants).

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LS1.B. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. Students investigate plant reproductive structures in Lesson 13, focusing on how certain pollinators interact with specialized flower parts. The PE related to this DCI element is shared with OpenSciEd Unit 8.6: How could things living today be connected to the things that lived long ago? (Penguins Unit).

LS1.A: Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. By lesson 4, students have figured out through looking at a blood sample under the microscope that our blood is made up of different small structures called red blood cells, white blood cells, and platelets. In Lessons 5 and 6, they discover that nerves, bone, skin and muscle are also made up of cells. Through comparing the structures of these different types of cells, students notice that they all have definite shapes with an outer structure or boundary, the cell membrane.

Crosscutting Concepts (CCC)

Cause and Effect: This crosscutting concept is key to the sensemaking students do in this unit. Students' more independent use of cause-effect thinking is supported by removing scaffolds and applying these ideas to explain increasingly complex phenomena.

Structure and Function: This crosscutting concept is key to the sensemaking in this unit. Students explicitly use a structure function lens to consider several of the ideas they're developing in this unit. Specific wording in videos and readings as well as guiding questions on handouts and slides and in discussions scaffold students as they explore structure-function relationships in complex biological systems. They investigate how proteins have specific structures to do their jobs (Lessons 2 and 6), and they learn that if there is a change to the structure of a gene it can affect the protein produced (Lesson 7).

The following crosscutting concepts are also key to the sensemaking in the unit:

- Patterns
- Scale, proportion, and quantity

Career Readiness, Life Literacies and Key Skills

Standard	Performance Expectations	Core Ideas
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.	
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).	Multiple solutions often exist to solve a problem.
9.4.8.DC.1	Analyze the resource citations in online materials for proper use.	Detailed examples exist to illustrate crediting others when incorporating their digital artifacts in one's own work.

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9.4.8.DC.2	Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).	
9.4.8.DC.7	Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.	Digital communities are used by individuals to share information, organize, and engage around issues and topics of interest.
9.4.8.DC.8	Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).	Digital technology and data can be leveraged by communities to address effects of climate change.
9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).	Sources of information are evaluated for accuracy and relevance when considering the use of information.
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.	

Central Idea/Enduring Understanding: Lesson 1: How do organisms get their differences? Lesson 2: How do extra-big muscles compare to typical ones up close? Lesson 3: How do diet and exercise affect muscle size? Lesson 4: What is different about the food and exercise for cattle with extra-big muscles? Lesson 5: Where do the babies with extra-big muscles get that trait variation? Lesson 6: How do chromosomes cause cattle to be born with extra-big muscles? Lesson 7: How does an animal get extra-big muscles? Lesson 8: Why don't offspring always look like their parents or their siblings? Lesson 9: How do farmers control the variation in their animals? Lesson 10: How can we use our model to explain a different trait variation?	**Essential/Guiding Question:** Why are living things different from one another?
Content: **Open Sci Ed Unit 8.5 Lessons 1-10** Lesson 1 Phenomena/Design Problem: There are cattle (and several other animals) that have extra-big muscles. Lesson 2 Phenomena/Design Problem: Students view videos and images of muscle	**Skills(Objectives):** 1.A Obtain information from images and doctor's notes to identify patterns between the relationship of important events (effect) and the evidence of interacting subsystems healing (cause). 1.B Develop an initial model of the healing process that occurs within and between multiple interacting systems and subsystems and restores the foot's function.

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composition and analyze data from extrabig-muscled animals versus typically muscled animals showing differences in muscle cells. Lesson 3 Phenomena/Design Problem: Data in text, images, graphs, and charts show the effect of diet and exercise on muscle growth. Lesson 4 Phenomena/Design Problem: A farmer talks about the lifestyle and diet of extra-big, heavily muscled cattle. Images of baby cattle show that heavily muscled animals are born with bigger muscles. Lesson 5 Phenomena/Design Problem: Pedigrees of cattle show patterns between relatedness and musculature. We can see chromosomes in images of sperm, eggs, and muscle cells. Lesson 6 Phenomena/Design Problem: The cattle photo cards we analyzed last time and organized into pedigrees now include images of protein(s) found in their bodies and data about their genotype, so we can look for patterns related to the heavily muscled phenotype. Lesson 7 Phenomena/Design Problem: Students put together the pieces of recent phenomena: cattle karyotypes; chromosomes in sperm, egg, and offspring's cells; genotype; and myostatin data Lesson 8 Phenomena/Design Problem: Offspring don't always look like their parents or their siblings even though biological siblings get their genes from the same two parents. Lesson 9 Phenomena/Design Problem: Articles and a computer simulation allow the class to work with selective breeding to see how certain combinations of alleles lead to generations with costly or beneficial outcomes. Lesson 10 Phenomena/Design Problem: The probability of a goldfish offspring having certain color scales (brown, transparent, or	1.C Ask questions that arise from observations of injuries to multiple subsystems that result in the loss of function of the foot (larger complex system). 2.A Analyze and interpret data to highlight the interactions between subsystems (skin, muscle, bone) within the larger system (foot or wing). 2.B Revise the experimental design and conduct an investigation to predict the change in function of the chicken wing (effect) when parts are injured (cause). 3.A Critically read and interpret scientific texts (images and diagrams) adapted for classroom use to describe patterns to figure out that blood and nerves are present in skin, muscle, and bone of a human body. 4.A Collect data at different scales to answer scientific questions about the components found in blood. 4.B Critically read scientific text to make sense of patterns within structures we observe in the blood related to their function in the body. 5.A Gather and synthesize information from scientific text and other sources to describe the basic structure of nerves and nerve cells and explain how its structure supports both the function of those cells within the nervous system and the interactions that occur between nerves and other parts of the body (e.g., skin, bone, muscle). 6.A Analyze and interpret observational data of microscopic structures of skin, bone, and muscle, relating those structures to the functions of those parts of the body. 7.A Plan an investigation and construct an argument using evidence from the microscopic scale that all things are not made of cells. 7.B Develop a model at a zoomed-in scale to describe what changes happen to the structure and function of skin cells at the time of injury. 8.A Develop a model to predict how the interacting systems and subsystems of groups of skin cells work together to form or repair new tissues and organs. 9.A Analyze and interpret data from a video and microscopic images at varying spatial and time scales to conclude that new cells come from old cells following a predictable pattern of repeated steps.

speckled) can be predicted based on the phenotype of its parents.	10.A Analyze and interpret data for patterns to identify the relationship between the amount of food (cause) and the amount of bacteria made (effect) to provide evidence that cells need food to grow and make more of themselves. 10.B Construct a written argument using cause-and-effect relationships to conclude that the cells that make up multicellular organisms need food to make more cells, as do the cells of unicellular organisms.

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SL.PI.7.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

Mathematics -NJSLS

6.SP.B.4: Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
7.SP.C.5: Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
7.SP.C.6: Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
7.SP.C.7: Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
7.RP.A.2: Recognize and represent proportional relationships between quantities.

Stage 2: Assessment Evidence

Performance Task(s):	Other Evidence:
- "Create a baby Monster" Project -Unit 3 Assessment	Classwork Personal digital responses (Kahoot, Quizizz, Quizlet, etc.) Homework Scientific inquiry analysis Quizzes Common Formative Assessments Tests Summative Unit Assessments

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Stage 3: Learning Plan

Learning Opportunities/Strategies:

- Build DNA
- Mendel's Peas
- Mitosis/Meiosis
- Alleles
- Punnett Squares
- Students will utilize topic specific vocabulary to support core concepts and further understand the essential question

Teaching Scientific Practices:

- Guide students through appropriate laboratory techniques (safety, accuracy, frequency, data collection, etc.)
- Students will utilize the engineering and design process to ask questions, plan and carry out investigations, refine models, design solutions, construct explanations, and design solutions.

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Learning Strategies

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- MiniLabs
- Content Practice worksheets
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- Challenge
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- Labs
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- Chapter Tests
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- Online Standardized Test Practice
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- BrainPop Videos
- Flocabulary
- Newsela
- Readworks.org
- Scholastic Science World magazine
- Planet Earth "Caves"
- Edulastic
- IXL

LGBT and Disabilities Resources:

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- GLSEN Educator Resources
- Supporting LGBTQIA Youth Resource List
- Respect Ability: Fighting Stigmas, Advancing Opportunities
- NJDOE Diversity, Equity & Inclusion Educational Resources
- Diversity Calendar

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- Socratic Seminar Learning Management - Google Classroom - share information with students, post assignments, collect feedback - Google Docs & Google Slides - creation and presentation tools	

Differentiation

*Please note: Teachers who have students with 504 plans that require curricular accommodations are to refer to Struggling and/or Special Needs Section for differentiation

High-Achieving Students	On Grade Level Students	Struggling Students	Special Needs/ELL
Page Keeley Science Probes Interactive Science notebooks - higher level of Costa's questions created Scaffolded guiding questions - above level Less structure provided for assignments / assessments Heterogeneous grouping Research independently or collaboratively with minimal teacher guidance Laboratory investigations designed and carried out by students	Interactive Science notebooks Scaffolded guiding questions - on level Provide challenging tasks with support to allow students to experience success Moderate amount of scaffold on assignments Heterogeneous grouping Laboratory investigations designed by students with teacher assistance and carried out by students	Interactive Science notebooks - templates provided by teacher Scaffolded guiding questions - below level Break down assignments into smaller tasks Structured, predictable classroom Graphic organizers/Study guides provided Copy of class notes/presentation provided to student Utilize student's best personal learning modality (auditory, visual, kinesthetic) Heterogeneous grouping Laboratory investigations provided by teacher for students to carry out	Any student requiring further accommodations and/or modifications will have them individually listed in their 504 Plan or IEP. These might include, but are not limited to: breaking assignments into smaller tasks, giving directions through several channels (auditory, visual, kinesthetic, model), and/or small group instruction for reading/writing ELL supports should include, but are not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

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Unit Title: 8.6 Natural Selection & Common Ancestry

Stage 1: Desired Results

Standards & Indicators:

NJSLS for Science

MS-LS1-4.* Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants, respectively.
MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.
MS-LS4-3. Analyze displays of pictorial data to compare patterns of similarities in embryological development across multiple species to identify relationships not evident in the fully formed anatomy.
MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Science and Engineering Practices (SEP)

Analyzing and Interpreting Data: This unit intentionally develops this practice as students investigate large data sets for variations in animals' body structures and changes over time. Although students have had prior experience with this practice, the data sets they use in this unit are the largest and most complex that they have worked with in OpenSciEd. Throughout the unit, students analyze and interpret data from photos, sketches, modern and ancient world maps, organism size comparison charts, timelines, tables displaying multiple categories of body structures, environmental and behavioral information, linear models, histograms, and box-and-whisker plots. Students consider the role of randomness in the simulations they use to describe the shifts in distribution and central tendency of trait variations in populations. The work of this unit requires students to synthesize these data sets in more complex ways than they did in past units. Students combine evidence from their analyses and interpretation of data about multiple organisms to support the models they develop throughout the unit. The unit provides several different opportunities to assess students' work in this practice.

Constructing Explanations and Designing Solutions: This practice is intentionally developed in this unit. Students construct explanations throughout the unit as they gather evidence for the mechanism in their General Model for Natural Selection in efforts to explain "Where did all the ancient penguins go?" and "Where did all the different species of modern penguins come from?" Students have experience with this SEP from prior units, including with long time scales and small changes accumulating over time, but now they are building that kind of explanation in living systems. There are multiple opportunities to assess students' independent use of this practice throughout the unit, including a peer feedback activity in Lesson 11 during which students respectfully provide critiques about each other's explanations and respond by adding more elaboration and detail.

Engaging in Argument from Evidence: This practice is key to the sensemaking students do in this unit. Arguing from evidence they have collected from multiple investigations is deeply embedded into students' work supporting their scientific explanations for how populations of organisms can change over time and how they are connected to those long ago. A key goal of the unit is for students to be able to say not only what they think happened in these cases of natural selection but also how the evidence supports that explanation. Students specifically engage in this practice in Lessons 5, 6, 8, and 14, at which points they can also be assessed.

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The following practices are also key to the sensemaking in the unit:

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Obtaining, evaluating, and communicating information

Disciplinary Core Ideas (DCI)

LS1.B. Growth and Development of Organisms: Animals engage in characteristic behaviors that increase the odds of reproduction. Students will develop and use these ideas in Lessons 2, 7, and 11 when they investigate, compare, and contrast the behaviors of various animals. Note that the PE related to this DCI element is shared with OpenSciEd Unit 8.5: Why are living things different from one another? (Muscles Unit).

LS4.A. Evidence of Common Ancestry and Diversity

- The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.
- Anatomical similarities and differences between various organisms living today, and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.
- Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully formed anatomy.

LS4.B. Natural selection leads to the predominance of certain traits in a population and the suppression of others.

LS4.C. Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common and those that do not become less common.

Crosscutting Concepts (CCC)

Stability and Change: The crosscutting concept of “stability and change of systems” is key to the sensemaking students do in this unit as students are continually evaluating trait variations in populations before and after an environmental change. In Lesson Set 1, students develop an explanation for “Why are there similarities and differences in the body structures of modern and ancient penguins?” which highlights what has remained stable and what has changed in the different species’ body structures. In Lesson Set 2, students develop the ideas that the trait variations found in a population may shift relatively rapidly due to sudden environment changes and that trait variations found in a large population may remain relatively stable when the environment doesn’t change. Students figure out that seemingly small changes in organisms can accumulate over generations and add up to relatively large amounts of change over long periods of time.

Structure and Function: The crosscutting concept of “structure and function” is key to the sensemaking students do in this unit. Students bring a vast amount of experience with structure and function thinking into this unit from prior work which they now use to support their investigations and make sense of data in almost every lesson. As they consider how organisms could be connected over time, students analyze the body structures of those organisms and consider how they function in similar or different ways and in similar or different environments. The models they develop for natural selection and common ancestry are informed by structure and function thinking.

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Career Readiness, Life Literacies and Key Skills		
Standard	**Performance Expectations**	**Core Ideas**
9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.	
9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).	Multiple solutions often exist to solve a problem.
9.4.8.DC.1	Analyze the resource citations in online materials for proper use.	Detailed examples exist to illustrate crediting others when incorporating their digital artifacts in one's own work.
9.4.8.DC.2	Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8).	
9.4.8.DC.7	Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.	Digital communities are used by individuals to share information, organize, and engage around issues and topics of interest.
9.4.8.DC.8	Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).	Digital technology and data can be leveraged by communities to address effects of climate change.
9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).	Sources of information are evaluated for accuracy and relevance when considering the use of information.
9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.	

Central Idea/Enduring Understanding:	**Essential/Guiding Question:**
Lesson 1: How could penguins and other things living today be connected to the things that lived long ago? Lesson 2: How similar or different are different species of penguins? Lesson 3: How do the body structures of other ancient penguins compare to modern penguins? Lesson 4: Why are there similarities and differences in the body structures of modern and ancient penguins?	How could things living today be connected to the things that lived long ago?

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Lesson 5: How might other living things be connected to ancient organisms? Lesson 6: How could organisms living today be connected to organisms that lived long ago? Lesson 7: How do traits found in a population change over a shorter amount of time? Lesson 8: How can we model what is causing the changes in the populations happening across all our case studies? Lesson 9: How well does our General Model predict and explain the changes happening over time in a different population? Lesson 10: Why does our General Model tend to produce different outcomes in different environmental conditions?	
Content: **Open Sci Ed Unit 8.6 Lessons 1-10** Lesson 1 Phenomena/Design Problem: A giant fossil penguin, named Pedro, that lived 36 million years ago and was discovered in Peru has important anatomical similarities to and differences from penguins that are alive today Lesson 2 Phenomena/Design Problem: Heritable physical structure and behavior variations have been measured for different modern penguins, and some of these have been measured for Pedro. Lesson 3 Phenomena/Design Problem: Body structure data from fossils for different penguin species found at different sites provide information on how old the fossils are and the environment the ancient penguins lived in. Lesson 4 Phenomena/Design Problem: When multiple fossils of the same species are found, they have the same variations. We also put pieces together from all phenomena we explored in Lessons 1 through 3. Lesson 5 Phenomena/Design Problem: Body structure variation data have been collected from modern whales, horses, and horseshoe crabs, as well as from ancient fossils of these organisms. The specific locations where these fossils were found also provide information on how	**Skills(Objectives):** 1.A Obtain information from images and doctor's notes to identify patterns between the relationship of important events (effect) and the evidence of interacting subsystems healing (cause). 1.B Develop an initial model of the healing process that occurs within and between multiple interacting systems and subsystems and restores the foot's function. 1.C Ask questions that arise from observations of injuries to multiple subsystems that result in the loss of function of the foot (larger complex system). 2.A Analyze and interpret data to highlight the interactions between subsystems (skin, muscle, bone) within the larger system (foot or wing). 2.B Revise the experimental design and conduct an investigation to predict the change in function of the chicken wing (effect) when parts are injured (cause). 3.A Critically read and interpret scientific texts (images and diagrams) adapted for classroom use to describe patterns to figure out that blood and nerves are present in skin, muscle, and bone of a human body. 4.A Collect data at different scales to answer scientific questions about the components found in blood. 4.B Critically read scientific text to make sense of patterns within structures we observe in the blood related to their function in the body. 5.A Gather and synthesize information from scientific text and other sources to describe the basic structure of nerves and nerve cells and explain how its structure supports both the

old they are and what their local and global environments were like at that time the fossils formed. Lesson 6 Phenomena/Design Problem: No new phenomena are introduced in this lesson. We put the pieces together for all phenomena we previously explored in Lessons 1 through 5. Lesson 7 Phenomena/Design Problem: In five different populations (cliff swallows, peppered moths, finches, sticklebacks, and mustard plants) scientists measured a rapid shift in the distribution of a trait variation in a population over multiple generations Lesson 8 Phenomena/Design Problem: No new phenomena are introduced in this lesson. We put the pieces together for all phenomena we explored in Lesson 7. Lesson 9 Phenomena/Design Problem: A simulation that includes trait variation in a salmonella bacteria population and two types of white blood cells produces shifts in the distribution of the bacteria trait variations Lesson 10 Phenomena/Design Problem: A simulation of two different bacteria populations produces different shifts in the distribution of trait variations in the populations over time depending on the type of distribution of food in the environment.	function of those cells within the nervous system and the interactions that occur between nerves and other parts of the body (e.g., skin, bone, muscle). 6.A Analyze and interpret observational data of microscopic structures of skin, bone, and muscle, relating those structures to the functions of those parts of the body. 7.A Plan an investigation and construct an argument using evidence from the microscopic scale that all things are not made of cells. 7.B Develop a model at a zoomed-in scale to describe what changes happen to the structure and function of skin cells at the time of injury. 8.A Develop a model to predict how the interacting systems and subsystems of groups of skin cells work together to form or repair new tissues and organs. 9.A Analyze and interpret data from a video and microscopic images at varying spatial and time scales to conclude that new cells come from old cells following a predictable pattern of repeated steps. 10.A Analyze and interpret data for patterns to identify the relationship between the amount of food (cause) and the amount of bacteria made (effect) to provide evidence that cells need food to grow and make more of themselves. 10.B Construct a written argument using cause-and-effect relationships to conclude that the cells that make up multicellular organisms need food to make more cells, as do the cells of unicellular organisms.

Interdisciplinary Connections:

ELA/Literacy -NJSLS

RL.CR.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what a literary text says explicitly as well as inferences drawn from the text.
RI.MF.7.6. Compare and contrast texts to analyze the unique qualities of different mediums, including the integration of information from multiple formats and sources to develop deeper understanding of the concept, topic or subject and resolve conflicting information.
RI.CT.7.8. Analyze and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) how two or more authors writing informational texts about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.

W.IW.7.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

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SL.PE.6.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6* topics, texts, and issues, building on others' ideas and expressing their own clearly.

SL.PI.7.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

Mathematics -NJSLS

6.SP.A.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
7.SP.B.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
8.SP.A.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

Stage 2: Assessment Evidence

Performance Task(s):
-Darwin's Finches Lab

Other Evidence:
Classwork
Personal digital responses (Kahoot, Quizizz, Quizlet, etc.)
Homework
Scientific inquiry analysis
Quizzes
Common Formative Assessments
Tests
Summative Unit Assessments

Stage 3: Learning Plan

Learning Opportunities/Strategies:

- Wacky People Dichotomous Key
- Create a creature
- Invasive Species One Pager
- Students will utilize topic specific vocabulary to support core concepts and further understand the essential question

Teaching Scientific Practices:

- Guide students through appropriate laboratory techniques (safety, accuracy, frequency, data collection, etc.)
- Students will utilize the engineering and design process to ask questions, plan and carry out investigations, refine models, design solutions, construct explanations, and design solutions.

Literacies:

- Use reading strategies to read non-fiction text (preview, question, reflect, highlight, recite, review, utilize text structure, etc.)

Resources:

- Content Vocabulary
- MiniLabs
- Content Practice worksheets
- Math Skills
- Enrichment
- Challenge
- Lesson Quizzes
- Kessler Science
- Labs
- Key Concept Builder activities
- Chapter Tests
- Online Quiz
- Online Standardized Test Practice
- YouTube Videos
- BrainPop Videos
- Flocabulary
- Newsela
- Readworks.org
- Scholastic Science World magazine
- Planet Earth "Caves"
- Edulastic

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- Digital tools - utilize features available on ebooks such as highlighting, bookmarking, linking to more information, etc.
- Digital literacy - Find and evaluate digital sources. Communicate clearly using digital platforms

Questioning - Present guiding leveled questions to students. See differentiation section for specific questions.

Formative assessment response modalities
- Teacher/student question discussion
- Thumbs up/thumbs down
- Rate yourself on understanding on a fist to five scale
- Google Forms
- Digital polling devices (Kahoot, Quizizz, etc.)
- Exit tickets/responses
- Whiteboards

Learning Strategies
- Think, Pair, Share
- Direct instruction
- Jigsaw
- Cooperative groups
- Discussion in class and discussion boards
- Socratic Seminar

Learning Management
- Google Classroom - share information with students, post assignments, collect feedback
- Google Docs & Google Slides - creation and presentation tools
- IXL

LGBT and Disabilities Resources:
- LGBTQ-Inclusive Lesson & Resources by Garden State Equality and Make it Better for Youth
- LGBTQ+ Books

DEI Resources:
- Learning for Justice
- GLSEN Educator Resources
- Supporting LGBTQIA Youth Resource List
- Respect Ability: Fighting Stigmas, Advancing Opportunities
- NJDOE Diversity, Equity & Inclusion Educational Resources
- Diversity Calendar

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Less structure provided for assignments / assessments Heterogeneous grouping Research independently or collaboratively with minimal teacher guidance Laboratory investigations designed and carried out by students	Moderate amount of scaffold on assignments Heterogeneous grouping Laboratory investigations designed by students with teacher assistance and carried out by students	Structured, predictable classroom Graphic organizers/Study guides provided Copy of class notes/presentation provided to student Utilize student's best personal learning modality (auditory, visual, kinesthetic) Heterogeneous grouping Laboratory investigations provided by teacher for students to carry out	not limited to, the following:: Extended time Provide visual aids Repeated directions Differentiate based on proficiency Provide word banks Allow for translators, dictionaries

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Pacing Guide
(90 days)

Course Name	Content/Resources	Standards
UNIT 1:		
Ecosystems Dynamic 7.5 Weeks 1-3 (20 days)	• Welcome, Class expectations, Character Ed • Abiotic, biotic, ecosystems, ecology • Predator/Prey relationships, food webs • 2 days-Quarter 1: Study guides, review, Unit 1 Assessment	**NJSLS for Science** MS-LS2-1 MS-LS2-4 MS-LS2-2 MS-LS2-5 MS-ESS3-3 MS-ETS1-1
UNIT 2:		
Cells & Systems 6.6 Weeks 4-6 (20 days)	• Cells/organelles • Body Systems • 2 days-Quarter 2(MP1, 3): Study guides, review, Unit 2 Assessment	**NJSLS for Science** MS-LS1-1 MS-LS1-2 MS-LS1-3 MS-LS1-8
UNIT 3:		
Genetics 8.5 Weeks 7-9 (20 days)	• Genetics intro, reproduction, mating rituals, inherited vs acquired traits • Genotype/phenotype Punnett Squares • 2 days-Quarter 3: Study guides, review, Unit 3 Assessment	**NJSLS for Science** MS-LS1-5. MS-LS3-1. MS-LS3-2. MS-LS4-5. MS-LS1-2. MS-LS1-4. .
UNIT 4:		
Natural Selection & Common Ancestry 8.6 Weeks 10-1 (20 days)	• Darwin, Adaptations, Common Ancestor • Dichotomous keys and cladograms • 2 days-Quarter 4 (MP2,4): Study guides, review, Unit 4 Assessment	**NJSLS for Science** MS-LS1-4. MS-LS4-1. MS-LS4-2. MS-LS4-3. MS-LS4-4. MS-LS4-6.