SUBJECT: SCIENCE Life Science

BOE APPROVAL:August 2016

Cliffside Park Public Schools

GRADE: 6

Unit 2: Matter and Energy in Organisms and Ecosystems

CONTENT AREA: General Physical Science	GRADES: 6	UNIT: 1 of 7
Pacing: Approx. 25 Days		

Engaging in Argument from Evidence

Analyzing and Interpreting Data

• Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1) Constructing Explanations and Designing Solutions

• Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2) Developing and Using Models

• Develop a model to describe phenomena. (MS-LS2-3)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

• Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)

• 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. (MS-LS2-1)

• Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)

• 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. (MS-LS2-2)

Crosscutting Concepts

Patterns

• Patterns can be used to identify cause and effect relationships. (MS-LS2-2)

Cause and Effect

• Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)

Energy and Matter

• The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3)

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Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

• Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3)

	LS2.B: Cycle of Matter and Energy Transfer in Ecosystems **• Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)** **LS2.A: Interdependent Relationships in Ecosystems** **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.**	**Patterns** **Patterns can be used to identify cause and effect relationships.**
Performance Expectations: MS-LS2-1, MS-LS2-2, and MS-LS2-3.		
Evidence Statement(s): MS-LS2-1, MS-LS2-2, and MS-LS2-3.		
Essential Question: How and why do organisms interact with their environment and what are the effects of these interactions?		

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21st Century Skills: 8.1.8.A.1, 8.1.8.A.2, 8.1.8.A.3, 8.1.8.A.4, 8.1.8.A.5, 8.1.8.D.4, 8.1.8.D.5, 8.1.8.E.1, 8.1.8.F.1, 8.2.8.A.2, 8.2.8.A.3, 8.2.8.B.1, 8.2.8.D.1
Career Ready Practices: CRP2, CRP4, CRP5, CRP6, CRP7, CRP8 ,CRP11,CRP12

Technical Terms (Suggested)	Core Instructional Materials	Assessment Statement
The terms are located in the corresponding chapter of the students text. All terms will be addressed before the beginning of the unit. ** All terms should be taught in context rather than in isolation. These terms should be addressed after conceptual understanding.**	MS-LS2-1 - Chromebook, internet access, smartboard, notebook, pen, pencil, whiteboard. MS-LS2-2- Computer, Internet access, smartboard, notebook, pen, pencil, whiteboard. MS-LS2-3- Computer, Internet access, smartboard, notebook, pen, pencil, whiteboard.	Students who understand the concepts are able to: • Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. • Use cause-and-effect relationships to predict the effect of resource availability on organisms and populations in natural systems. Students who understand the concepts are able to: • Construct an explanation about interactions within ecosystems. • Include qualitative or quantitative relationships between variables as part of explanations about interactions within ecosystems. • Make predictions about the impact within and across ecosystems of competitive, predatory, or mutually beneficial relationships as abiotic (e.g., floods, habitat loss) or biotic (e.g., predation) components change. Students who understand the concepts are able to: • Develop a model to describe the cycling of matter among living and nonliving parts of an ecosystem.

		• Develop a model to describe the flow of energy among living and nonliving parts of ecosystem. Track the transfer of energy as energy flows through an ecosystem. • Observe and measure patterns of objects and events in ecosystems.

Modifications

English Language Learners	Special Education	At Risk	Gifted & Talented
Scaffolding	Word walls	Teacher tutoring	Curriculum compacting
Word walls	Visual aides	Peer tutoring	Challenge assignments
Sentence/paragraph frames	Graphic organizers	Study guides	Enrichment activities
Bilingual dictionaries/translation	Multimedia	Graphic organizers	Tiered activities
Think alouds	Leveled readers	Extended time	Independent research/inquiry
Read alouds	Assistive technology	Parent communication	Collaborative teamwork
Highlight key vocabulary	Notes/summaries	Modified assignments	Higher level questioning
Annotation guides	Extended time	Counseling	Critical/Analytical thinking tasks
Think-pair-share	Answer masking		Self-directed activities
Visual aides	Answer eliminator		
Modeling	Highlighter		
Cognates	Color contrast		

5E Model	
Performance Expectation: MS-LS2-1	
Engage: Anticipatory Set	http://www.ck12.org/ngss/middle-school-life-sciences/ecosystems:-interactions,-energy,-and-dynamics Open Limiting Factors to Population Growth Tab Click Video: Populations' Biotic Potential
Exploration: Student Inquiry	Rat Attack- Interactive Population Activity In this lesson, students will - understand that an ecosystem encompasses both biotic (organisms) and abiotic components (such as light, nutrients, and moisture).

	- describe the interactions among the components of one forest ecosystem. - predict how a forest ecosystem might change when a resource pulse occurs. http://www.pbs.org/wgbh/nova/education/activities/3603_rats.html Exploring Resource Availability and Population Size In this lesson, students will analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. http://betterlesson.com/lesson/639457/exploring-resource-availability-and-population-size
Explanation: Concepts & Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS2.A: Interdependent Relationships in Ecosystems Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. 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. Growth of organisms and population increases are limited by access to resources.
Elaboration: Extension Activity	RiverVenture: Population Study Game http://wwAnalyze and interpret data to provide evidence for phenomena.w.riverventure.org/charleston/resources/pdf/population%20study%20game.pdf
Evaluation: Assessment	Assessment Task A: Narrative (Rat Attack Activity) Have the new teams combine organism stories and put together a comprehensive narrative of what happened with the entire forest ecosystem over the two years, including the outcome of each organism at the end of each year. Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Assessment Task B: Collaborative Group Discussion Questions (Exploring Resources Activity) Student responses will indicate their ability to analyze and interpret given data.

	Assessment Task C: Exit Slips (Exploring Resources Activity) Students will complete an Exit Slip which requires them to construct a scientific explanation addressing the relationship between resource availability and population dynamics.

5E Model	
Performance Expectation: MS-LS2-2	
Engage: Anticipatory Set	Videos: http://www.ck12.org/ngss/middle-school-life-sciences/ecosystems:-interactions,-energy,-and-dynamics Competition, Predation, and Symbiosis (separate videos as part of explanation) Symbiosis: A Surprising Tale of Species Cooperation
Exploration: Student Inquiry	In groups, students will create a digital presentation (PPT, Google Slides etc.) for an assigned biome. Each student will be responsible to contributing to the presentation by creating at least one slide on one of the following factors of their biome: abiotic and biotic factors, food chain and web, land features, organisms, cycles, etc. The following websites can be used for student research: http://kids.nceas.ucsb.edu/biomes/ http://www.blueplanetbiomes.org/world_biomes.htm http://earthobservatory.nasa.gov/Experiments/Biome/ The following are short video clips: http://www.pbslearningmedia.org/resource/tdc02.sci.life.eco.arctic/arctic-tundra/ http://www.pbslearningmedia.org/resource/tdc02.sci.life.eco.desert/desert-biome/ http://www.pbslearningmedia.org/resource/tdc02.sci.life.oate.rainforest/amazon-rainforest/ Following the group presentations, guide students in predicting the patterns on interaction that were presented in each biome by asking the following questions: 1. What competitive interactions did you see?

	2. What predatory interactions did you see? 3. What symbiotic interactions did you see? 4. Which interactions were mutually beneficial to more than one organism?
Explanation: Concepts & Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS2.A: Interdependent Relationships in Ecosystems 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.
Elaboration: Extension Activity	Related Activities: http://www.ck12.org/search/?q=MS-LS2-1&referrer=student_landing&autoComplete=false
Evaluation: Assessment	Assessment Task A: Group Presentation Response Questions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.

5E Model	
Performance Expectation: MS-LS2-3	
Engage: Anticipatory Set	Video and Activities http://betterlesson.com/lesson/639248/biotic-and-abiotic-factors

Exploration: Student Inquiry	Carbon Cycle Role Play https://www.calacademy.org/educators/lesson-plans/carbon-cycle-role-play Role Play Cards: http://www.calacademy.org:8080/sites/default/files/assets/docs/pdf/048s1_carboncycledemocards.pdf Lesson Plan: http://www.calacademy.org:8080/sites/default/files/assets/docs/pdf/048_carboncycleroleplayredesign10nov2014mks.pdf
Explanation: Concepts & Practices	In these lessons: Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices. Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS2.B: Cycle of Matter and Energy Transfer in Ecosystems Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.
Elaboration: Extension Activity	Meadowlands Environmental Center http://mec.rst2.edu/environment/
Evaluation: Assessment	Assessment Task A: Discussion- Human Impacts on the Carbon Cycle (Part of Carbon Cycle Role Play lesson plan) Lead a class discussion to assess student understanding of human impact on the carbon cycle. Assessment Task B: Carbon Cycle Poster https://www.calacademy.org/educators/lesson-plans/carbon-cycle-poster

	Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

How and why do organisms interact with their environment and what are the effects of these interactions?

Students analyze and interpret data, develop models, construct arguments, and demonstrate a deeper understanding of the cycling of matter, the flow of energy, and resources in ecosystems. They are able to study patterns of interactions among organisms within an ecosystem. They consider biotic and abiotic factors in an ecosystem and the effects these factors have on populations. They also understand that the limits of resources influence the growth of organisms and populations, which may result in competition for those limited resources. The crosscutting concepts of matter and energy, systems and system models, patterns, and cause and effect provide a framework for understanding the disciplinary core ideas. Students demonstrate grade-appropriate proficiency in analyzing and interpret data, developing models, and constructing arguments. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on MS-LS2-1, MS-LS2-2, and MS-LS2-3.

#	STUDENT LEARNING OBJECTIVES	CORRESPONDING PEs and DCIs
1	**Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.] (MS-LS2-1)**	LS2-1
2	**Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.] (MS-LS2-2)**	LS2-2
3	**Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and**	LS2-3

	out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.] (MS-LS2-3)	

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

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

Analyze and interpret data to provide evidence for phenomena.

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

LS2.A: Interdependent Relationships in Ecosystems

Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.

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.

Growth of organisms and population increases are limited by access to resources.

LS2.A: Interdependent Relationships in Ecosystems

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

Cause and Effect

Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Patterns

Patterns can be used to identify cause and effect relationships.

Energy and Matter

The transfer of energy can be tracked as energy flows through a natural system.

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. **Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop a model to describe phenomena.	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. **LS2.B: Cycle of Matter and Energy Transfer in Ecosystems** Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.	**Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation.**

Connections to other DCIs in this grade-band: MS.LS1.B
Articulation of DCIs across grade-bands: 1.LS1.B ; HS.LS2.A ; HS.LS2.B ; HS.LS2.D

Common Core State Standards Connections:

ELA/Literacy -

Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-1),(MS-LS2-2) RST.6-8.1 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS2-1) RST.6-8.7 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-LS2-2) WHST.6-8.2 Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2) WHST.6-8.9 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. (MS-LS2-2) SL.8.1 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MSLS2-2) SL.8.4 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS2-3) SL.8.5

Mathematics -

Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (MS-LS2-3) 6.EE.C.9 Summarize numerical data sets in relation to their context. (MS-LS2-2) 6.SP.B.5