Rigorous Curriculum Design

Unit Planning Organizer

Subject:	Science			Grade:	7th
Unit Number:	4	Unit Name:	Ecosystem Interactions, Energy, and Dynamics		
Unit Length	Days: 6 Weeks (5+1 Buffer)		Mins/Day: 55		
Unit Synopsis	-Ecosystem -Populations (affect) -Biodiversity -Construct an argument with evidence to support -Evaluate design solutions				

	NGSS	Science and Engineering Practice(s)
Priority Performance Expectations	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 [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-LS2-2. 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 LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.] MS LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services. [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]	**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. (MS-LS2-1) **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. ▪ Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2) **Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds on K– 5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). ▪ Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS2-4) ▪ Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2- 5)

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)

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

- 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. (MS-LS2-4)
- 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. (MS-LS2-5)

LS4.D: Biodiversity and Humans

- 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. (secondary to MS-LS2-5)

ETS1.B: Developing Possible Solutions

- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary to MS-LS2-5)

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) **Stability and Change** ▪ Small changes in one part of a system might cause large changes in another part. (MS- LS2-4),(MS-LS2-5)	

Supporting Performance Expectations	NGSS	Math CCSS	Literacy CCSS
	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. **MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. **MS-ETS1-3.** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. **MS-ETS1-4.** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS2-2) MP.4 Model with mathematics. (MS-LS2-5) 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-LS2-5)	RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-LS2-1),(MS-LS2-2),(MS-LS2-4) RST.6-8.7 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.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. (MS-LS2-5) RI.8.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims. (MS-LS-4),(MS-LS2-5) WHST.6-8.1 Write arguments to support claims with clear reasons and relevant evidence. (MS-LS2-4) WHST.6-8.2 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.6-8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (MS-LS2-2),(MS-LS2-4) SL.6-8.1 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.6-8.4 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. (MS-LS2-2)

Interdisciplinary Connections	NG ELD Standards	Literacy / Science / History / Other
	Collaborative 3- Offering and justifying opinions, negotiating with and persuading others in communicative exchanges. Interpretive 6- Reading closely literary and informational texts and viewing	

	multimedia to determine how meaning is conveyed explicitly and implicitly through language. Productive 11- Justifying own arguments and evaluating others' arguments in writing. (Teacher tip: teacher should model respectful project discussions)	

Unwrapped Priority Performance Expectations

PE:MS-LS2-1	Analyze and interpret data to provide evidence of resource availability in an ecosystem.			
Skills	Concepts	Bloom's	DOK (Rigor Matrix)	Language Demand
Analyze and interpret	Data to provide evidence of resource availability in an ecosystem.	Analyze	3	

PE:MS-LS2-2	Construct an explanation to predict patterns of interactions among organisms			
Skills	Concepts	Bloom's	DOK (Rigor Matrix)	Language Demand
Construct	An explanation	Create	4	
To predict	Patterns of interactions among organisms.	Create	4	

PE:MS-LS2-4	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations			
Skills	Concepts	Bloom's	DOK (Rigor Matrix)	Language Demand
Construct	An argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations	Create	4	

PE:MS-LS2-5	Evaluate competing design solutions for maintaining biodiversity and ecosystem services			
Skills	Concepts	Bloom's	DOK (Rigor Matrix)	Language Demand
Evaluate	Competing design solutions for maintaining biodiversity and ecosystem services	Analyze	4	

Learning Progressions of Skills and Concepts

PE: DCI(s):		
Previous Course_____	Current Course	Next Course_____
5.LS2.A – Relationships in food webs	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	HS.LS2.A – Environemental carrying capacity HS.LS4.C – Adaptation HS.LS4.D – Biodiversity and Humans

		HS.ESS3.A – Natural resources

PE:		
DCI(s):		
Previous Course_____	Current Course	Next Course_____
NA	MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	HS.LS2.A – Environemental carrying capacity HS.LS2.B – Matter and energy transfer HS.LS2.D – Group behavior to increase survival

PE:		
DCI(s):		
Previous Course_____	Current Course	Next Course_____
NA	MS LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	HS.LS2.C – Ecosystem dynamics HS.LS4.C – Adaptation HS.LS4.D – Biodiversity and Humans HS.ESS2.E – Biogeology HS.ESS3.B – Natural Hazards HS.ESS3.C – Human impacts on Earth systems

PE:		
DCI(s):		
Previous Course_____	Current Course	Next Course_____
NA	MS LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	HS.LS2.A – Environemental carrying capacity HS.LS2.C – Ecosystem dynamics HS.LS4.D – Biodiversity and Humans HS.ESS3.A – Natural resources HS.ESS3.C – Human impacts on Earth systems

PE:		
DCI(s):		
Previous Course_____	Current Course	Next Course_____

PE: DCI(s):		
Previous Course_____	Current Course	Next Course_____

21st Century Skills

Big Idea(s)	Corresponding Essential Question(s)
1. Competition for resources affects organism population. 2. Organisms interact across multiple ecosystems. 3. Changes to physical or biological components of an ecosystem affect populations. 4. Design solutions aid in maintaining biodiversity.	1. How does competition affect populations? 2. How do ecosystems interact? 3. What affects the survival of a population? 4. How can we maintain biodiversity (Ex: What are some ways we can protect the environment?)

Unit Vocabulary Words	
Academic Cross-Curricular Vocabulary (Tier 2)	Content/Domain Specific Vocabulary (Tier 3)
Abundant Scant Resources Relationships Interactions	Populations Ecosystems Empirical Evidence Organisms Abiotic/Biotic Competitive/Predatory/mutually beneficial interactions Biodiversity Ecosystem services (water purification, nutrient recycling, soil erosion prevention)
Supporting Vocabulary (Tier 2)	Supporting Vocabulary (Tier 3)

Resources for Vocabulary Development (Strategies, Routines and Activities)

- Instagram vocab activity
- Vocabulary Matchbooks/Frayer model/Looping
- Vocabulary Flashcards
- Vocabulary Flipbook/Foldable
- Vocabulary around the World
- Vocabulary Snowball Fight
- Vocabulary Examples/non-examples
- Vocabulary Matrix
- Vocabulary Web
- Vocabulary Focus Word Wall
- Mnemonics

☐ Creativity and Innovation	☐ Initiative and Self-Direction
☐ Critical Thinking and Problem Solving	☐ Social and Cross-Cultural Skills
☐ Communication and Collaboration	☐ Productivity and Accountability
☐ Flexibility and Adaptability	☐ Leadership and Responsibility
☐ Globally and Financially Literate	☐ _____
☐ Communicating and Collaborating	☐ _____

Connections between 21st Century Skills, NGSS, and Unit Overview:

Costa & Kallick, 2008

<table>
<tr><th colspan="4">Unit Assessments</th></tr>
<tr><th colspan="2">Pre-Assessment</th><th colspan="2">Post-Assessment</th></tr>
<tr><td colspan="2">Please see www.alvordschools.org/cfa for the most current EADMS CFA ID numbers.</td><td colspan="2">Please see www.alvordschools.org/cfa for the most current EADMS CFA ID numbers.</td></tr>
<tr><th colspan="4">Scoring Guides and Answer Keys</th></tr>
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<tr><th colspan="4">Assessment Differentiation</th></tr>
<tr><td rowspan="2">Students with Disabilities</td><td rowspan="2">Accommodations
Reference IEP to ensure appropriate testing environment

Modifications</td><td rowspan="2">English Language Learners</td><td>Emerging</td></tr>
<tr><td>Expanding</td></tr>
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Engaging Scenario Overview (Situation, challenge, role, audience, product or performance)	
Description:	Suggested Length of Time Days: Mins/Day:

Engaging Learning Experiences Synopsis of Authentic Performance Tasks		
Authentic Performance Tasks	Description	Suggested Length of Time
Task 1: Collect data on the number of animals (abundance) and the number of different species (richness) in schoolyard zones	S (which performance expectations will this address?) Q (what essential questions and corresponding big ideas willt his task target?) U (which unwrapped specific concepts and skills will this task target?) A (how will the students apply the concepts and skills? What will they do and/or produce?) R (what resources, instruction, and information will students need in order to complete the task?) E (what evidence of learning will I look for to show that I know all my students have conceptually learned the concepts and skills – the standards?) D (what types of differentiation will be necessary so that all students can learn)	Days: Mins/Day:
Task 2: Create bar graphs that illustrate patterns in abundance and richness data from each of the schoolyard zones.	S (which performance expectations will this address?) Q (what essential questions and corresponding big ideas willt his task target?) U (which unwrapped specific concepts and skills will this task target?) A (how will the students apply the concepts and skills? What will they do and/or produce?) R (what resources, instruction, and information will students need in order to complete the task?) E (what evidence of learning will I look for to show that I know all my students have conceptually learned the concepts and skills – the standards?) D (what types of differentiation will be necessary so that all students can learn)	Days: Mins/Day:

Task 3: Construct an explanation to support your answer to the question, which zone of the schoolyard has the greatest biodiversity?	S (which performance expectations will this address?) Q (what essential questions and corresponding big ideas willt his task target?) U (which unwrapped specific concepts and skills will this task target?) A (how will the students apply the concepts and skills? What will they do and/or produce?) R (what resources, instruction, and information will students need in order to complete the task?) E (what evidence of learning will I look for to show that I know all my students have conceptually learned the concepts and skills – the standards?) D (what types of differentiation will be necessary so that all students can learn)	Days: Mins/Day:
Task 4: Construct an explanation to support your answer to the question, which zone of the schoolyard has the greatest	S (which performance expectations will this address?) Q (what essential questions and corresponding big ideas willt his task target?) U (which unwrapped specific concepts and skills will this task target?) A (how will the students apply the concepts and skills? What will they do and/or produce?) R (what resources, instruction, and information will students need in order to complete the task?) E (what evidence of learning will I look for to show that I know all my students have conceptually learned the concepts and skills – the standards?) D (what types of differentiation will be necessary so that all students can learn)	Days: Mins/Day:

Authentic Performance Task 1

Name:		Suggested Length	Days: Mins/Day:
	Priority Standards		
Performance Expectations / Standards Addressed	NGSS	Science and Engineering Practice(s)	
		Disciplinary Core Idea(s)	

Teaching and Learning Progression			Crosscutting Concept(s)	
	Supporting Standards			
	NGSS	CCSS Math	CCSS Literacy	NG ELD
			Bloom's	DOK
			Scoring Rubric	

Instructional Strategies			
All Students	SWD	ELs	Enrichment
	Accommodations	Emerging	
		Expanding	
	Modifications		
		Bridging	

Authentic Performance Task 2

Name:		Suggested Length	Days: Mins/Day:

Performance Expectations / Standards Addressed	Priority Standards	
	NGSS	Science and Engineering Practice(s)
		Disciplinary Core Idea(s)
		Crosscutting Concept(s)

	Supporting Standards			
	NGSS	CCSS Math	CCSS Literacy	NG ELD

Teaching and Learning Progression		Bloom's	DOK
		Scoring Rubric	

Instructional Strategies			
All Students	SWD	ELs	Enrichment
	Accommodations	Emerging	
	Modifications	Expanding	
		Bridging	

Authentic Performance Task 3

Name:		Suggested Length	Days: Mins/Day:

Performance Expectations / Standards Addressed	Priority Standards	
	NGSS	Science and Engineering Practice(s)
		Disciplinary Core Idea(s)
		Crosscutting Concept(s)
	Supporting Standards	
	NGSS / CCSS Math / CCSS Literacy / NG ELD	

Teaching and Learning Progression			Bloom's	DOK
			Scoring Rubric	

Instructional Strategies			
All Students	SWD	ELs	Enrichment
	Accommodations	Emerging	
		Expanding	
	Modifications		
		Bridging	

Authentic Performance Task 4

Name:			Suggested Length	Days: Mins/Day:

Performance Expectations / Standards Addressed	Priority Standards			
	NGSS		Science and Engineering Practice(s)	
			Disciplinary Core Idea(s)	
			Crosscutting Concept(s)	
	Supporting Standards			
	NGSS	CCSS Math	CCSS Literacy	NG ELD
Teaching and Learning Progression			Bloom's	DOK

			Scoring Rubric

Instructional Strategies			
All Students	SWD	ELs	Enrichment
	Accommodations	Emerging	
		Expanding	
	Modifications		
		Bridging	

Engaging Scenario

Detailed Description (situation, challenge, role, audience, product or performance)

Instructional Strategies			
All Students	SWD	ELs	Enrichment
	Accommodations	Emerging	
		Expanding	
	Modifications		
		Bridging	

Scoring Guide:

Feedback to Curriculum Team Reflect on the teaching and learning process within this unit of study. What were some successes and challenges that might be helpful when refining this unit of study?		
	Successes	Challenges
Student Perspective		
Teacher Perspective		