

Southern Cayuga Central School District – Curriculum Map

Subject: LIVING ENVIRONMENT

School Year: 2022-2023

Teacher: Michele Shaw

<https://www.drcrean.com/storylines>

3-Dimensional Learning Phenomenon - Driven Storyline

SEP 1: Asking questions & defining problems

SEP 2: Developing & using models

SEP 3: Planning & carrying out investigations

SEP 4: Analyzing & interpreting data

SEP 5: Using mathematics & computational thinking

SEP 6: Constructing explanations & designing solutions

SEP 7: Engaging in argument from evidence

SEP 8: Obtaining, evaluating, & communicating information

CCC P:

CCC C&E:

CCC SP&Q:

CCC S&SM:

CCC E&M:

CCC S&F:

CCC S&C:

Patterns

Cause & Effect

Scale, Proportion, & Quantity

Systems & System Models

Energy & Matter

Structure & Function

Stability & Change

African Storyline - How do organisms get what they need to live and survive?

Title or Topics	Driving Question Board (Anchoring Phenomenon)	Performance Expectations LSX-X	Science and Engineering Practices SEPs	Cross Cutting Concepts CCCs	Goals	Time Frame	Assessments (Tests, Projects, etc.)
<p>African Storyline Unit</p> <p>How do Organisms get what they need to survive?</p>	<p><i>Why were the lions living in a group?</i></p>	<p>LS2-8</p>	<p>SEP 1: Asking questions & defining problems</p> <p>SEP 2: Developing & using models</p>	<p>CCC C&E: Cause & Effect</p>	<p>Highlight any questions that address group behavior.</p> <p>Highlight items on the Venn diagram that address group behavior.</p>	<p>Day 1 & 2</p>	<p>Formative Assessment: Check to ensure that “living in groups” is an item shared between lions and water buffalo</p>

Life as a Hunter Activity	<i>Why were the lions living in a group?</i>	LS2-8	SEP 3: Planning & carrying out investigations	CCC SP&Q: Scale, Property & Quantity	Allow students to explain the energy benefits of hunting in groups.	Day 3/4	Formative Assessment: The performance assessment is embedded at the end of Part I where students use their kcal cash to illustrate cooperative hunting. At the end of Part II, groups should have decided on the best prey choice(s) based on their cost-benefit analysis.
Lulu the lioness lab	<i>Why do lions live in groups?</i>	LS2-8 LS3-2	SEP 4: Analyzing & interpreting data	CCC S&SM: Systems & System Models	Students should be able to explain that lions also live in groups to protect their collective offspring and, thus, their shared alleles.	Day 5/6/7	Formative Assessment: Students should determine that there are multiple mothers and fathers who have contributed to the alleles in their cubs, but many share these alleles as well.
Mapping Lion Populations	<i>How do we know which lions are related to each other?</i>	LS2-8 LS4-2	SEP 8:	CCC C&E and S & P:	Students should be able to explain the relationships between lion populations using the data	Day 8/9	Students should be able to determine that the closer geographically, the more closely they are related, aside from Sabi Sands who were translocated from another area of Africa.

					sets provided and generated.		
Lion pride research	<i>How is life similar or different among the different lion populations?</i>	LS2-1	SEP 6: Constructing explanations & designing solutions	CCC SP & Q:	<p>Students will use the information they research to make a food web to show connections between lions and other species.</p> <p>Students will use the information they research to better understand the abiotic factors that affect lions and other species</p> <p>Students should be able to apply these ideas to a new context (species).</p>	Day 10/11	Formative Assessment: Students should identify similarities and differences among the prides to better understand the lion's niche, regardless of its environment.

					All organisms need energy from the food they consume.		
How is energy used in organisms ?	<i>How do different organisms obtain their energy?</i>	LS1-2 LS1-7	SEP 4:	CCC E & M: Energy & Matter		Day 12	Formative Assessment: Through the proposed line of questioning above, students should understand that energy is acquired through the breakdown of foods.
Animal nutrition Lab Hide-n-go Ceca Lab	<i>How do animals obtain their energy?</i>	LS1-7	SEP 4:	CCC S&F/E&M:	Students should get measurements into MS Excel spreadsheet/Google Sheet, produce graph and print before period ends so all students have the group's data to answer questions.	Day 13	Formative Assessment: Students should identify similarities and differences through the use of patterns between the species analyzed.
Complete the Animal Nutrition	<i>How do animals obtain</i>	LS1-1 LS1-2 LS1-3	SEP 4:	CCC S&F/E&M		Day 14/15/16	Formative Assessment: The final lab assessment should be administered though students may use their

lab	<i>their energy?</i>						materials since they are having to adapt their thinking to new contexts.
Macromolecules: What are the building blocks of life?	<i>What is the primary source of energy for lions?</i>	LS1-6	SEP 6:	CCC E&M Energy & Matter		Day 17	Formative Assessment: The final page of this activity allows students to make their learning visible and highlight the big ideas around how larger molecules are broken and reassembled into other useful molecules.
Lion vs. elephant digestion lab	<i>How do carnivores differ from herbivores?</i>	LS1-6 LS1-7	SEP 4/6:	CCC E&M Energy & Matter		Day 18/19	Formative Assessment: Students should recognize that nitrogen is required to make elephant proteins and that some diets provide more net Kcal than others.
Creating Chains and Webs	<i>Do lions only eat zebras?</i>	LS2-4	SEP 5:	CCC E&M Energy & Matter	Students should be able to use information in order to create a complete food web	Day 20	Formative Assessment: Having students take pictures of their completed webs and/or have other groups peer review will ensure their ability to create a food web is satisfactory.
Food Webs activity	<i>How do human impacts impact</i>	LS2-4 LS2-7	SEP 5:	CCC S&C/E&M:	Students should be able to model relationships between	Day 21	Formative Assessment: Students should be able to explain the impacts on the interdependent relationships between organisms on

	<i>food webs?</i>				species and explain the impacts on these relationships when disturbances occur.		their webs when a disturbance is introduced.
Limiting factors on populations	<i>Can populations of organisms grow without limits?</i>	LS2-1 LS2-2	SEP 4:	CCC S&C:	Students should be able to explain the factors that impact elephant populations and where they live.	Day 22	Formative Assessment: Students should be able to correlate water sources with where elephants live and identify water as an abiotic factor.
Tusklessness	<i>What factors impact elephant populations?</i>	LS2-7	SEP 4/5/6:	CCC S&C:	Students should be able to interpret and analyze the data provided to determine the selective pressure on these elephant populations.	Day 23/24	Formative Assessment: Students should be able to explain how humans are driving selection of tuskless elephants.

CSI Wildlife	<i>What threats do elephants face?</i>	<i>LS2-2/ 2-7/3- 3/4-1/ 4-6</i>	<i>SEP4/5/6</i>	CCC S&C:	<p>Students should be able to identify the human impact problem and explain why they are using genetic data.</p> <p>Students should be able to analyze patterns in the data to use them for identification.</p>	Day 25/26	Formative Assessment: There is a recommended CSI: Wildlife Part II assessment that can be done instead of the entire activity.
Elephant Value Lab	<i>Why are elephants important ?</i>	<i>LS2-6/ 2-7</i>	SEP 5	CCC S&C:	<p>Students should be able to explain why elephants are valued for different reasons.</p> <p>Students should be able to evaluate different solutions to human impact</p>	Day 27/28	Formative Assessment: The CER activity that is the final part of the activity can be a helpful tool in assessing their use of evidence to support their claim.

					problems in how they affect elephants.		
Elephant Population Census	<i>Where do elephants live?</i>	<i>LS2-2/2-6</i>	SEP 7	<i>S&C/SP&Q</i>	Students should be able to identify patterns in the geographic and population data. Students should be able to explain why sampling is important when collecting data.	Day 29/30	Formative Assessment: The final question (Q8) on the final page is a possible formative that incorporates previously learned concepts and applies them to this new context.
Niche Partitioning	<i>Do similar organisms eat the same things?</i>	<i>LS4-2</i>	SEP 4	<i>CCC C & E:</i>	Students should be able to explain how occupying different niches limits competition between species.	Day 31	Formative Assessment: The final question (Q10) is a helpful formative question that will help lead students into the next segments of this storyline.
It's in the Poop Lab	<i>What do elephants</i>	<i>LS 2-3</i>	SEP 3	<i>CCC E & M</i>	Students should be able to explain how	Day 32 - 34	

	<i>do for plants?</i>				and why they are testing a variable in this context.		
Plant Growth Lab (Mitosis Lab)	<i>What do plants need to survive?</i>	<i>LS 1-4</i>	SEP 2	<i>CCC S & SM</i>	<p>Students should be able to distinguish cells that are dividing versus those not dividing.</p> <p>Students should be able to explain why certain tissues are dividing more than others.</p>	Lesson 33	Formative Assessment: The last few questions of the Mitosis Lab are helpful to ascertain if they have successfully adapted their understanding to this context.
Seed Lab	<i>What do plants need to survive?</i>	<i>LS 1-4</i>	SEP 2	<i>CCC S & SM</i>	Students should be able to explain why light is important for plant survival.	Lesson 35	Formative Assessment: The last few items ask students to identify evidence and explain reasoning which are helpful tools to assess student understanding.
Characteristics of	<i>Are seeds alive?</i>				Students should be able	Lesson 36	Formative Assessment: Being sure students have all three (3) organisms

Life (Nitrogen Cycle) May be skipped if time is short					to compare and contrast lions, elephants, and plants and identify that they share all characteristics of life.		checked for each criterion they have listed will illustrate their understanding that seeds are just as alive as other organisms.
Plant Diversity (May be skipped if time is short)	<i>How have African plants adapted to the savanna?</i>	LS2-3/ 2-5	SEP5/6	CCC S & SM	Students should be able to identify modifications to plant structures that enhance survival.	Lesson 37	
A Plant's Raw Materials (Data Points)	<i>What do plants need to survive?</i>	LS2-3/ 2-5	SEP5/6	CCC S & SM	Students should be able to analyze various factors and how they impact plant productivity.	Lesson 38	Formative Assessment: Questions 6 and 7 on page 2 are particularly helpful in determining whether students understand the big ideas inherent to this activity.
Energy Pyramids: Tying it all together	<i>How do organisms obtain their energy?</i>	LS2-3/ 2-5	SEP5/6	CCCS&SM	Students should be able to explain how energy is transferred	Lesson 39	Formative Assessment: The final page is composed of questions that are effective in assessing students' ability to make connections between previously learned concepts.

					from one level to the next.		
Cellular Respiration (Data Points)	<i>How do organisms obtain their energy?</i>	<i>LS2-3/2-4</i>	SEP 4	<i>CCC S & SM</i>	Students should be able to explain the factors that affect cell respiration.	Lesson 40	Formative Assessment: The first two (2) pages act as a tie-together for the various data sets so may act as a suitable assessment.
Week 1-9	<i>Application</i>					~ 3 days	Summative Assessment involving a new storyline and applying what they had done in class to the new storyline.

Homeostasis Storyline - Where have all the otters gone?

Title or Topics	Driving Question Board (Anchoring Phenomenon)	Performance Expectations LSX-X	Science and Engineering Practices SEPs	Cross Cutting Concepts CCCs	Goals	Time Frame	Assessments (Tests, Projects, etc.)
Anchoring Phenomenon		<i>LS4-5/2-6</i>	<i>SEP1</i>	<i>CCC-P</i>	Highlight any questions that address the concept of keystone species and/or regulation in systems.	Lesson 1	
	Energy Flow and Feeding Relationships in the Pacific Northwest	<i>LS2-1/2-2</i>	<i>SEP2/3/4,</i>	<i>CCC-P/S&SM/E &M</i>	Determine which species in the Northwest Pacific ecosystem is the keystone species and begin to explore what factors limit the size of	Lesson 2 & 3	FORMAT IVE ASSESSMENT: The modeling activities (food web construction and keystone

					populations in those ecosystems.		e model) may act as the formative performance assessments, allowing for student revisions and mastery.
	What limits populations	<i>LS2-1/2-2</i>	<i>SEP6/8</i>	<i>CCC-C&E/S&S M</i>	Students should determine how both abiotic and biotic factors can affect the community.	Lessons 4 & 5	FORMATIVE ASSESSMENT : Each student in a group should be able to identify how the environmental factors impact their individual species and others represented in their group.

	What is carrying capacity?	<i>LS2-1/2-2</i>	<i>SEP2/4</i>	<i>CCC-P/S&C</i>	Students should be able to explain what these populations need to look like to maintain ecosystem homeostasis.	Lesson 6 & 7	FORMATIVE ASSESSMENT: They then should work together to show how their own species' population could impact others in their group.
	What will happen to the Urchin population?	<i>LS4-2/4-3/4-4</i>	<i>SEP2/3/4/5</i>	<i>CCC-P/C&E</i>	Students should explain how natural selection impacted a population and how genetic drift can also be observed, even though it was not the selective factor.	Lesson 8	FORMATIVE ASSESSMENT: The data provided by each group helps to ensure students have collected and analyzed their data correctly. Key analysis questions that include how the

							<p>urchin population changed over time as a result of selective pressure and/or genetic drift are ideal formative assessment pieces.</p>
<p>The virtual urchin</p>		<p>LS4-5</p>	<p>SEP2/4/8</p>	<p>CCC-C&E/S&F</p>	<p>Students will better understand how urchins are affected by abiotic factors in their environment based on their anatomy.</p>	<p>Lesson 9 & 10</p>	<p>FORMATIVE ASSESSMENT: Using the digital simulation provided in this interactive, students should be able to determine what the urchin shell is composed of and the connection between carbon dioxide and</p>

							decreasing pH levels through manipulation of this model.
Water testing lab		<i>LS2-2/4-5</i>	<i>SEP3/4/7</i>	<i>CCC-P/C&E</i>	Students should begin to make connections between high CO ₂ levels and low pH levels.	Lesson 11	FORMATIVE ASSESSMENT : Student groups will share their data with the class via the data table projected on the board. Students should be able to make the connection between increased carbon dioxide levels and decreasing pH levels which are negatively impacting the urchins.

<p>What does Kelp need?</p>	<p>What effect(s) does atmospheric CO₂ have on ocean acidification?</p>	<p><i>LS1-5/2-5</i></p>	<p>SEP 4</p>	<p><i>CCC-P/C&E/S&SM</i></p>	<p>Students should determine the needs of kelp as a producer.</p>	<p>Lesson 12</p>	<p>FORMATIVE ASSESSMENT: The CER provided can serve as the formative assessment piece as students will cite evidence from the data provided.</p>
<p>What do urchins need?</p>		<p><i>LS2-5</i></p>	<p>SEP 4/8</p>	<p><i>CCC-P/C&E/S&F</i></p>	<p>Students should be solidifying their understanding of urchin anatomy and the impacts of abiotic factors.</p>	<p>Lesson 13</p>	<p>FORMATIVE ASSESSMENT: Teachers may want to choose the question that asks students what would happen to the ecosystem if</p>

							urchins were removed from the food web. This will help lead them to the next lesson where the needs of otters are addressed.
What do otters need?		LS 2-5	SEP 4/8	<i>CCC-C&E/S&C /S&SM</i>	Students should make connections between the abiotic factors explored and their relationship with otters.	Lesson 14	FORMATIVE ASSESSMENT: Emphasis on the question that asks students to connect the content of the article with what they have figured out in previous lessons will aid in supporting the coherence in further lessons.

<p>What are human impacts on the ecosystem?</p>		<p>LS 4-2</p>	<p>SEP 4/7</p>	<p><i>CCC-P/C&E</i></p>	<p>Students should be making further connections between biotic and abiotic factors as a result of data analysis.</p>	<p>Lesson 15</p>	<p>FORMATIV E ASSESSME NT: Asking students to share the connections they made between the individual data sets through the CER tool will be a great check to be sure they are prepared for the lab investigation that follows this lesson.</p>
<p>Egg Lab: Environmental Impacts on Urchins Days 2-3:</p>		<p><i>LS1-3/4-6</i></p>	<p><i>SEP2/3</i></p>	<p><i>CCC-C&E/S&S M/S&F</i></p>	<p>Students should make connections among data to explain how human</p>	<p>Lesson 16-18</p>	<p>FORMATI VE ASSESSM ENT: Students should</p>

					activities are impacting the ecosystem and its organisms.		be able to explain what occurred to dissolve the egg shell as well as explain the movement of water and coloring in and out of the egg.
How do nutrients cycle in the ecosystem?		<i>LS2-4/2-5</i>	<i>SEP4/7/8</i>	<i>CCC-E&M</i>	Students will review the cycling of matter in aquatic ecosystems and compare it to what they have previously learned about cycling in terrestrial ecosystems.	Lesson 19-20	FORMATIVE ASSESSMENT : Students should be connecting what they did in previous lessons that dealt with the needs of different organisms in

							the food chain with these cycles and the impacts that some of the elements in these cycles have on those same organisms.
Human Dive Response Lab/Activities		LS1-3/2-3	SEP2/3	CCC-P/C&E/S&F	Students will construct knowledge based on accumulation of data over this series of activities regarding oxygen needs and the functioning of cellular	Lesson 21-25	FORMATIVE ASSESSMENT: Students should be able to explain how organisms exchange gasses with the environment and how they transport these gasses for key processes like that of photosynthesis and cell respiration.

					respirati on.		Students may also be asked to explain how different organisms have adapted to these different environments.
How do molecules get to the cells?		<i>LS1-2/1-3</i>	<i>SEP2/4/8</i>	<i>CCC-P/E&M/S &SM/S&F</i>	Students should be able to develop and use models to illustrate how the inputs of outputs of cell respiration and photosynthesis make their way to and from cells.	Lesson 25-30	FORMATIVE ASSESSMENT: Students should be making connections in the models provided to illustrate how different organisms transport the raw materials needed to perform photosynthesis and cell respiration.
Final Assessment						3 Day	

Melanin Storyline - What causes albanism?

Title or Topics	Driving Question Board (Anchoring Phenomenon)	Performance Expectations LSX-X	Science and Engineering Practices SEPs	Cross Cutting Concepts CCCs	Goals	Time Frame	Assessments (Tests, Projects, etc.)
	<i>How do traits vary among individuals?</i>	<i>LS3-1</i>	SEP 1	C & E	Ask questions that arise from observations that seek additional information for what caused albinism in the children.	Day 1	
Pedigree investigation	How does albinism happen? Do children get it from their parents?	<i>LS3-2,3</i>	SEP 1	<i>C&E,P</i>	Using the (pedigree) model created, students should analyze data to look for patterns	Lesson 2	Formative assessment: The reasoning students write should contain specific

					in how albinism is passed from generation to generation.		evidence that explains that parents with normal pigmentation can have albino children.
Helena's Story (or Hidaya's Story)	How does albinism happen? Do children get it from their parents?	LS3-2/3	SEP 1	C&E,P	Using the (pedigree) model created, students should analyze data and complete Punnett squares as evidence to determine how albinism is passed from generation to generation.	Lesson 3	Formative Assessment: Students will use a pedigree to complete the Punnett Squares for Hidaya's family.

<p>Karyotype & Gene Map Activities</p>	<p>How is albinism passed down from parents? How does each parent pass traits down to their children? How can children from the same parents be so different?</p>	<p><i>LS3-2/3</i></p>	<p>SEP 1</p>	<p><i>C&E,P</i></p>	<p>Students will look at patterns and analyze data in order to determine if looking at a karyotype will offer enough information to determine how albinism occurs.</p>	<p>Lesson 4</p>	<p>Formative Assessment: Students will complete a CER to demonstrate their understanding of karyotypes and that a karyotype can't tell us how albinism is inherited.</p>
<p>How does genotype affect phenotype?</p> <p>Lab Transcription/ Translation</p>	<p>How is albinism passed down from parents?</p>	<p><i>LS3-1</i></p>	<p>SEP 1</p>	<p><i>C&E,P</i></p>	<p>Students should analyze the data to describe the cause of the different types of mutations in DNA sequence that may or may not cause the effect of a change in phenotype (different forms of albino) through</p>	<p>Lesson 5</p>	<p>Formative Assessment: Students will complete a CER to justify their claim albinism is caused by a mutation in the DNA.</p>

					changes in proteins.		
Protein Modeling Modeling Activity: Protein Folding		<i>LS1-1</i>	SEP 2	<i>C&E,P</i>	Students should create models in order to see patterns in how different mutations affect protein structure and produce varied phenotypes.	Lesson 6	Formative Assessment: Check to see that students have modeled their proteins correctly and that the silent mutation hasn't changed the shape from the normal protein. (If students make a small mistake and their altered protein doesn't look exactly as it should, as long as it looks different from the normal version of the protein, the takeaway has been met.)

Mapping Skin Color Activity	Did geography play a role in the evolution of different skin colors?	<i>LS4-5/4-3</i>	SEP 1	<i>C&E,P</i>	Analyze and interpret data in order to make predictions on how and why skin color evolved.	Lesson 7	Formative assessment: Students should explain what they suspect occurred to human skin color over time as a result of the information provided.
Mapping Skin Color	What causes differences in skin color? What is the role of the environment in the evolution of skin color?	<i>LS4-5</i>	SEP 4	P	Students will analyze data to see patterns in where people live and the effect of UV radiation as a selecting factor on skin color.	Lesson 8	FORMATIVE ASSESSMENT: Make sure students correlate people's skin color with the amount of UV radiation they receive.
Evidence for Selection in Human Skin Color	What causes differences in skin color? What is the role of the environment?	<i>LS4-5</i>	SEP 4	P	Students will analyze and interpret data to look for patterns in order to determine how different skin colors	Lesson 9	Formative Assessment: Students should be able to determine that the darkest skin is found closer to the

					are associated with UV light intensity.		equator and at higher elevations, and the lightest skin is found further away from the equator.
The Biology of Skin Color Student Film Quiz		<i>LS4-4/4-5</i>	SEP 1	S & F	Analyzing and interpreting data to look for patterns in order to determine how different skin colors have evolved.	Lesson 10	Formative Assessment: Based on new evidence from the video, students will revise their CER.
How are skin colors inherited?		<i>LS4-3</i>	SEP 4	<i>C&E,P</i>	Analyzing and interpreting data to look for patterns in order to determine the effect of mutations in skin color alleles on skin color and how it can predict one's ancestry .	Lesson 11	Formative Assessment: Students should understand that skin color is determined by many genes and the combinations can lead to many different skin colors. They should also

							understand the role that ancestry plays in determining skin color.
How is melanin adaptive in other species?		<i>LS4-3</i>	SEP 4	<i>C&E,P</i>	Analyzing and interpreting data to look for patterns in order to determine that melanin plays a role in natural selection of fur color in other species as well .	Lesson 12	Formative Assessment: Students' discussions should center around how melanin is also found in other animals and is adaptive.
Why are the rock pocket mouse populations changing?		<i>LS4-3</i>	SEP 1	<i>C & E</i>	Analyzing and interpreting data to look for patterns in order to determine how the amino acid sequence can affect a phenotype Analyzing and interpreting data to look for patterns in	Lesson 13	Formative Assessment: Students will complete a CER to make a claim about how melanin can change and that this becomes a selective advantage depending on the environment.

					order to determine how environmental pressures affect population change.		
How has the population changed?		<i>LS4-3/4-4</i>	SEP 5	<i>SPQ</i>	Analyzing and interpreting data to look for patterns in order to determine how environmental pressures affect population change.	Lesson 15	
Melanin Storyline Review							Concept Map

Disease Storyline - What causes cells to divide uncontrollably?

Title or Topics	Driving Question Board (Anchoring Phenomenon)	Performance Expectations LSX-X	Science and Engineering Practices SEPs	Cross Cutting Concepts CCCs	Goals	Time Frame	Assessments (Tests, Projects, etc.)
	How are cancer cells different from “normal” cells?	LS1-4	SEP 1	C & E	Ask questions that arise from careful observation of the teenaged girl with melanoma to clarify and seek additional information for what causes cancer cells to be different from normal cells.	Lesson 1	Formative assessment: Kids have questions on the questioning form and can make statements backed with evidence describing what is happening in the diagram on the back of the questioning form.
	How are cancer cells different from	LS1-4	SEP 1,4	C&E, P	Analyze data to clarify and seek	Lesson 2	Formative assessment: Suggested: Data Sets

	“normal” cells?				additional information for what causes cancer cells to be different from normal cells.		Activity(last page completed) Cancer Cells and Normal Cells - students should have individual CER & additional questions generated.
	How are cancer cells different from “normal” cells?	LS1.4	SEP 4	C & E	Ask questions that arise from careful observation to clarify and seek additional information for what causes cancer cells to be different from normal cells.	Lesson 3	Formative assessment: Students can answer how normal cells are different from cancer cells.
	How do cells multiply for organism growth or repair in mitosis?	LS1,4	SEP 2	C& E, P	Using paper models, students will explore how cells divide normally, ie.	Lesson 4	Formative assessment: observe each student’s flipbook to make sure it

					the process of mitosis.		makes sense-if necessary give advice on how to reorder the steps before they glue everything down.
	How does a cell know when to divide and when not to divide?	LS1,4	SEP 3	C & E	Students will work with a model of the cell cycle to learn what causes normal cells to be able to regulate the cell cycle.	Lesson 5	Formative assessment: Can students answer the "Ask" question above. Option- pose the question on an exit slip.
	What happens when the cell is not properly regulated during cell division?	LS3-2	SEP 2	C & E	Analyze data about cell cycle regulation and apoptosis to determine what causes cancer cells to be regulated differently than normal cells.	Lesson 6	Formative assessment: Students should be able to answer the questions on the Cell Death and Cancer half sheet.

	Why do cells need to die?	LS 1-4	SEP2,4	C & E, P	Analyze data about the Hayflick limit to learn about what causes normal cells to die and that maintaining a constant cell number is a balance between cell division and cell death.	Lesson 7	Formative assessment: Cell Division and cancer risk
	Where are the instructions that cells use to divide properly?	LS3-1	SEP 2	C & E, SF	Students will model and analyze data to learn about the structure and function of DNA.	Lesson 8	Formative assessment: Observe each student's model to determine if it is correct.
	How do existing cells pass the directions on to new cells?	LS3-1	SEP 2	C & E, SF	Students will model the process of DNA replication to understand how the structure of DNA allows it	Lesson 9	Formative assessment: Check student's models before they are taped down to make sure the model is

					to function so it can make an exact copy for each cell prior to cell division.		correct.
	What happens if there is a mistake in the DNA?	LS3-2	SEP 2	C & E, P	Ask questions about patterns in the variations in the p53 gene that affects whether different species get cancer.	Lesson 10	Formative assessment: Students will do the p53 worksheet to review transcription/translation and the effect of mutations.
	Why are cells dividing more/faster?	LS3-2	SEP 1	C & E, SF	Ask questions that arise from careful observation for what causes HeLa cells to be different from normal cells.	Lesson 11	Formative assessment: Check students' CERs for clarity
	Why don't Henrietta's children have immortal cells?	LS3-2	SEP 2	C & E, SF	Students will model how chromosomes move and separate	Lesson 12	Formative assessment: check the students models as

					during meiosis to be able to distinguish what causes sex cells to be different than somatic cells and how this adds to genetic diversity.		they move through the lesson
	How are mitosis and meiosis different?	LS3-2	SEP 2	SF, P	Model the processes of mitosis and meiosis to clarify what caused Henrietta's cells to be cancerous but not her children's.	Lesson 13	Formative assessment: Have a third color of pop bead handy to add a mutation to the mitosis model to show that Henrietta's mutation happened in tumor cells, not sex cells. Ask them where it would have had to occur for her children to inherit her cancer.

	Are there other ways to get cancer?	LS3-2	SEP 1,3	C & E, SF	Model how cancer can be caused by certain viruses.	Lesson 14	Formative assessment: Check to make sure students' models are correct.
	How is DNA used by viruses?	LS3-2	SEP 1-3	C & E, SF	Model how viruses insert their DNA into host cells to show how this can cause cells to divide faster than normal.	Lesson 15	Formative assessment: Check student models for accuracy.
	Are all viruses the same? (Optional activity)	LS1-3	SEP 3	C & E, P	Analyze DNA sequence of various strains of Ebola virus to see how sequence changes can be to track the spread of the virus.	Lesson 16	

	Connections and Closure	LS3-1	SEP 1	C & E	Ask questions that arise from careful observation of the teenaged girl with melanoma to clarify and seek additional information for what causes cancer cells to be different from normal cells.	Lesson 17	Summative assessment: see the assessments folder
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Penguin Storyline - How can captive populations be managed?

Title or Topics	Driving Question Board (Anchoring Phenomenon)	Performance Expectations LSX-X	Science and Engineering Practices SEPs	Cross Cutting Concepts CCCs	Goals	Time Frame	Assessments (Tests, Projects, etc.)
	What do you know about penguins?	LS3	SEP-1, 4	<i>C&E-1</i>	Ask questions that arise from careful observation of the penguin ecosystem to clarify and seek additional information for what caused humans to impact the diversity of penguins.	Lesson1	
	Where do penguins live?	LS4.A	<i>SEP 1,2,4,7</i>	<i>C&E-1</i>	Ask questions, develop a model, and engage in	Lesson 2	

					argument from evidence to analyze and interpret data from DNA to recognize patterns in order to determine common ancestry and diversity in penguins.		
Species ID Lab		LS4.A	SEP-1,2,4,7	C&E-1	Analyze and interpret data to develop a model to show patterns and construct explanations to determine common ancestry and relatedness of the penguin population.	Lesson 3	Formative Assessment: If students can complete Species ID: Formative they have figured out what they should know in this lesson.
Who's Your Daddy Lab?	How are restriction enzymes used to answer	LS4.A, LS3.A	SEP-2,4,7	C&E-1	Analyze and interpret data to develop and use a model to	Lesson 4	Formative Assessment: Successful completion of Entrance slip:

	scientific questions?				reveal patterns of inheritance and develop an argument showing evidence of common ancestry.		Species ID Completing the gel and answering the questions in Who's Your Daddy? (Penguin Paternity Lab)
Penguin Isolation Types	How can different species of penguins live together and still be different species?	LS4.C	<i>SEP-4, 7, 8</i>	C&E -1, 2	Analyze and interpret data related to penguin niches/behavior or to recognize patterns revealing adaptations and behaviors specific to particular penguin species. Obtain, evaluate, and communicate information to	Lesson 5	Formative Assessment: Satisfactory completion of the CER at the end of the activity.

					engage in argument from evidence to describe the causes and effects of the emergence of new distinct species of populations.		
	How does beak shape determine prey type?	LS4.A, LS3.A	SEP-2,4,7	C&E-1	Analyze and interpret data to recognize patterns revealing adaptations and behaviors specific to particular penguin species allowing them to successfully hunt.	Lesson 6	Formative Assessment: Satisfactory completion of the CER at the end of the activity.
The Hippo Dilemma	How do human	LS4.D	SEP-1, 6, 8	C&E -2, 7	Construct explanations	Lesson 7	Formative Assessment:

	actions affect species?				describing the causes of and design solutions to address the effects of the impact of humans on biodiversity		Student understanding of HIPPO related to penguins as demonstrated by Make the Connection (Concept Map) or selected activity to follow the Jigsaw.
	Shopping for Penguins	LS4.D	SEP-1, 6, 8	<i>C&E -2, 7</i>	Evaluate a solution for reducing the impacts of human activities on the population and biodiversity of humboldt penguins.	Lesson 8	Formative Assessment: Completed Shopping for Penguins Budget sheet and rich classroom discussion
	How do zoos help endangered	LS2.D/4.D	SEP7&8	S&C	Evaluate a solution for	Lesson 9	Formative Assessment: TSS Quiz to

	animals?				the role of zoos in helping to protect endangered species.		assess students ability to use and interpret the information in the database.
	Querying the Database:	LS2.D/4.D	SEP7&8	S&C	Use a computer database to monitor demographics to determine whether the monitoring projects are having an effect on populations of endangered species.	Lesson 10	Formative Assessment: Students should be able to complete the student handouts related to the database and answer the Supplemental Analysis Questions
	Creating Penguin Pedigrees	LS4.D	SEP-1, 6, 8	C&E -2, 7	Model relationships using pedigrees to determine which penguins are most suited to become	Lesson 11	Formative Assessment: Check student pedigrees for accuracy.

					mating pairs.		
	Calculating birth and death rates in a penguin population	LS4.D	SEP-1, 6, 8	C&E -2, 7	Students use the database to collect data and figure out how rates of change can be used to predict the health of a penguin population.	Lesson 12	Formative Assessment: Completion of student handout from Penguin Populations Change (3.1) (pgs. 115 & 117)
	<i>Penguin Populations Over Time</i>	LS4.D	SEP-1, 6, 8	C&E -2, 7	To use a database to monitor birth and death rates of penguins in the population to determine the health of the population.	Lesson 13	Formative Assessment: Completion of , Penguin Populations Over Time (p. 123-126)
	<i>Penguin Matchmaking</i>	LS4.D	SEP-1, 6, 8	C&E -2, 7	Use a database to investigate the cause and effect of factors that affect	Lesson 14	Formative Assessment: check worksheets for accuracy.

					successful breeding programs in captive populations.		
	<i>Penguin Pedigrees & Mean Kinship Values</i>	<i>LS4.D</i>	SEP-1, 6, 8	C&E -2, 7	Use a database to investigate the cause and effect of factors that affect successful breeding programs in captive populations.	Lesson15	Formative Assessment: Completion of Mean Kinship Formative
	<i>Making Penguin Pairs</i>	LS4.D	SEP-1, 6, 8	C&E -2, 7	Use a database to investigate the cause and effect of factors that affect successful breeding programs in captive populations.	Lesson 16	Formative Assessment: Completion of •Student Handout: Humboldt Penguin Pedigree Chart (Page 147) • Student Handout: Mean Kinship Value Penguin

							<p>Match Chart (Page 149)</p> <ul style="list-style-type: none"> • Optional Handout: Humboldt Penguin Pedigree Chart with MK Values (Page 151) • Optional Handout: Mean Kinship (MK) Calculations (Pages 153-154)
Review					Review Challenge	Lesson 17	

Dog Storyline - Do dogs and wolves share a common ancestor?

Title or Topics	Driving Question Board (Anchoring Phenomenon)	Performance Expectations LSX-X	Science and Engineering Practices SEPs	Cross Cutting Concepts CCCs	Goals	Time Frame	Assessments (Tests, Projects, etc.)
	What evidence do we need to look deeper into common ancestry?	<i>LS-4.A</i>	SEP 1	CC 1	Ask questions that arise from careful observation of dog breeding to identify patterns of evidence of common ancestry for dogs and wolves.	Lesson 1	Formative assessment: Students should have a set of individual questions Completed Dog Breed Entrance Slip Completed Questioning Form
Natural Selection of Wolves from a Common Ancestor		<i>LS-4.A</i>	SEP 6	CC 1	Constructing explanations of wolf ancestry by comparing patterns of evidence of common	Lesson 2	Formative assessment: Completing the behavior activity

					ancestry for wolves and lions by examining group behavior.		
	What evolutionary relationships exist between wolves and dogs?	LS-4.A	SEP 2	CC 1	Developing and using models of wolf and dog ancestry by comparing patterns of geography and phylogeny as evidence of common ancestry	Lesson 3	Formative assessment: Completing Dog & Wolf Phylogeny (including showing completion of map)
	How are wolves adapted?	LS-4.A	SEP 5	CC 1	Using mathematics and computational thinking to compare canid skulls by identifying patterns of evidence of common ancestry for wolves and	Lesson 4	Formative assessment: Dogs Around the World with Video Map can be done individually Video questions can be done individually then reviewed

					dogs.		as a group to discuss the evidence presented by the scientists in the video.
	How were humans involved in the evolution of wolves into domesticated dogs?	<i>LS-3.B</i>	SEP 6	CC 6	Constructing explanations of how humans were involved in wolf evolution using patterns revealed by the variation of traits between wolves and dogs.	Lesson 5	Formative assessment: CER Activity Data sets contributions are good to evaluate group behavior while the CER is a good tool to evaluate individual student understanding.
	What other phenotypic trait differences exist between wolves and dogs?	LS-3.A and LS-3.B	SEP 1	CC 1	Constructing explanations of structure and function changes between dogs and wolves based on inheritance and variation	Lesson 6	Formative assessment: Achondroplasi a activity Students will demonstrate their understanding of inheritance through

					of traits.		completing the Punnett squares and completing the breeding situations on the last page of the activity.
	Dog Breeding: How do dog breeders know which dogs to breed to get desired traits?	LS-3.B	SEP 6	CC 2	Constructing explanations of dog breeding by evaluating the structure and function of dog breeds as evidence of variation of traits due to artificial selection.	Lesson 7	Formative assessment: Dog breeding activity Students should have completed the Dog breeding activity. Part III will best reflect the student's understanding of breeding dogs for specific functions with Parts I and II serving as research.
	Dogs Before and After: How have dog breeds	LS-3.A & 3.B	SEP 6	CC 2	Constructing explanations of the effects of dog breed	Lesson 8	Formative assessment: Completion of the CER at

	changed over time?				evolution caused by dog breeders determining the inheritance and variation of traits.		the end of the Dogs Before & After Activity will allow students to demonstrate their understanding of the impact of artificial selection on phenotypic traits.
	Farm Fox Activity: Is there a genetic connection between behavior and appearance?	LS-3.A	SEP 6	CC 2	Constructing explanations of how the inheritance of certain traits causes foxes to exhibit the effects of domestication .	Lesson 9	
	Mapping Genes to Traits: How do we use genes to determine phenotypes?	LS-3.A & 3.B	SEP 4	CC 1	Analyzing and interpreting data of the connection between dog genotypes and phenotypes	Lesson 10	Formative assessment: Mapping Genes to Traits: Students should be able to

					by comparing patterns of inheritance and variation of traits.		explain how SNPs show changes in phenotypes.
Regents Exam Review						Lesson 11	