BIOLOGY UNIT PLAN

Stage 1 – Desired Results

Established Goals

BIO.8 The students will investigate and understand dynamic equilibria within populations, communities, and ecosystems. Key concepts include

a) Interactions within and among populations including carrying capacities, limiting factors, and growth curves;
b) Nutrient cycling with energy flow through ecosystems;
d) The effects of natural events and human activities on ecosystems;

NGSS

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-3. Construct and revise and explantion based on evidence for the cycling of matter and flow energy ~~in aerobic and anaerobic conditions~~.

HS-LS2-7. Design, evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Name: Zach Jernigan

Content Area: Biology

Unit Topic: Ecosystems

Grade Level: 9th

UNDERSTANDINGS

Students will Understand THAT...

U1: Relationships among living and nonliving things help to shape the world we see.
U2: Human activities can greatly change the world we live in.
U3: The environment is made of different **systems** constantly interacting with and around each other to keep the flow of energy and matter going.

ESSENTIAL QUESTIONS

Students will keep considering...

EQ1: What do dead and nonliving things "do"?
EQ2: How can one individual's action impact the community as a whole?
EQ3: Is there a "most important" part of a system?

KNOWLEDGE

Students will know...

K1: Populations are held in check by abiotic and biotic factors
K2: Growth curves include several stages (initial growth, exponential, steady state, decline, and extinction)
K3: Limiting factors are parts of the environment that decrease the carrying capacity
K4: Carrying capacity is the number of organisms that can be supported by an ecosystem
K5: A community is a collection of interacting populations
K6: Symbiosis is a close and permanent relationship between two organisms (mutualism, commensalism, and parasitism)
K7: An ecosystem consists of all the interacting species and abiotic environment in a given area.
K8: All essential nutrients cycle through the ecosystem (water, carbon, and nitrogen cycles).
K9: Energy flows from producers to consumers (primary, secondary, tertiary) to decomposers
K10: Analyze the effect of human activities, such as forest clearing and intense farming, on the environment

SKILLS

Students will be able to... (include Bloom's Label)

D1: Create and interpret a population growth curve (Bloom's 6 and 2)
D2: Estimate what changes would occur to a population as a result of population interactions (Bloom's 5)
D3: Illustrate the key processes in the water, carbon and nitrogen cycles (Bloom's 3)
D4: Explain the role of living thing in the water, carbon and nitrogen cycles (Bloom's 2)
D5: Diagram the flow of energy between trophic levels in all of the following: food chain, food web, energy pyramid, and biomass pyramid (Bloom's 4)
D6: Formulate a hypothesis for reducing the impact of human activities on the environment and/or biodiversity (Bloom's 6)

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Stage 2 – EVIDENCE (PERFORMANCE ASSESSMENT)

Rubric Criteria (Categories)	

○ Graph of Population Data
○ Analysis of Population Data
○ Identification and Discussion of Relationship
○ Human Impact
	GOAL: Your task is to analyze population data of a particular species to determine its impact on the ecosystem
	
	ROLE: Biologist
	
	AUDIENCE: Government Panel
	
	SITUATION: You have been given government funding to analyze the effect of removing coyotes from an ecosystem. You have collected data over many years and now you must analyze the effect of removing the coyotes and report your findings back to a government panel. You will focus on one aspect, while your colleagues will report on others.
	
	PERFORMANCE/PRODUCT: Make a multimedia presentation, trifold, scientific poster, or a scientific report to present the findings for your species. Included in your report should be the stage of the growth curve you believe your species is in (including an explanation as to why you believe this), any relationships you believe exist between your species and other factors (abiotic, biotic) in the environment (this excludes the coyotes that were removed), and any changes that can be made to human activity to assist the species.
	
	Included in the report you should also:
	
	• Introduce your species
	  ○ Give it's common name and scientific name
	  ○ Discuss what tropic level it exists at
	  ○ Any other information you feel relevant to the report
	• Analyze the data and produce a graph of the population data
	  ○ You should make sure to include a figure legend and discuss the graph
	  ○ Make sure to analyze for mean, median, standard deviation, and carrying capacity

Differentiation Ideas

Interest-

1. Pick their organism (rat, fox, grass, bushes, etc.)
2. Pick their mode of communication/presentation

Readiness-

1. Give students a guide for how to go about analyzing the data
2. User-friendly Vs. more scientific resources
3. Examples of scientific posters/PowerPoints/papers with guide of how to set up

Mr. Jernigan

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The state government of Texas has tasked you with investigating an ecosystem in West Texas. They want to better understand the effects of removing coyotes on this environment. The coyotes have been a problem for local residents and they want to make sure that the removal of these animals does not have any unforeseen consequences.

You and your team have been collecting data on the populations of different species for 5 years. You started with establishing a base line for 3 years. After that you removed all coyotes you could find in the area. For our purpose, let us assume after the summer of 1990 there are no more coyotes present on your land. *Your task now is to analyze the data you have collected and present it to a government panel. You will select one species and analyze this data.*

Your can choose your own organism from the list of all the populations that were observed. You will then take the data and compare it to other species. Remember, science is not performed in a vacuum. Instead of analyzing every single species you may discuss trends with other colleagues (your classmates). Just remember ultimately you are responsible for your data. Trust others but verify. Using this data, you need to give the government a report on the proposal. Your report should include the following:

- A brief introduction to your species
- Any relationships that you can find between the species and other factors (abiotic, biotic) (U1, K5, K6)
- A graph representing population data (K2, D1)
- An analysis including: mean, median, standard deviation and carrying capacity (K3, K4, D1)
- Any changes that can be made to human activity to assist the species (U3, K10, D6)

Your report can be a *multimedia presentation, PowerPoint, trifold, scientific poster, or a scientific paper.* (this is later in the year and students have already been instructed on what each different mode of communication looks like in a scientific community)

You will be given class time over the next two class periods where you will be allowed to work on this project. I will be available to answer questions about how to set up your presentation but will be unavailable to answer content questions. I will have markers and other coloring utensils, computers for you to create a PowerPoint, and any other materials that you specify you need. Of course you may work on it at home if you desire but I believe if you are focused and working throughout the allotted time you should have enough time to complete this project in class.

Table 1: The table below shows the raw data collected from a West Texas plot. Coyotes were removed starting in the Summer of 1990. Note: Win implies winter of the preceding year and S represents Summer time of that year. The numbers are in values of number of individuals caught during a trapping session.

Species	1987 S	Win	1988 S	Win	1989 S	Win	1990 S	Win	1991 S	Win
Dipodomys ordii	38	13	40	10	41	9	42	33	59	105
Perognathus flavus	18	0	20	0	16	0	6	0	0	0
Onychomys leucogaster	10	2	8	3	9	5	2	4	0	0
Reithrodontomys montanus	0	0	0	0	0	0	1	1	3	3
Taxidea taxus	38	0	39	0	39	0	39	58	86	102
Felis rufus	0	0	0	0	0	0	0	43	46	20
Urocyon cinereoargenteus	0	0	0	0	0	0	0	66	0	46
Mephitis mephitis	0	0	0	0	0	0	0	70	90	42

Use all the diagnostic skills we have learned while looking at this table before beginning with any numbers. What is this chart telling you? What does each number mean? Do I need to use all the data present?

Remember if you are stumped, raise your hand and ask. I will help you all I can but remember I want to know what you know.

	Expert	Developing	Needs Improvement

Graph of population data
10 points
	10 points
	- Graph is professional in quality (D1)
	  ○ Graph has clearly labeled x and y axis
	  ○ Graph has a title
	  ○ Graph includes a figure legend that discusses all relevant informatio n presented in graph
	- There is discussion of graph and what information it tells us outside of the figure legend (D1)
	- Graph accurately portrays the data for the species being studied (K2)
		7 points
		- Graph is missing one element under professional quality
		- Discussion of graph is limited to figure legend
		- Graph portrays information about the species that incomplete
			5 points
			- Graph is missing two or more elements under professional quality
			- No discussion of graph in report or figure legend
			- Graph portrays data for the species that is inaccurate

Analyzing of population data **20 points**	**20 points** - Population data is completely analyzed mathematically (D1) ○ Includes mean, median, standard deviation, and carrying capacity (K4) - Effect of removal of coyotes on studied	**15 points** - Population data is analyzed but missing one or two of the following: mean, median, standard deviation and carrying capacity - Effect of removal of coyotes is mentioned but no elaboration is given	**10 points** - Population data is analyzed but missing three or all of the following: mean, median, standard deviation, and carrying capacity - Effect of removal of coyotes is not mentioned - No scientific explanation

	species is discussed (D2) - Scientific explanation is given as to why removal of coyotes had that effect (K3)	- No scientific explanation given	given
Relationships found and discussed **20 points**	**20 points** - A relationship with another organism (other than coyote), cycle, or non-living member of the community is identified and discussed accurately (U1, K5, K6) - Explanation is given as to what type of relationship exist (K6)	**15 points** - A relationship with another organism (other than coyote), cycle, or non-living member of the community is identified but not discussed or accuracy of relationship is not found - Type of relationship is stated but no explanation is given	**10 points** - No relationship with another organism (other than coyote), cycle, or non-living member of the community is identified or discussed
Human impact **10 points**	**10 points** - At least one human impact on the species is mention and accurately discussed/interpreted (U3, K10, D6)	**7 points** - At least one human impact on the species is mentioned but not discussed accurately or interpreted accurately	**5 points** - No human impact on the species is mentioned or discussed

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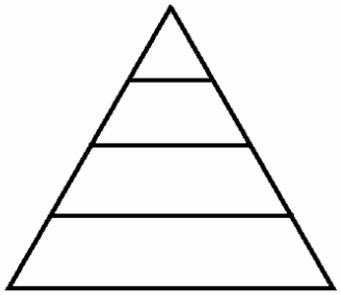
STAGE 3: THE LEARNING/FORMATIVE ASSESSMENT PLAN (USE AS MANY ROWS AS NECESSARY)			
Lesson # & Topic/Focus	UKDs (You can include #s from Stage 1)	Concrete GROUP Formative Assessments (Thoroughly Describe and/or Attach)	Concrete INDIVIDUAL Formative Assessments (Thoroughly Describe and/or Attach)
#1 Population introduction	U1, K1, K3, K4, D2	While instruction is going on about growth curves and the different stages, I will use **Dry Erase boards** to pick the students brains about limiting factors. Questions will include: 1. *Name a biotic feature of an environment that could limit the amount of individuals that could live in an area.* 2. *Are there factors that may be abiotic but are also a limiting factor?* 3. *Name one.* If most of the groups appear to be getting the information then I will jump ahead in my instruction to talking about carrying capacity. However, if they do not appear to be grasping the information I will discuss limiting factors longer before asking the next question.	To end of class, students will be given a **Quick Write** to perform. The students will pull out their journals that they have been working with all year long. The students will have 3 minutes to best answer the following prompt. *Think of the entire human population as a population as we have defined it today. Name/list limiting factors (abiotic or biotic) that impact the human population. What do you think would happen to the human population if another Homo species (like Homo Neanderthal) was suddenly discovered and began to use the same resources we use?* Students will turn in their journals and those will be used to direct the beginning of the next lesson. If a large portion of the students can name limiting factors and understand that this competition would decrease the population size of humans then we will jump into the next lesson. If it appears that students need a refresher, I will tie growth curves and human population

			into one by presenting a human growth curve and discussing what is happening as we approach the black plague and industrialization. This will lead to a discussion of limiting factors pre-industrialization. It will also be used to predict what would happen if Homo Neanderthal were discussed. Then after this refresher I would feed right into the discussion of growth curves stagesusing the same graph.
#2 Growth Curves	K2, D1, D2	After about 10-15 minutes of discussion on growth curves, I will pause and allow students to **Turn 'n' Talk** with a partner near them. However, I will expand on the idea slightly. Each group will have one scratch piece of paper. One student will discuss the prompt (listed below) for two minutes while the other attempts to write down what that student is saying. They will then switch roles for another minute. I will collect the papers for reference later; however, I will also be walking around listening for misconceptions and asking probing questions if I feel that the conversation is heading in an undesirable direction. I will use information gathered by listening to direct my instruction for the next 10 minutes. If all the students appear to get it I will move on or I will address misconceptions that I feel the whole class is making. For the prompt for this activity, I will ask students to discuss the following topic:	Students will be making a **Thinglink image** of a population growth curve. This formative assessment would be given after the instruction on growth curves. Students will have time in class to finish this before the class period is up. If it is not finished in class then it will be assigned as homework. The instructions will be sure to include all stages (extinction can be excluded if the graph does not show extinction). Also students will need to predict a carrying capacity for the graph they choose. The students will be posting their images on a Padlet I have created. An example of what I am expected can be found at https://www.thinglink.com/scene/625048393047080960 This is one I created to help teach population growth curves but can serve as a key. I will be checking on the Padlet before class starts to see if students understand the information. If they do get it I will move on. If they seem to need more instruction I will use my own Thinglink to do a quick re-

		Without using pictures, describe to your classmate the important parts of a growth curve? What can change the shape of each part? If nothing say so.	teach.
#3 Community and Symbiosis	U1, U3, K5, K6, K7, D2	I will be using a **Graffiti** activity to assess the students in a group fashion. After the instruction, I will place five large pieces of paper around the room. *Each paper will have a title, these titles will be Mutualism, Commensalism, Parasitism, Ecosystem and Community.* The students will be broken into groups and asked to write down terms, definitions or examples of each word they encounter. After two minutes, the students will rotate and begin the process again with a new word. However, first they must look at what previous groups wrote and place a check by the ideas they agree with, an (X) by anything they disagree with and why they disagree, an (!) by anything they agree with and find really interesting or a (?) by anything they would like more explanation on. After each group has gone to each piece of paper, I will place all of them at the front of the classroom. I will then go over all the papers making sure to examine each (?) and go over any statements that seemed controversial (a bunch of X) or those that seemed to be excellent examples (a bunch of !).	As an exit ticket, I would use a matrix that students would have to fill out regarding different symbiosis. I have attached it at the end (FA 3.2). I will use this form to assess if the students grasp the idea of symbiosis. If I feel that the students do not understand the information I will use a re-teaching method. I have attached what the strategy would be as FA 3.2.1. However, if I feel that this would be an unwise use of my time, I would simply move on to the next lesson after the bell ringer the next class.
	U1, U3, K7, K8, K9,	In their groups, after learning about the different cycles (nitrogen, carbon and water) students will be doing a **List-**	This would be an **exit ticket** for the students. I would place an **Energy Pyramid** on the board with the terms missing.

#4 Cycles and Pyramids	D3, D4, D5	**Group-Label**. I will be providing the students with the terms in baggies. I will also be tiering this activity. Those groups that are more prepared will not receive group labels and must sort the terms into groups of their own making. For those students who need more tiering I will provide their groups with the groups to sort them into. The terms and groups are listed below. *Terms: Precipitation, Condensation, Evaporation, Transpiration, Groundwater, Photosynthesis, Cellular Respiration, Decomposers, Denitrifying Bacteria, Atmosphere, Lighting, Nitrifying Bacteria, Sunlight, Auto Emissions, Volcanic Activity* *Categories: Carbon Cycle, Nitrogen Cycle, Water Cycle*	Students will be asked to draw the pyramid and fill it out. Inside the specific level will be real-world examples of species that exist at that trophic level (words or pictures). Beside the trophic level students should place the term that best describes the trophic level (producer, consumer, etc.) Below is an example of what the pyramid would look like. 
#5 Human Impact	U2, K10, D6	In their groups, students will go to the webpage http://www.earthday.org/footprint-calculator In their groups, they will run the program and calculate how many earths it would take to support their current lifestyle. Students will then do a **Roundtable** where each student will respond to the following prompt: Name one aspect of your life (that was used in the website) that you could realistically cut back on and reduce your	Here I would use an Exit Ticket that would be a **3-2-1 Summarizer**. The questions would be as follow: List 3 human activities that negatively impact the environment. Provide 2 actions that individuals can do to reduce their impact on the environment. Name 1 action that YOU could do to reduce your own carbon footprint. Try to go a full 24 hours using the strategy you provided. This exit card will be taken in and assessed prior to the next class period. I will start the next class by asking if anyone was able to go a full 24 hours reducing their carbon

		carbon footprint? How would it help? These Roundtables will be placed up on the board and each group will quickly come up and discuss one (1) or two (2) of the ideas they came up with. After each scenario I will open it up to the class to discuss what they think of each example and how the aspect could be achieved realistically. This will extend the learning that was just done on human impact.	footprint. I will lead this into a discussion of how hard it was to do that. If the students are still struggling with the information then this discussion will extend into a re-teaching of human impact.

FA 3.2

Fill out the table below for each type of symbiosis. Your example does not have to be a real life example as long as you can explain why it is that type of symbiosis.

	Mutualism	Commensalism	Parasitism
Who benefits? (Both, One, or none)			
Who is hurt? (Both, One, or none)			
Provide one example in nature and explain why it is an example			

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FA 3.2.1

Time: 15 – 20 minutes

Group 3 and 4 (More prepared group but figured shouldn't also label them as group 1 and 2)

- Needs a deeper understanding, an extension as they seem to grasp symbiosis
- Students will read an article on Commensalism
    - https://www.ma.utexas.edu/users/davis/375/LECTURES/L22/Commensalism.pdf
        - This website seeks to show that every commensalism is actually mutualistic in some way
    - In your groups, you will take 1-2 examples you gave in your responses and think of ways that what appears to be a commensalism is actually parasitism or mutualism
- Connect to community
    - https://www.youtube.com/watch?v=ufxGw8EqY5Q
    - Describe what is happening in this scene being sure to answer these questions
        - Is there one species shown or many?
        - What are they doing?
        - Obviously, fish don't act this way in real life (sorry to burst any bubbles) but if these were humans, can you think of a single word (1) to describe what is being shown throughout the scene?
        - In this last question, I am hoping they will put community but most likely they will put school which still works.

Group 1 and 2 (students that still need more help understanding commensalism)

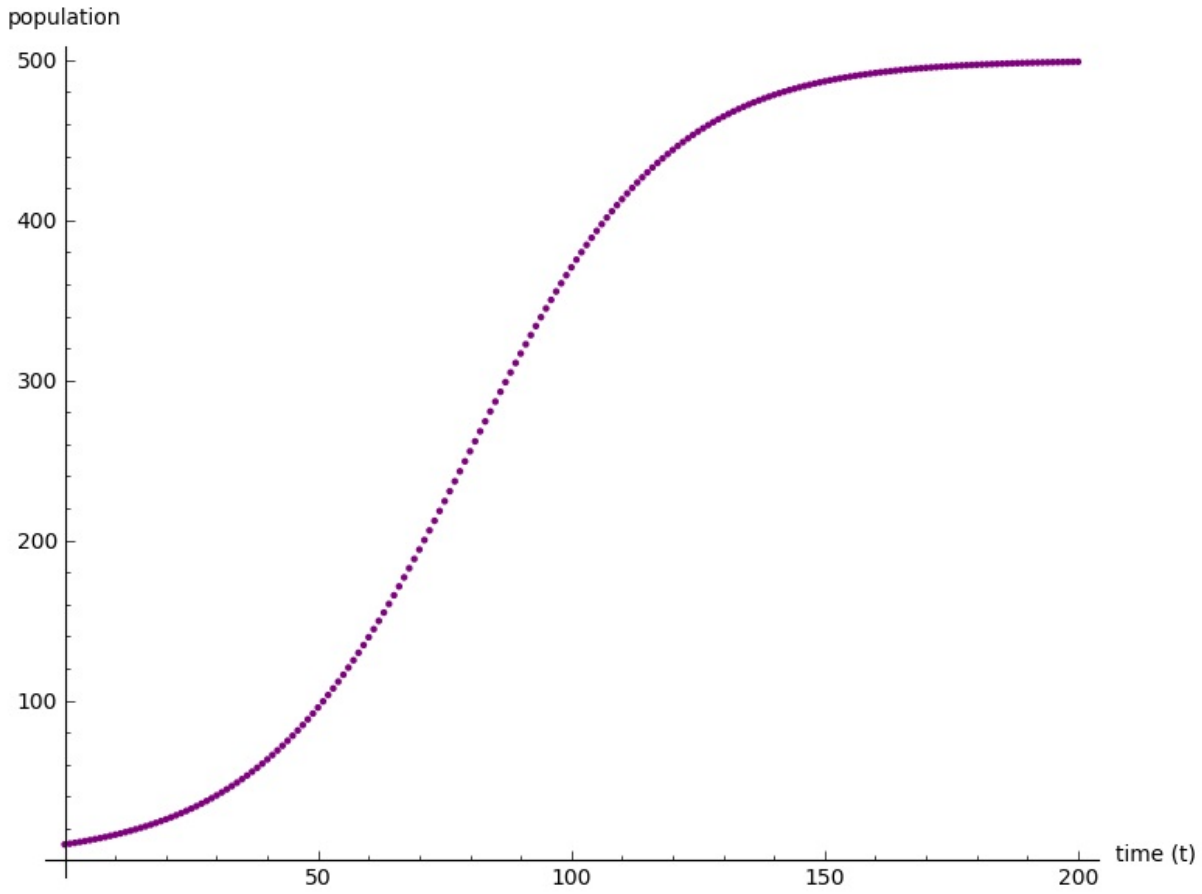
- These students need help with thinking of examples and with the definition of commensalism
- Students will be watching a video of Finding Nemo
    - https://www.youtube.com/watch?v=Kd43CoSmy88
        - Finding Nemo
    - In your groups, you will describe the relationship between Nemo and his home by answering these questions
        - Why did Nemo's dad choose to live there? Is there a benefit to living there instead of out in the open?
        - What does the Sea Anemone get out of the relationship?

        - Looking back at your answers, what type of symbiosis (mutualism, commensalism, or parasitism) did you describe?
- Connect to community
    - https://www.youtube.com/watch?v=ufxGw8EqY5Q
    - Describe what is happening in this scene being sure to answer these questions
        - Is there one species shown or many?
        - What are they doing?
        - Obviously, fish don't act this way in real life (sorry to burst any bubbles) but if these were humans, can you think of a single word (1) to describe what is being shown throughout the scene?
        - In this last question, I am hoping they will put community but most likely they will put school which still works.

I will ask all the groups to describe what they saw and give me their one word. If they come out with community, great! If they don't then I will direct it towards community. With School being an easy transition from school to school community to community and then off to the biological definition.

Biology Pre-Assessment

For the next 2 problems use the graph below:



1. What is one (1) piece of information you can pull out from this graph? D1

2. What do you expect to happen if the x-axis was extended to 500 years? Give a hypothesis or scenario as to what could be happening. K4, K3

3. Describe a community in biological terms and in your own words. K5

4. Name different ways that you personally impact the world every day in a positive way and in a negative way. U2

5. Identify the independent and dependent variable for each equation. Pre Req
    a. Y=f(x)

    b. A=2b+56

    c. dP/dt= 1.4N((500-N)/500)

Learning Goals Assessed

Pre Req – Functions, in the form y=f(x), are used to find dependent variables using independent variables.

U2: Human activities can greatly change the world we live in.

K3: Limiting factors are parts of the environment that decrease the carrying capacity

K4: Carrying capacity is the number of organisms that can be supported by an ecosystem and is can be defined by a mathematical equation [dN/dt = rN((K-N)/K)]

K5: A community is a collection of interacting populations

D1: ~~Create and~~ interpret a population growth curve (Bloom's 6 and 2)

Learning Goals (UKDs) ***Label each Learning Goals as U, K, D, or Pre-Req***	**Corres-ponding Standard(s)** ***(if applicable)***	**✓ if Pre-Assessed? (*If so, indicate question type*)**	**How Formatively Assessed – At Least 1 Concrete <u>GROUP</u> Method** ***(List Strategy and Give Lesson #)***	**How Formatively Assessed – At Least 1 Concrete <u>INDIVIDUAL</u> Method (*List Strategy and Give Lesson #)***	**✓ if Summatively Assessed via the GRASP (*Provide Rubric Criteria*)**	**✓ if Summative Assessed v the TEST (*Provide question and item format*)**
Pre Req – Functions, in the form y=f(x), are used to find dependent variables using independent variables.		✓ Identifying IV and DV				
U1: Relationships among living and nonliving things help to shape the world we see.	BIO.8 a, b		Dry Erase Boards Lesson #1	Exit Pyramid Lesson #4	✓ Relationships found and discussed	
U2: Human activities can greatly change the world we live in.	BIO.8 d HS-LS2-7	✓ Open Ended	Roundtable Lesson #5	3-2-1 Summarizer Lesson #5	✓ Human Impact	
U3: The environment is made of different systems constantly interacting with and around each other to keep the flow of energy and matter going.	BIO.8 a, b, d HS-LS2-3		Graffiti Lesson #3 List-Group-Label Lesson #4	Exit Pyramid Lesson #4		Q3, Q4, Q5, (:MC
K1: Populations are held in check by abiotic and biotic factors	BIO.8 a HS-LS2-1		Dry Erase Boards Lesson #1	Quick Write Lesson #1		Q2, Q8, Q9: MC,
K2: Growth curves include several stages (initial growth, exponential, steady state, decline, and extinction	BIO.8 a HS-LS2-1		Turn 'n' Talk Lesson #2	Thinglink/Padlet Lesson #2	✓ Graph of population data	Q11, Q12, Q1 Q14, Q15: M Q26, SA
K3: Limiting factors are parts of the environment that decrease the carrying capacity	BIO.8 a HS-LS2-1	✓ Open ended	Dry Erase Boards Lesson #1	Quick Write Lesson #1	✓ Analyzing population data	Q1: MC; Q33 Matching
K4: Carrying capacity is the number of organisms that can be supported by an ecosystem and is can be defined by a mathematical equation [dN/dt = rN((K-N)/K)]	BIO.8 a HS-LS2-1	✓ Indirectly (asked without need to know term)	Dry Erase Boards Lesson #1	Quick Write Lesson #1	✓ Analyzing population data	Q10: MC;
K5: A community is a collection of interacting populations	BIO.8 a	✓ Open ended	Graffiti Lesson #3	FA 3.2-Matrix Lesson #3	✓ Relationships found and discussed	Q17: MC; Q2 SA

Learning Goals (UKDs)	Corres-ponding Standard(s) *(if applicable)*	✓ if Pre-Assessed? (*If so, indicate question type*)	How Formatively Assessed – At Least 1 Concrete <u>GROUP</u> Method *(List Strategy and Give Lesson #)*	How Formatively Assessed – At Least 1 Concrete <u>INDIVIDUAL</u> Method (*List Strategy and Give Lesson #)*	✓ if Summatively Assessed via the GRASP (*Provide Rubric Criteria*)	✓ if Summative Assessed v the TEST (*Provide question and item format*)
K6: Symbiosis is a close and permanent relationship between two organisms (mutualism, commensalism, and parasitism)	BIO.8 a		Graffiti Lesson #3	FA 3.2-Matrix Lesson #3	✓ Relationships found and discussed	Q26-30. FITB
K6a: the definition of mutualism	See above K6		See above K6	See above K6	See above K6	Q26-30. FITB
K6b: the definition of commensalism	See above K6		See above K6	See above K6	See above K6	Q26-30. FITB
K6c: the definition of parasitism	See above K6		See above K6	See above K6	See above K6	Q26-30. FITB
K7: An ecosystem consists of all the interacting species and abiotic environment in a given area.	BIO.8 a, b HS-LS2-1		Graffiti Lesson #3	FA 3.2-Matrix Lesson #3 Exit Pyramid Lesson #4		Q8 + Q9; MC
K8: All essential nutrients cycle through the ecosystem (water, carbon, and nitrogen cycles).	BIO.8 b HS-LS2-3		List-Group-Label Lesson #4	Exit Pyramid Lesson #4		Q3, Q4, Q5, C MC;
K9: Energy flows from producers to consumers (primary, secondary, tertiary) to decomposers	BIO.8 b HS-LS2-3		List-Group-Label Lesson #4	Exit Pyramid Lesson #4		Q18, Q19, Q2 Q21 : MC; Q2 Q28: SA
K9a: the definition of producer	See above K9		See above K9	See above K9		
K9b: the definition of primary consumer	See above K9		See above K9	See above K9		Q18, MC
K9c: the definition of secondary consumer	See above K9		See above K9	See above K9		
K9d: the definition of decomposers	See above K9		See above K9	See above K9		Q18, MC
K10: Analyze the effect of human activities, such as forest clearing and intense farming, on the environment	BIO.8 d HS-LS2-7		Roundtable Lesson #5	3-2-1 Summarizer Lesson #5	✓ Human Impact	Q7, Q22.MC,
D1: Create and interpret a population growth curve (Bloom's 6 and 2)	BIO.8 a HS-LS2-1	✓ Interpret a graph	Turn 'n' Talk Lesson #2	Thinglink/Padlet Lesson #2	✓ Graph of population data	Q11, Q12, Q1 Q14, Q15: M Q26 SA
D2: Estimate what changes would occur to a population as a result of population interactions (Bloom's 5)	BIO.8 a, b HS-LS2-1		Dry Erase Boards Lesson #1 Turn 'n' Talk Lesson #2	Quick Write Lesson #1 Thinglink/Padlet Lesson #2 FA 3.2-Matrix Lesson #3	✓ Analyzing population data	Q16: MC
D3: Illustrate the key processes in the water, carbon and nitrogen cycles (Bloom's 3)	BIO.8 b HS-LS-3		List-Group-Label Lesson #4	Exit Pyramid Lesson #4		Q3, Q4, Q5, C MC
D4: Explain the role of living thing in the water, carbon and nitrogen cycles (Bloom's 2)	BIO.8 b HS-LS-3		List-Group-Label Lesson #4	Exit Pyramid Lesson #4		Q3, Q4, Q5, C MC