

5E Arts Integrated STEM Lesson Plan – Template

This template serves as a guide for developing a lesson that integrates across subject areas and includes the components of a quality STEM lesson. Please use it to support your work and engage in discussions with your instructors and peers when you have questions.

Lesson Title: *Explosive Populations!*

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Topic: *Ecosystems: Interactions, Energy, and Dynamics*

Targeted Grade Level: *9-12*

Time Needed: *1 hour- 2 hours*

Subject Integration: *Art, Science and Technology*

Justification: *Science- This lesson focuses on factors that affect carrying capacity of ecosystems at different scales. This lesson will focus on Ecosystem interdependence between predators and prey. It will then focus on the environmental factors that affect a local National Park.*

Art & Technology- Students will use digital artmaking to create an infographic on the environmental factors affecting Mammoth Cave (National Park). This will allow students to explore digital art making and graphic design with canva.com .

Standards:

3.c. Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.

Art- 5. Develop and refine artistic techniques and work for presentation.

6. Convey meaning through the presentation of artistic work.

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

NGSS Performance Expectations *HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.* [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.]

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ADD LESSON AUTHOR NAME

ADD DATE

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts:
Using Mathematics and Computational Thinking <u>Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.</u> Use mathematical and/or computational representations of phenomena or design solutions to support explanations.	LS2.A: Interdependent Relationships in Ecosystems Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.	<u>Scale, Proportion, and Quantity</u> The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs.

Common Core State Standards:

Math:

ELA:

ITEEA Standards

3.c. Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.

National Art Standards

Art- 5. Develop and refine artistic techniques and work for presentation.

6. Convey meaning through the presentation of artistic work.

Measurable Student Learning Objectives:

Students will be able to observe population explosions.

Students will be able to collaborate with others.

Students will be able to make inferences from graphs and predict outcomes.

Students will be able to research environmental impacts on Mammoth Cave.

Students will be able to create infographics using digital artmaking.

Students will be able to develop artistic techniques to create awareness presentations for local newspapers.

Nature of STEM:

Engaging Context/Phenomena:

<https://thewonderofscience.com/videos/2017/12/10/ls2c-ecosystem-dynamics-functioning-and-resilience>

After students watch the video, they will collaborate using a [jamboard](#) to discuss takeaways. Guiding question- How are the organisms dependent on each other?

Data Integration: Students will compare predator/prey relationships on graphs to determine ecosystem interdependence. They will also explore Mammoth Cave's National Park data to determine environmental effects.

Differentiation of Instruction: *Students in Special Education will work collaboratively with their group to make a collaboration board about Ecosystem Interdependence. They will receive a modified evaluation and more guidance when looking at the graphs and making inferences. Students can use the reader extension to listen to the material read to them. They will also receive more support when working with Canva. Canva is very user friendly and should be able to support their needs.*

Real-life Connection: *Students who live in this area need to be aware of the environmental impacts on Mammoth Cave and how this is their ecosystem and they depend on it. They also need to learn how to use digital art making for so many jobs in today's world (graphic design, teaching, advertising, web design, coding, etc.)*

Possible Misconceptions: *Students will be surprised with how much predators and prey numbers influence each other. They will also be surprised at how user friendly Canva is.*

Lesson Procedure:

5E Model	5E Objectives
<u>Engage</u> <i>Introduce the lesson with</i>	Procedure: The teacher will begin the lesson by asking students: What is a predator/prey relationship? (Give examples) If deer are on an island without a predator- will that have a positive or negative effect on the deer? https://thewonderofscience.com/videos/2017/12/10/ls2c-ecosystem-dynamics-functioning-and-resilience After students watch the video, they will collaborate using a jamboard to discuss takeaways. Guiding question- How are the organisms dependent on each other?

<i>an anchoring phenomenon. Facilitate student questions, discussion, etc. as appropriate. Learn about what students already know and want to know.</i>	Modifications- <i>Students that struggle to spell can use the images to insert an image on the jamboard but will also have a word bank given to them to help them write their responses. The word bank has pictures and will be placed on their desk.</i> Standards Addressed <i>HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.</i> Formative/Summative Assessments <i>The jamboard will be used to assess this phase.</i> Resources https://thewonderofscience.com/videos/2017/12/10/ls2c-ecosystem-dynamics-functioning-and-resilience Jamboard word bank
<u>Explore</u> <i>Plan for students to engage in hands-on activities that are designed to facilitate conceptual change.</i>	Procedure: <i>Students will launch this interactive to explore what happens when the population of one species explodes. They will work with direct and indirect connections. They will answer the questions as they work through the trophic cascades on the Google Doc.</i> Modifications <i>Students in Special Education will have a different Google Doc to work in that has a word bank and multiple choices for the answers.</i> Standards Addressed <i>HS-LS2-1.</i> Formative/Summative Assessments <i>The Google Doc that walks the students through the trophic cascades.</i> Resources interactive Google Doc Modified Google Doc

<u>Explain</u> Facilitate opportunities for students to explain their understanding of concepts and processes and make sense of new	Procedure: <i>Students work together on this part of the lesson. They will work in groups and create anchor charts that map out what they think of when they think of Ecosystem interdependence. They will use this rubric to guide their charts.</i> Modifications <i>The teacher should be selective when making groups. It works best if students in special education are either in a group together with a modified rubric or if they are the only one in the group in special education. If they are the only one in the group they would make a great “reporter” (the one who writes down the information). Another “job” that would work well is to allow that student to be the illustrator. If there was an area of the cascades that interested that student more, that may be a good area to allow them to work on.</i> Standards Addressed <i>Art- 5. Develop and refine artistic techniques and work for presentation. 6. Convey meaning through the presentation of artistic work. HS-LS2-1</i> Formative/Summative Assessments <i>The teacher needs to walk around the room and monitor participation so that one student is not completing the whole assignment. Students will use this Group Role Chart to know their job for this task and the infographic. The teacher will write their names down on their role and use this as an observation checklist for both activities. This rubric and the modified rubric can also be used to assess the charts.</i>
<i>concepts.</i>	Resources <i>chart paper, markers, coloring pencils, rubric, modified rubric, Group role chart</i>

<u>Elaborate</u> Provide applications of concepts and opportunities to challenge and deep ideas; build on or extend understanding and skills.	Procedure: The teacher will display the scenarios for the class to discuss. After the scenarios have been discussed, Students can break up into groups and each group will pick a different environmental factor that is affecting Mammoth Cave (a local National Park). They will do some research using this website on the impact of this environmental factor. Students will use this research sheet. They will take the information found on the website that they put on their research sheet and use canva to create an infographic to raise awareness about environmental effects on Mammoth Cave. Rubric Modifications Once again, this is a group activity. Students in Special Education can either use a different research sheet or work within their group as the person who copies the information found on the website. Students in Special Education will have a modified rubric Standards Addressed HS-LS2-1, Art- 5. Develop and refine artistic techniques and work for presentation, 3.c. Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions., Formative/Summative Assessments Infographic (Rubric) Resources scenarios google slide, website, research sheet, modified research sheet, rubric, modified rubric , Group role chart
<u>Evaluate</u> Assess students knowledge, skills and abilities.	Procedure: The teacher can either do a live Quizizz quiz or a paper copy of the quiz. Students in Special Education will get this quiz instead along with a reader for this quiz. Modifications Students in Special Education will get this quiz instead along with a reader for this quiz. Standards Addressed HS-LS2-1, Formative/Summative Assessments The quiz Resources Both versions of the quiz

Teacher Background: *Students have previously learned about carrying capacity and balancing ecosystems. The teacher should also be aware which students need modified assignments and/or instructions. This is a high school lesson and students have typically been exposed to ecosystems at this point in their education and they have a pretty clear understanding of balancing ecosystems and carrying capacity.*