Endeavor STEM Teaching Certificate Project
Rachel Kiper
November 22, 2021

Lesson Title: *Deforestation and Primary Land Cover*
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Topic: *Deforestation: availability of natural resources*
Targeted Grade Level: *9-12*
Time Needed: *2-3 hours*
Subject Integration: Science (HS-ESS3-1*) Math (CCSS.MATH.CONTENT.HSF.IF.A.1) and Technology (KC2) ELA (C.9-10.2)*
Justification: Science- students will explore the effects of natural hazards, climate change, and deforestation on the primary land growth in certain areas of the World. Math- Students must analyze the data in the graph. Then, they write an analysis describing correlation and use linear equations to make predictions. Technology- students will use what they have learned and their data from their graphs to create an infographic to increase public awareness of the effects of deforestation. Math and Science are a great fit in a lot of areas. Especially when you are interpreting graphs and predicting future data. It is important for students to learn that these are not isolated skills and they work hand in hand. Technology will be very beneficial to give students an opportunity to present their information and data and summarize their observations. ELA- At the end of the lesson, students will use their infographic that they created as their brainstorming stage of writing an essay that gives information and answers the performance expectation: *How has the amount of primary land cover changed over time and how will human impact affect the change in the future?*
Standards: Science- HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
Math- CCSS.MATH.CONTENT.8.F.B.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x, y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Technology- *KC2. Produce creative artifacts and make meaningful learning experiences from curated knowledge for themselves and others.*
ELA- C.9-10.2: Compose informative and/or explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization and analysis of content.

NGSS Performance Expectations *How has the amount of primary land cover changed over time and how will human impact affect the change in the future? What can we do?*

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Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts:
Constructing Explanations and Designing Solutions *Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories.* ● *Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations,	***ESS3.A: Natural Resources*** ● *Resource availability has guided the development of human society.* ***ESS3.B: Natural Hazards*** ● *Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations.*	***Cause and Effect*** ● *Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.* - ***Connections to Engineering, Technology, and Applications of Science*** ***Influence of Science, Engineering, and Technology on Society and the Natural World***

models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.		• *Modern civilization depends on major technological systems.*
Common Core State Standards: Math: CCSS.MATH.CONTENT.8.F.B.4 *ELA: C.9-10.2*		
Other Standards TECHNOLOGY: KC2		

Measurable Student Learning Objectives:

I can make observations from data.

I can identify primary land cover.

I can identify human and natural impacts on natural resources.

I can use graphs and equations to make predictions.

I can create an infographic that summarizes information.

I can write an essay that gives information about complex ideas.

Nature of STEM: *When thinking about the tenets of science that are used in this particular lesson, it is clear that the nature of STEM has been a major area of focus. Scientific knowledge is subject to change is one of the main tenets that I feel is covered in this lesson. It discusses how scientists have become more aware of the effects of deforestation since 2001 and how it can impact the wildlife and the environment in that*

area. Science is based on observations of the natural world. This tenet is addressed when students are to look at the graphs that show the satellite views of the primary land cover and make observations about the graphs. Science is inferential, imaginative and creative. This tenet is addressed when students are asked to make inferences about the information given to them in the lesson and then create an infographic addressing that issue. Science is subjective and theory laden. Based on our current knowledge of land use, there are many areas in the world that are being overused. Such as these areas that are experiencing large amounts of deforestation. As we learn more about land use and how to better coexist with our planet, deforestation will be less and less of an issue. Science is socially and culturally embedded. Deforestation and loss of primary land cover is one of the most socially and culturally embedded world wide issues in present times. The contamination of the water and the dust produced in the air are not only affecting the wildlife who use these forests as their home but also the people who live in that area.

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Engaging Context/Phenomena:

https://www.youtube.com/watch?v=6AVkjJKK3iE&t=34s

The above video is what I will use as the phenomena for this lesson. This will be the first thing the students will see. Students will be asked to make observations on this jamboard and then we will discuss those observations. After watching the video and discussing observations, the students will take a look at the data and then be asked to make observations from that using slide 2 &3 of the same jamboard.

Data Integration:

https://mynasadata.larc.nasa.gov/mini-lessonactivity/comparing-global-land-use-over-time-student-activity

This will be displayed for students to make observations out loud and on the jamboard slide 2. After observations are made, I will begin the discussion questions:

1. Which color shows the most primary land cover percentage? Least?

2. Where in the world would you expect to have the most percentage of primary land cover in 1900? Least?

3. Describe where you would expect to find the most percentage of primary land cover in 2100. Least?

The class will then focus on Africa images after that and make observations on slide 3 of the jamboard. Once again, we will discuss the observations and guiding questions:

a. *What do you observe in Africa for 1900?*
b. *What do you observe in Africa for 2100?*
c. *What are the differences?*
d. *What do these differences signify?*
e. *Since people have been more aware of the effects of deforestation in the last 20 years, what changes would you suggest may have happened?*

Differentiation of Instruction: *The engagement part of the lesson is based a lot on observations and discussion with visuals. This is something that is suitable for all learners. When it comes time to calculate the change of outside tropics and tropics, all students will work with a calculator and students with disabilities will be given this modified form that already has the numbers used for calculation and step by step instructions. The graph is a little difficult to read and this will help students that struggle with that. When it comes time to create the advertisement using canva.com students with disabilities will receive this word bank to help them spell words correctly. When writing the essay for the newspaper, the students with a disability will receive this graphic organizer to help them organize their thoughts.*
Enrichment: Students that need to be challenged will be assigned to use canva.com to make a commercial that will be uploaded to the school's Facebook page and their essay will include a section about the animals that lose their homes because of deforestation. These essays will be entered into this contest.
Real-life Connection: *Students will be submitting their essays and/or commercials to the newspaper, school Facebook page and an essay contest about the humane treatment of animals. Throughout the lesson, the students will also reflect on ways that they can make changes in their everyday lives to decrease the amount of trees that are cut each year.*
Possible Misconceptions: *Climate change has been an issue that has come to the forefront of politics in the last few years. Because this is such a political topic and the majority of the students at this particular school are conservative, they will sometimes make comments that climate change is not something that is affecting the primary land cover. Another misconception may be that children in a high school in a small county in Ky cannot make changes in the world.*

Lesson Procedure:

5E Model	5E Objectives
Engage *Video and data to make observations*	**Procedure:** *https://www.youtube.com/watch?v=6AVkjJKK3iE&t=34s* *The above video is what I will use as the phenomena for this lesson. This will be the first thing the students will see. Students will be asked to make observations on this jamboard and then we will discuss those observations. After watching the video and discussing observations, the students will take a look at the data and then be asked to make observations from that using slide 2 of the same jamboard.* **Modifications** *Students will be allowed to write observations or put pictures on the jamboard to record their observations if they struggle with writing.*

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Students will have prior knowledge of primary land cover and how natural hazards affect primary land cover, natural resources and the effects of using those on the biosphere, geosphere, global warming	**Standards Addressed** HS-ESS3-1: Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. **Formative/Summative Assessments** This phase is assessed by the observations and discussion from the jamboard. **Resources** *https://www.youtube.com/watch?v=6AVkjJKK3iE&t=34s (phenomena video)* *Jamboard (jamboard for observations and discussions)* https://mynasadata.larc.nasa.gov/mini-lessonactivity/comparing-global-land-use-over-time-student-activity (where I got the data and idea)

and climate change *Have students brainstorm what could have caused the difference in primary land cover and have the class focus on deforestation.*	
Explore *This section is when students will compare the tropics and outside tropics.* Students will analyze the data in the graph. Then, they write an analysis describing correlation and use linear equations to make predictions.	**Procedure:** *The teacher will show the students graphs that illustrate the forest loss in tropical areas since 2001 (https://rainforests.mongabay.com/08-deforestation.html). Students will make observations about the data but we will focus on the comparison graph of tropics and outside tropics. Students will then break off into groups. In their groups, they will need to perform equations to determine the change of deforestation from year to year and then use that information to determine the rate of change. They will use that information to make predictions on the forest loss in the tropical areas in 2050.* **Modifications** *All students will be allowed to use a calculator. If students have a severe disability that keeps them from reading the graphs correctly, they will have a modified graph* (the first sheet is for teacher use. Students will be given sheet #2 and #3. If students have a severe disability, they can work on the spreadsheet. It has formulas that will automatically do the math for them. **Standards Addressed** CCSS.MATH.CONTENT.8.F.B.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x, y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in

	terms of the situation it models, and in terms of its graph or a table of values. **Formative/Summative Assessments** *The graph sheet that students will work together on and determine the rate of change and predictions will be the assessment for this part.* **Resources** *https://rainforests.mongabay.com/08-deforestation.html (graph to compare and get data from)* *Assessment sheet- students will create this product. They will make a graph that shows forest loss for 2001, 2010, 2019 and 2050 (prediction). They will have used the graph in the lesson to collect this information.* Assessment sheet modified
Explain *Students will use canva.com to make an infographic to raise awareness about the effects of deforestation.*	**Procedure:** *Students have used canva in the past. They will be guided to create an infographic that shares the information that they have gathered about the effects of deforestation. They will include their data about the forest loss in the tropics compared to outside tropics. They will also need to include the prediction made about the amount of loss by 2050. The rubric will help students be successful.* **Modifications** *There is a different rubric for students with accommodations. They are allowed more pictures with captions and less written information. Also, students that need to be challenged will be asked to make a commercial and they will have a different rubric also.* **Standards Addressed** Technology- *KC2. Produce creative artifacts and make meaningful learning experiences from curated knowledge for themselves and others.* **Formative/Summative Assessments** *The assessment will be their finished product from canva using the differentiated rubric.* **Resources** www.canva.com , students will also use their graphs and information that they have collected so far as a resource

Elaborate *Students will use their canva infographic to write an essay to raise awareness of the effects of deforestation. These will be submitted to the newspaper and every student that wants to will be able to submit theirs to an essay contest.*	**Procedure:** Students will use this rubric to write an essay that will be submitted to the newspaper. If students want to, they can submit their essay to *this contest* about the humane treatment of animals and the effects of deforestation. Students will follow their differentiated rubric to make sure they include all the parts required of them. **Modifications** *Students that have a learning disability will have their infographic as a graphic organizer to help them with this essay assignment. Their rubric will be different as well. Students that need to be challenged will have a rubric that includes a section on the humane treatment of animals because of deforestation and their essay will be submitted for a contest. ALL students that want to join the contest will be allowed to.* **Standards Addressed** *ELA- C.9-10.2: Compose informative and/or explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization and analysis of content.* **Formative/Summative Assessments** *The essays will be the assessment and it will be graded with the rubrics.* **Resources** *Students will be provided all the websites that were used above in the lesson along with their infographic, students will also use this opportunity to do some research of their own and be introduced to https://scholar.google.com/ https://www.financialaidfinder.com/student-scholarship-search/student-scholarships-college-major/veterinary-scholarships/animal-essay-contest/ - contest*

Evaluate *Students will then complete the assessment on* how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	**Procedure:** *Students will then complete the assessment on* how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. *I like using quizizz to give the assessment but you can print them off also.* **Modifications** *Students with special needs will receive a modified version of the assessment along with a reader (if needed).* **Standards Addressed** HS-ESS3-1 **Formative/Summative Assessments** *Students will complete the summative assessment. This grade will be averaged with their essay grade (from the rubric).* **Resources** www.quizzizz.com - I used someone else's quiz and changed it a little to fit my lesson.

Teacher Background: *The teacher needs to know the following vocabulary terms that have been previously taught:*

Primary land cover- the surface cover on the ground like vegetation, urban infrastructure, water, bare soil etc.

Natural resources- materials or substances such as minerals, forests, water, and fertile land that occur in nature and can be used for economic gain.

Natural hazards-a natural phenomenon that might have a negative effect on humans and other animals, or the environment.

Biosphere- the regions of the surface, atmosphere, and hydrosphere of the earth (or analogous parts of other planets) occupied by living organisms.

Geosphere- any of the almost spherical concentric regions of matter that make up the earth and its atmosphere, as the lithosphere and hydrosphere.

Global warming- a gradual increase in the overall temperature of the earth's atmosphere generally attributed to the greenhouse effect caused by increased levels of carbon dioxide, chlorofluorocarbons, and other pollutants.

Climate Change-a change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels

The teacher will also need to know about the different types of natural hazards. Such as:
Land slides, floods, tornadoes, hurricanes, earthquakes, fire, drought and tropical storms
It would also be helpful if the teacher knew about some human created hazards such as deforestation since it will become the focus of the lesson. Students will have prior knowledge of primary land cover and how natural hazards affect primary land cover, natural resources and the effects of using those on the biosphere, geosphere, global warming and climate change