TREES
IN OUR FORESTS

BY HYE JUNG KIM

Why are trees important in our lives?

MIDDLE SCHOOL EIGHTH GRADE

TIMEFRAME THREE SESSIONS - 50 MIN. EACH

STANDARD BENCHMARKS AND VALUES

- Make sense of problems and persevere in solving them. (CCSS-SMP-1)
- Reason abstractly and quantitatively. (CCSS-SMP-2)
- Construct viable arguments and critique the reasoning of others. (CCSS-SMP-3)
- Model with mathematics. (CCSS-SMP-4)
- Use appropriate tools strategically. (CCSS-SMP-5)
- Attend to precision. (CCSS-SMP-6)
- Look for and make use of structure. (CCSS-SMP-7)
- Look for and express regularity in repeated reasoning. (CCSS-SMP-8)
- Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (CCSS.Math.Content.8.F.A.1)
- Compare properties of two functions each represented in a different way. (CCSS.Math.Content.8.F.A.2)
- Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. (CCSS.Math.Content.8.G.C.9)

- Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
  (CCSS.Math.Content.HSG.GMD.B.4)
- Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. (NGSS: MS-ESS3-5)
- Developing and Using Models (NGSS: MS-ESS2-6)
- Planning and Carrying out Investigations (NGSS: MS-ESS2-5)
- Stability and Change; Stability might be disturbed either by sudden events or gradual changes that accumulate over time (NGSS: MS-ESS3-5)
- Nā Ala ‘Ike: ‘Ike Pilina (Relationship Pathway)
- Nā Ala ‘Ike: ‘Ike Na’auao (Intellectual Pathway)
- Nā Ala ‘Ike: ‘Ike Honua (Sense of Place Pathway)
- Nā Ala ‘Ike: ‘Ike Kuana‘ike (Worldview Pathway)

ENDURING UNDERSTANDING

- We can mālama ʻāina by restoring our forests and educating others about the importance of our forests.
- We have the power to improve our honua.
- Climate change is occurring and the rate can be decreased by restoring our forests.

CRITICAL SKILLS AND CONCEPTS

Understand the carbon cycle and the human interaction within the cycle.

- Discuss the carbon cycle.
- Graph the atmospheric CO_2 levels and discuss the mathematical model.

Present various methods of calculation in both carbon footprint and also in carbon absorption from the trees.

- Cite the information source.
- Logically argue why their source is reliable.
- Work together to gather information.
- Prepare a presentation for the class.
- Use technology to help present their ideas to the class.

AUTHENTIC PERFORMANCE TASK:

- Collaborate in groups to find out how to calculate their carbon footprint and cite sources that the information came from. Reason out if it is a reliable source of that information.
- Research how many trees would be needed to offset the carbon footprint that is created by them and then present to the school community or create a video to share to the community at large. In this process, students will compare different tables of information and equations used to figure out how much carbon each tree absorbs.

AUTHENTIC AUDIENCE:

School community consisting of faculty, staff, parents, and other students. The University Laboratory School serves a population of students reflective of the Hawaiʻi population. Our students are from all over the island with varying levels of achievement and backgrounds.

OTHER EVIDENCE:

Models and graphs, organization of data. This will be dependent on what the students find in their research and how they want to present the data.

Here are some examples:
Models and graphs, organization of data. This will be dependent on what the students find in their research and how they want to present the data.
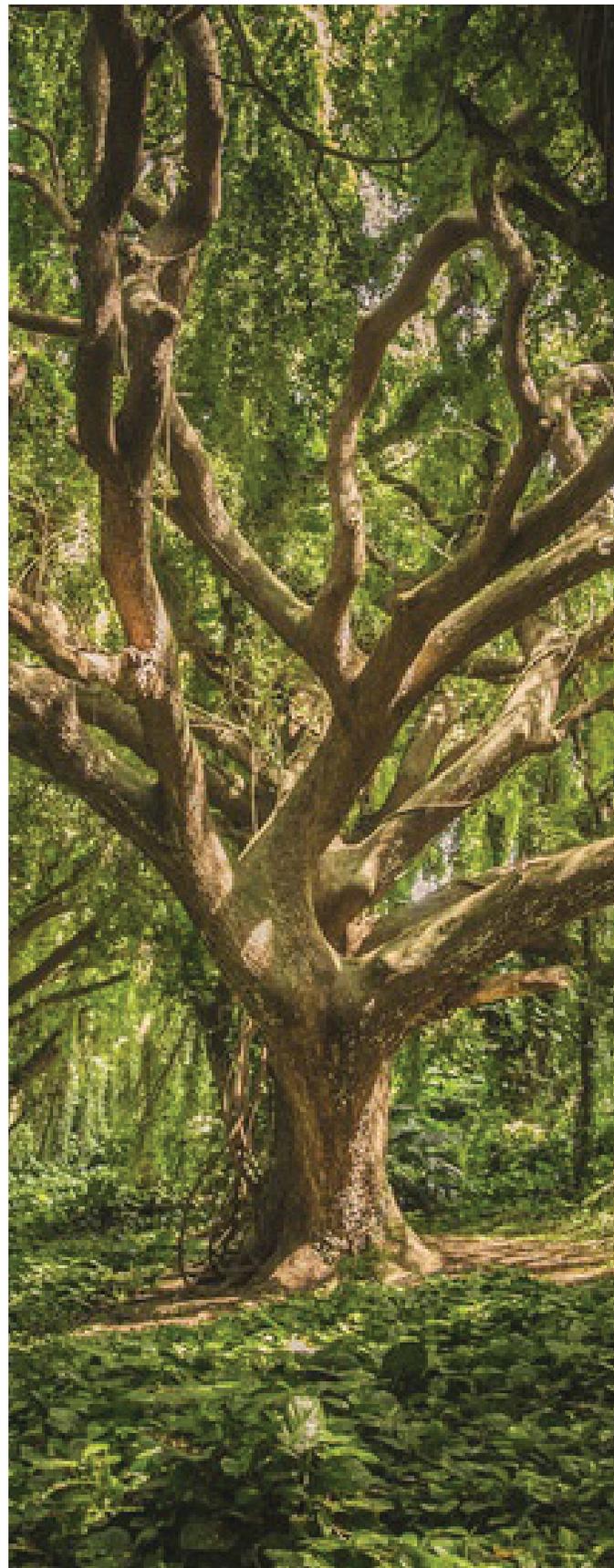
Here are some examples:
Flow Chart (URL: http://www.justgreencommunity.com/shifting-to-neutral-how-to-reach-a-state-of-carbon-neutrality/)

Table Representation (URL: http://2centsapiece.blogspot.com/2013/07/how-many-trees-does-it-take-to-offset.html) of achievement and backgrounds.

LEARNING PLAN

1. Students make predictions on how much carbon a tree can hold (on average) using the calculators that they have researched (see below for a few examples). Facilitate a class discussion on what makes sense and how it can vary depending on the various sizes of the trees. Discuss measurements of trees and what makes sense in terms of carbon calculation. Review terminology such as circumference, diameter, etc. Discuss calculation of height of tree; what are some of the realistic obstacles in doing so? What could we do instead to figure out the height? Discuss proportional reasoning.

Sample Sources:

Trees' Carbon Sequestration
(*URL: https://www.americanforests.org/assumptions-and-sources/*)

Tufts
 (*URL: http://sustainability.tufts.edu/carbon-sequestration/*)

Carbon Offset Calculator
(*URL: http://treescharlotte.org/support-us/carbon-offset-calculator/*)

Carbon Footprint Calculator
(*URL: http://www.americanforests.org/discover-forests/carbon-calculator/*)

2. Students research various methods to calculate how much carbon a tree holds.

3. Share the different calculations of carbon based on dimensions measured on a tree then discuss the different functions/relations being used when doing the calculation.

4. Revise the method of carbon calculation based on discussion.

5. Students will calculate, through various methods, their carbon footprint. The class will then collect all the data from the class and then analyze the data given. Discussion of which statistic would be useful in which case.

6. Start to prepare the presentation in the format of choice.

7. Research and discuss number of trees that are needed to offset their carbon footprint.
(URL: http://www.nature.org/greenliving/carboncalculator/)

8. Give a presentation to the school community and interested community members about what their findings are or share the videos to the community.

	Does not meet expectation	Meets expectation	Exceeds expectation
Logical Reasoning/ Critical Thinking	When evaluating sources for the information found, the student does not consider the credibility of the site and does not make sense of the calculations provided in the resources.	The student evaluates the data and the various calculations that are presented in the sites that they research. Student makes sense of the calculations and justifies the outcomes.	Student works through the site and carefully evaluates the sources of information that is provided on the site. Student has an understanding of the calculations and also the limitations of the carbon calculations provided on the sites they research.
Communication of Ideas (Presentation)	Does not articulate the research and results in a comprehensible manner. Did not have valid conclusions drawn from their research.	Articulates the research and presents the conclusions and gives some details to back up the conclusions drawn.	Creative presentation to deliver their research and backs up their claims and conclusions with their sources. Clearly articulates their findings of their carbon footprint and how it was calculated.
Participation in Discussion	Does not participate in the group nor class discussions. Also does not listen carefully to others.	Is attentive to others' ideas and contributes to the discussion.	Carefully listens and responds to others' ideas and contributes their point clearly. Heavily involved in the discussions that are happening in the classroom