

LESSON TITLE: \_\_\_\_\_Lesson 1: Intro to ES and Sustainability\_\_

\_GRADE: <u>9-12</u>

**Amount of Preparation Needed Prior to Class:** 15-20 minutes to review the resources. Review the Ecological Footprint Activity Now. Students may need it well in advance to get

and accurate calculation of their footprint.

### Learning/Lesson Plan

## **Environmental Concept**

NGSS Standards: For more details on the standards and clarification statements click here: <u>NGSS</u>

<u>HS ESS3-</u>3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

<u>HS ESS3-4</u> Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. (on individual level)

<u>HS ESS3-5</u> Analyze geoscience data and the results from global climate models to make an evidencebased forecast of the current rate of global or regional climate change and associated future impacts to Earth systems

• <u>DCI ESS3.D: Global Climate Change</u> Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

# **Objective(s) and Essential Questions**

(What will a student know [content] and be able to do [skills/process]? Overview: The purpose of this lesson is to give students an overview of the major causes of environmental issues. The themes discussed in the first lesson will be revisited on several occasions throughout the course.

- Define sustainability and the discuss the challenges of achieving it.
- Be able to effectively communicate the terms sustainability using a picture or diagram.
- Identify and discuss the issues surrounding our ecological footprints and the factors that impact it.
- Give examples of economic, political, and ethical concerns in environmental science.
- Explain how different worldviews create challenges as we strive for a sustainable Earth.

• Describe "tragedy of commons" and give examples of how it can occur. **Essential Questions** 

• What are some key factors of sustainability?



- How are our ecologic footprints affecting Earth?
- What causes environmental problems and why do they continue?
- What is an environmentally sustainable Earth?

### **Assessments Summative and Formative**

(What strategies will be employed? How will we know instruction has been successful?)

- Bell Ringers
- Exit Activities
- Mini Quizzes
- Discussions
- Lesson 1 Assessment (Summative)

## Materials Needed

- Beach Ball
- Computer
- Projector or a way to share a presentation
- Access to a computer lab or iPad cart or some other mean to do research
- Colored Pencils
- Graph Paper
- Assorted Paper/Poster Board
- Paper Straws (plastic will work but this is an environmental science class, check your cafeteria if you do not have any on hand)
- 2-3 Bag of Kidney Beans or a Big Box Goldish Crackers

Setting the Stage/Beginning the Lesson/Engagement\*

(How will new learning be introduced? How will students get motivated/excited regarding new learning? How will prior knowledge be tapped and assessed?)

**First Day Procedure**- Have assigned seats (Project them or label the desks). It is helpful to build a chart digitally so when you create/recreate it you can drag the names around and print for a substitute and yourself. Have two index cards on their desks. See slide 2 of the Lesson 1 presentation. "Collect the index cards. The set with the names on it you can use to call on students in a fair, random way. It is also super helpful and quick to use them for lab groupings. You can "stack the deck" and strategically pick the lab groups and it seems completely random to the



students. The other index cards are good to keep on file and review regularly as you build positive student relationships."

After collecting the cards, take a moment to address your top 3-5 procedures. (Examples: Cell phone policy, late policy, and other expectations that you have. There is a training on classroom management in the training area that would be good to preview before heading in for the first day). Depending on your first day schedule. You may not get to start into day one of the curriculum yet, but you have a plan if you have time and can get started.

**Day 1 [Engagement]** – Introduction to Environmental Science-See Slide 3. Have a piece of paper or their Lesson 1: Guided Student Notes waiting for students as they enter. Have the students answer the questions from slide 3 (projected) on their paper. Establish a procedure for sharing answers. I like to use the index they create to call on students randomly. (They are usually shy on the first day)

Day 2 - Students will complete 1.1 Sustainability Bell Ringer

Day 3 – Students will complete the 1.2 Sustainability and You Bell Ringer.

Day 4 – Students will complete Bell Ringer 1.3.

Day 5 - Students will complete the Bell Ringer 1.4

**Day 6 -Vocabulary Quiz** (terms from the Quizlet Only). The ecological footprint terms are assessed within the activity. The teacher may choose to review the vocabulary using Quizlet Live or printed flashed cards prior to the vocabulary Quiz. You can print flashcard from Quizlet.

Day 7- Begin Review ASAP to save time for going over it and questions.

Acquisition of Skills/Developing the Lesson/Exploration\*/Explanation\*/ Elaboration\* (What will Modeling, Guided Practice, Independent Practice, and Checking for Understanding look like?)



**Day 1:** Present slides 1-17. Students should complete their Guided Notes as you present the content. **Presentation tips:** Review the slide prior to teaching the for the first time. Bring enthusiasm to the content. Make personal connections and share them with your students.

- **Day 2:** Students will complete the Sustainability Activity 1.1. The teacher will present the Sustainability Activity Presentation 1.1 (Review the presentation notes for some tips). This activity has students creating a design that communicates the term sustainability. Each student will need 2 pieces of paper and at least 5 colored pencils each (they may need to share).
- **Day 3:** Use the index cards with students' names to break the students into groups of 3 or 4 to complete the **Tragedy of Commons Activity 1.2.** For this activity, kidney beans or Goldfish crackers can be used. The beans are reusable and do not have granules of salt that get can cause students to cough. Some students may not want to participate as a "fisher" you can assignment them the job of "Fish Commissioner" and have them ensure students are following the rules and issue fines/warnings. See activity teacher notes for tips. This lesson can be adapted to using spoons instead of straws.
- **Day 4:** The teacher will present slide 17-34. Students will engage in discussion several times throughout the presentation. Students could complete the discussions as "Think-Pair-Share"
- **Day 5-** (Before class, trace and cut out a footprint). Place the footprint in a highly visible spot in the classroom or hold it up to the class. While pointing out (or holding up) the footprint, tell the student to think about the footprint. Give them a minute then let them do a gallery/graffiti walk with the questions you previously hung around the classroom. Let them know at this point there are no right or wrong answers. (See "Teacher Preparation" section for question examples.
- After giving the students about 15 minutes for the gallery walk, discuss some of the answers written. This would be a good time to review the vocabulary: primary footprint, secondary footprint, carbon offsets, and carbon credits. (10-15 minutes). See the Ecological Activity for more notes. Students will complete the Ecological Footprint Activity. See teacher notes within the activity. You will need to read through it ahead of time.

Day 6 – Finish the Ecological Footprint Activity



Day 7 Review Day(s)- Complete the Lesson 1 Review.

Day 8 - Assessment

Closing the Lesson/Summary of Learning/Evaluation\* (How will learning be explained, summarized, applied to assure student understanding?)

Day 1 – Students will complete and discuss the questions slide 17 of the Lesson 1 Presentation.

**Day 2** – Students will do a gallery walk or simply share their design with the class. If time permits to do the gallery walk, give students a one sticky note and have them place them on the design they like the best or give one person a compliment about their design.

**Day 3** – Discussion of the students' research of the Tragedy of Commons.

Day 4 – Beach Ball Activity (click here to see my post on how to do this activity)

Day 5 – Students will play Quizlet Live or you can go to the Quizlet set and print the flashcards if students do not have access to devices to play Quizlet Live. You can also quickly create and print Quizzes from Quizlet.

**<u>Quizlet Link</u>** Remind students to study their vocabulary for a vocabulary quiz tomorrow. They can also access the Quizlet by sharing the link with them.

Day 6 – Class Discussion: Use the name card to call on students. Give the students one or two minutes to write down their answers to the question: What are two things you can do today to reduce your ecological footprint?

Day 7- Students will go over the test review and ask questions about concepts they do not understand. If time permits complete a Quizlet Live to Review Vocabulary.



# Differentiating the Lesson Differentiations will be based on students' needs

Higher Differentiation – For the quizzes and test remove the word banks. Student can write an essay on their Worldview and why they hold that worldview. Students can also create a presentation about their world view and try to convince the class to have the same worldview.

Lower Differentiation- Use the modified versions of the quiz. Strategically group students and possibly have them submit a group packet for Tragedy of Commons. Strategically partner the students when completing the ecological footprint activity. Include more in class study time.

#### Learning/Lesson Reflection

(What went well? What may need revision the next time I use this lesson? How did students react? etc.)

#### Learning/Lesson Extension

(What web sites, references, field experiences, related topics, or activities might offer enriched or enhanced learning opportunities?)

- 1. **Mini-project idea**: Students create a poster displaying realistic ways an individual can reduce their ecological footprint.
- 2. Calculate the ecological footprint of your class, cafeteria, or whole school.
- 3. Calculate the ecological footprint of a small business within a mile of your school.

Create a tracking system for tracking your personal or your family's carbon footprint. Track it for the entire school year. Teachers, an end-of-the-year contest will encourage students to reduce their ecological footprint.