

2. Engineering Design Lesson Plan (10 points) Protocol:

Create an engineering design lesson plan for your students. The lesson plan should engage the students in “hands-on” learning through use of the NASA engineering design process to solve a problem. The lesson should contain an appropriate “challenge” for the students and a discussion of the content (STEM) needed by students to solve the problem. Your lesson plan should include:

- Grade level and topic
7th grade life science

- Objectives

Design a method of seed dispersal that would carry a lentil seed the furthest

- Content (scientific principles, design process, etc.)

- Methods of seed dispersal
- Plant reproduction
- Structure and function
- Engineering design process

- Assessments

- Dropping the lentil seed and transport system in front of a fan and seeing which design travels the furthest

- ***SOMETHING RELATED TO ARGUMENT... PERSUASIVE EXIT TICKET?

Grade level and topic:

7th grade life science

Focus Question:

How do the structures of plants (including seeds and their parts) affect their function of reproductive success?

Instructional Objectives:

- SWBAT understand how plants disperse seeds
- SWBAT design a model of seed dispersal utilizing the engineering design process
- SWBAT test their design and address issues
- SWBAT utilize data collected from call to construct an explanation of how structures and functions of plants (and animals) affect reproductive success of plants

Key Content:

- Methods of seed dispersal (wind, sticking to or being eaten by animals)
- Plant reproduction
- Structure and function
- Engineering design process

NGSS: [MS-LS1-4 From Molecules to Organisms: Structures and Processes](#): Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

Challenge: Students will create a method of seed dispersal that can carry a lentil seed the farthest. Challenge information for students: Students have to collaborate and design a blueprint. Students have to drop (NOT throw!) their transport system in front of a fan (all from an agreed upon height so as to keep it consistent). Students can only utilize materials available to everyone- tissue paper, popsicle stick, egg cartons, construction paper, glue, stapler, tape, scissors, etc.

Time	Student/Teacher Actions
2 minutes	I will introduce myself to students, and I will hand out index cards and markers for students to write their names on.
1 minute	I will ask students if they have had lunch yet, what they ate/are going to be eating. I will then ask students if they know where that food came from, and what the food is used for within their body.
1 minute	I will call on 4 students to assist me in a demonstration about the 10% rule. Students not assisting will observe the demonstration. Students who are assisting me will be given a sign to wear that says their role in the ecosystem, but they can only put the sign on once I tell them to.
1 minute	I will explain that I am the sun, and I am the source of energy. I will explain that a bottle of water represents the energy that comes from me.
2 minutes	I will explain that I give 100 mL of energy to an organism, and will ask students in the audience to try to pick who will receive my energy first (the orchard grass). I will pour 100 mL of water into a graduated cylinder, then pour that liquid into a beaker and will ask the student in the orchard grass sign to hold the it (in the front of the room). I will ask students in the audience if they know what kind of organisms gets energy from the sun (plants, producers, autotrophs).
2 minutes	I will explain that something is going to eat the orchard grass, and have a student from the audience see if they can pick out who will eat the orchard grass (the rabbit). I will ask ask students if they know the name of this type of organism (consumer). I will ask students that when the consumer eats the producer, does it obtain all the energy? (<i>No- if students say yes, I will reveal that it actually doesn't- it obtains about 10%</i>). I will tell students we will revisit this idea later, and will discuss where the energy goes. I will ask students to calculate what 10% of 100 mL is. Once a student says 10, I will pour 10 mL of water and give it to the student wearing the rabbit sign to hold in the front of the room.
2 minutes	I will explain that consumers can be eaten as well, and I will ask students who they think will eat the rabbit (the coyote). I will ask students the same question- when the original consumer is eaten, does the secondary consumer obtain all the

	energy? (<i>No- only 10%</i>). I will ask students what 10% of 10 is, and once a student says so, I will pour 1 mL for the coyote.
Assessment: Questioning throughout lesson, engineering notebook,	
Instructional Resources Needed: fan, tape, markers, tissue paper, popsicle stick, egg cartons, construction paper, glue, stapler, tape, scissors, <i>**any household/art supplies available to the teacher should suffice!**</i>	