LESSON PLAN TEMPLATE – Classroom Interactions – Spring 2015

Teach Date: 4/9 70min	**Names of Student(s) teaching:** Kira Lowery
Teach Time/ - Thursday 1st period (late start)	**Big Idea/ Enduring Understanding for the lesson:** Life is powered through sunlight either directly or indirectly. The energy that is captured from sunlight is what is used to drive production of energy-rich organic compounds in plants through photosynthesis. The organic compounds made are the biomass of the ecosystem. The biomass in an ecosystem can be referred to as net primary productivity, which is the net energy, captured and stored by the producers. This energy is then the available (free energy) that can be passed from one trophic level to the next. The net primary productivity comes from the total gross primary productivity. Which is the amount of light that was captured and converted to chemical energy. The net productivity comes from the gross primary productivity minus all the energy that is used during cellular respiration, which is ultimately released as heat. Plants are the main role of produces, and use the biomass to power their life processes or to store energy. Plants are then consumed or decomposed and their stored chemical energy then powers other organisms. Biotic systems run on energy and therefore are fundamental to ecological interactions.

TEKS for lesson:

2A1: All living systems require constant input of free energy. •
2D1: All biological systems from cells and organisms to populations, communities, and ecosystems are affected by complex biotic and abiotic interactions involving exchange of matter and free energy. •
4A6: Interactions among living systems and with their environment result in the movement of matter and energy.

Objective/s- Write objective/s in SWBAT form… The SWBAT: Calculate the energy transferred Determine the amount of calories per gram Describe why energy transfer is a inefficient process	**Assessment:** What will you accept as evidence of student progress toward your lesson objective? Student's abilities to analyze the data they find during their experiment.

Overview of Activities: In the space below please provide a general overview of the various activities/events you will ask students to engage in during the lesson. *Please include the estimated time for each event*.
Ex. *Engage students by asking T/F questions about osmosis to pique curiosity and assess prior knowledge. Have students post their responses on the board (15 min)*

15min- Intro: Students will discuss what Calories are and how they are calculated. Then we will discuss their thoughts as a whole.
10: Instructions: Students and teacher will go over the lab procedure and instructions
20min- Lab: Students will use a homemade calorimeter to calculate the calories from one Dorito.
15min- Analysis and Discussion: Students will answer questions based on the lab and discuss as a class.
10min- Class discussion of results obtained in lab from each group

Lesson Sequence Rationale / Things to Think About

Consider the questions below as you plan your lesson. Give a brief response to each to question as a way to clarify your thinking and provide your reviewers with insight into the reasoning behind your lesson planning

1. How did you decide on this lesson sequence and why do you feel this sequence will support student learning?
   This lesson was decided to begin as a lab because it's a great way to actually visualize energy transfer. Students will be doing hands on measurement of energy and therefore they get to see that this energy transfer process is not really that efficient. The concepts that follow about how energy transfer flows through an ecosystem are going to be addressed on Day 2 through looking at energy in food chains and a handout that will help them follow up on the concepts. Doing the lesson this way helps get students thinking and visualizing a process that is hard to understand.

2. What are the big ideas of this lesson and how/when will they be expressed?
   The Big ideas for Day 1 are that energy comes from all difference sources, but the process of energy transfer is actually not that efficient. Students will also think about how and where energy is stored and then how is energy used. The students will use the calorimeter to visualize the process of energy (calories) that is emitted from a Dorito in order to heat up a gram of water. They will look at how this relates overall to energy, and where the energy in the Dorito came from. After experiment they will answer analysis questions that help them relate this energy found to energy transfer.

3. How will you introduce the lesson and task(s)? Engage students? Find out about prior knowledge?
   I hope to introduce the lesson and tasks by starting with examining the Dorito nutrition on the back of the package. I want to help students see that these Calories are the same as little calories. I want students to think about where these Calories come from and what Calories provide for those who consume them. Also I want to engage students by showing them a short experiment I actually got to see as a UT freshman…the growling gummy bear! To find out prior knowledge I will have the students address the questions about Calories and where they come from so that I can get an understanding of what they know about how calories relate to energy.

4. How will you maintain engagement of all students? For example, consider students who:
   a. -struggle with task
      During the activity, the teacher will walk around, for students who struggle with the task, it is important to help them learn the concepts by using what they already know. I hope to help students see this energy transfer as a process that occurs everyday. I would try and help them understand through the process they can relate on how calories affect their body. Too little calories, you don't have enough nutrition to sustain life and too much you store as fat.

   b. -race through task
      There are checkpoints for these students, so the teacher must approve a student who is racing through tasks before the student can move on. Therefore, if there isn't proper understanding or a good quality of work, the student must continue to work. If the student understands the concepts and moved quickly because of this, the teacher can assign a more difficult task, or require them to help other students (have to be careful here because you don't want them to do another students

work).

c. -express an idea that is hard to understand
If a student brings up difficult idea to understand (i.e. where does lost energy go? How is energy used inside the body?) then this is an important concept that can be broken down into parts to help identify an understanding. It could be something that you allow that student to research on their own, and then you can work with them individually on the hard to understand concept. I think it's important to work through hard concepts like puzzles, as a team/class

d. -express an idea that is different from direction of lesson
Address the idea, and try to have the student come up with a way on how it relates to the topic of the lesson. Don't spend to long on it however.

e. -are learning English
Have multiple forms of the lesson, (i.e. written on board, oral explanation and sheets for instructions.)

f. -are off task
Address the student that is off task, and help them get back on task by working with them.

5. How will you set up/pose the task(s)? How will you communicate your expectations?
The tasks are set up so that students will work through the procedure for the labs, and then they will use their data to analyze further questions and calculate the calories in one Dorito.
I've created a PowerPoint slide with the instructions for the lab and for the analysis portion. I also have made a handout for the students.

6. What questions will you ask to find out how students are thinking about the task(s)? What questions might you ask to extend students' thinking?

- Where did the energy stored in the Dorito originally come from?
- How does your calculated kilocalories/gram compare to the kilocalories/gram on the package of Doritos? Is it the same? If not, what are some possible reasons why these are different?
- During what process was this energy stored in the Dorito, & where specifically was it stored?
- Corn is the main ingredient in Dorito's. What simple sugar made by plants is a common source for stored energy?
- Which group of macromolecules would a Dorito contain --- carbohydrates, lipids, or protein?

- How are Doritos used to in a food chain?
- Where does the corn get its energy? Or rather what is the original source of energy?

7. How will you transition from one lesson segment to the next? How will your wrap up the lesson at the end and help students summarize the main idea/s?
   The transition between the intro and lab comes with the PowerPoint and showing an example of a larger calorimeter. The transition from the lab and the analysis comes from the questions and calculations students will perform. To wrap up the questions will be divided among the groups and then we will have a round table discussion going around to each group. To discuss the analysis questions, and then we will think about how this process of energy transfer is inefficient.

8. How will you facilitate a discussion of the big ideas that reveals student thinking? What is the structure of this discussion? Groups? Pairs? Whole class? Combination?
   There will be a group discussion in the beginning of the lesson for students to think about Calories, what they are and how they are found. This will be done at tables but then discussed as a class. During the lab the students analyze their data with their partners. Each must answer the questions on the handout, and then as a class we will divide the questions and have groups discuss their findings.

9. What kinds of artifacts will you require? How will those artifacts be used in the lesson?
   Artifacts collected during this lesson will be the handouts from the calorimetric lab and the PowerPoint with addition of student answers.

10. Work through (solve the problem, conduct the experiment, explore, etc.) the task yourself and predict what students might do. Play around with it. See if you can find alternative, viable pathways through the task. Describe what you learned from doing this.

Experiment was tested, and the set up was recorded. The issue with performing the experiment outside is wind. If the wind is a large factor then the Dorito could burn out before being completely burned. IT is best to do the experiment in a classroom with windows.

LESSON EPISODES (In segments. No set number.)

In writing a description of your lesson, it should be detailed enough that someone else can read this document and envision the lesson as it is going to play out in the classroom. *Please add more rows as needed.*

Estimated Time	**Segment title/ description**	**What teacher is doing <u>step by step</u> (*Include specific questions that the teacher will ask*)**	**What students are doing (*consider transitions to the next segment and grouping*)**
15 min	Intros and Engagement	Introduction: Say who I am and why I'm here. "Before beginning I wanted to establish a way of getting your attention during the class. Whenever I raise my hand in the air and say "Raise your hand if you can hear my voice" I would like you to put your hand in the air and just focus your attention towards me. I know it can get loud once we start working in our groups so this is just a way to get everyone's attention" Pass out a packet with the questions below and available space for students to write. "The handout I'm passing out is for you to use throughout this introduction to answer the questions being asked and to take any additional notes. When key terms come up be sure to write them down so that you can use them later today!" "On your table you have some packets of Doritos, take a look at the back of the package." Split the questions up between tables: "With your table I want you to discuss what you a calorie exactly is. What exactly are Doritos made of? What is the main ingredient? And lastly, how do you think we determine the calories on the back of the package of Doritos?" "What do these calories do for us?" "Write notes down for each of these questions because we are going to talk about your answers after, okay you have 5min to do this." Show the questions on a power point slide. After 5min collect each tables ideas on the questions asked and type their answers on the power point slide. "The Calories you seen on the back of the package of Doritos are actually a unit of energy, however this unit of	Students think with their table about what Calories are and how they are calculated. Students will take notes during the introduction over the questions being asked. Students explain the answers for what they think Calories are and how they are determined.

		energy is normally represented as calories with a lower case c. The Calories on the package of Doritos are actually kilocalories, What does kilo mean? A multiple of 1000, that means that a kilocalorie is 1000 little calories. Someone tell me how many kilocalories are in the package of Dortios." "So I'm going to show you a quick video actually from a chemistry class I took at UT" https://www.youtube.com/watch?v=IBO3-n5Kim8 What's being shown here is actually how much energy is being given off as heat from the gummy bear, a similar process works when we consume gummy bears, or any kind of food, All foods contain energy, but the amount of potential energy stored will vary greatly depending on the type of food. Moreover, not all of the stored energy is available to do work. Stored energy is also known as, potential energy. When we eat food, our bodies convert the stored energy, known as Calories, to chemical energy, thereby allowing us to do work. Food is a source that allows us to access a form of energy. Available energy, or energy able for use, is known as Free Energy. A calorie is the amount of heat (energy) required to raise the temperature of 1 gram (g) of water 1 degree Celsius (°C).	
Resources for this segment & SAFETY considerations		No safety concerns	
10 min	Instructions	"Today we are actually going to measure the energy given off by a Dorito through the use of a homemade calorimeter. Before beginning though I want to go over the experiment so that we all know exactly what we need to be doing."	Students will be reading instructions and procedure before beginning lab

		Pass out the instructions and packet. Using the PowerPoint and have a handout in hand to go through. Call on students to read different portions of the instructions, materials and procedure. Have one student read two steps on the procedure. Use the PowerPoint pictures to show how each step works. Show both Table 1 and 2 that students will be filling out on the PowerPoint. Explain what the students will be obtaining in lab in order to solve for the data in Table 2. Today you will be working in groups of three. The groups assigned are seen on PowerPoint.	
Resources for this segment & SAFETY considerations		Safety concerns with fire And sharp tools	
20 min	Gathering materials and Set up	Students will follow the instructions on hand out to make sure the have the materials they need. "In this lab you will be working as a group of three. Your group must have a bin of materials. This bin should include the following: Materials in bin: ● Several Doritos ● 1 Calorimeter (1 soda can, pre-cut in half) ● A 100mL graduated cylinder ● Several large paper clips ● Metal Thermometer ● Foil ● Picture Instructions	

		Your group will also need to use materials that will be shared among the class. These are stated below: Materials shared among entire class: ● Electronic Balance ● Lighters ● Water Read the procedure below thoroughly before beginning the experiment. Follow the procedure with your guided pictures provided to each of your groups." Each group of students will get a packet of pictures to help them through the procedures. Students will go through experiment and fill in the results for Table 1. Teach will walk around and help students. Helpful questions: What was the change in temperature? What was the mass of the Dorito after burning?	Students will work through the following Procedure: PROCEDURE: ZERO the Balance before use. (Press the on/off/zero button) 1. Take the mass of the paper clip; record your weight in **Table 1.** 2. Break a portion off from a single Dorito (about 1/3 of the entire chip). Weigh the piece of the Dorito. Try to obtain a weight between 0.60grams and 0.70grams. (If the piece is too big break a smaller one off, or if it's too small break a larger piece off. Try to get into this range of weight.) **Record your weight in Table 1.** 3. Take the mass of the piece of foil inside your bin. **Record in Table 1.** 4. Using your graduated cylinder obtain 100mL from the teacher. 5. Pour the 100mL into the bottom half of your soda can. 6. Take the initial temperature of the water. Do this by placing the thermometer in the water and wait for 2min and then **Record in Table 1. (In Celsius)** 7. Place the piece of foil down flat on the Table. 8. Shape your paper clip into a shape similar to the one provided on the picture instructions. Work with the shape to provide a stable balance for the part of your Dorito to rest on (as seen in the picture). Place your paper clip design on top of the piece of foil. 9. Rest your Dorito portion on the paper clip. 10. Once you have this design, and your Dorito is stable, obtain a lighter. 11. Light the Dorito on fire so that it is able to burn completely. (Hold the lighter on the Dorito for about 20 seconds) 12. Once your Dorito is on fire, place the top portion of your can completely over the Dorito-Paper Clip apparatus. Then immediately place the bottom half of your can on top of the top portion. Keep the thermometer in the water the entire time. 13. Let your Dorito burn completely (observe through slits in the can). Once it has stopped burning completely, and the temperature of the water has been constant for more than 25 seconds, record the final temperature into Table 1. 14. Let the apparatus sit for 1min, then carefully remove the can pieces. Take the Dorito-Paper Clip apparatus on the foil and weigh the mass of the entire apparatus (including the foil). Record data into Table 1. 15. Clean up all materials: a. Throw away your burned materials (foil, burnt chip, paper clip) b. Place all your materials back into your in (cans, extra paper clips, graduated cylinder, thermometer) c. Eat the rest of your chips while working Data Table 2 below
Resources for this segment & SAFETY considerations	□ If students have long hair, make sure it is pulled back. You don't want your hair to catch fire. □ If Students have long sleeves, or any loose clothing on make sure to pull them up so they don't catch on fire.		

		□ Do not touch the hot end of the lighter. □ Do not wave the lighter around or misuse the lighter □ Be careful touching your calorimeter after the experiment. Wait 1min at least before dismantling your calorimeter. It could be hot.	
15min	Data Analysis and Questions	Students will calculate the data for Table 2, and answer the following questions ● 1.Where did the energy stored in the Dorito originally come from? ● 2.One Dorito has 12 kilocalories. Calculate the calories for one Dorito. Using this value: If your Dorito piece is about 1/3 of a whole Dorito chip, how many estimated calories should your portion of Dorito have? ● 3.Using the answer from question 2. How does this compare to your value found in data Table 2? Is it the same? If not, what are some possible reasons why these are different? ● 4. During what process was this energy stored in the Dorito, & where specifically was it stored? What is the name for stored energy? ● 5.Compare the mass of your piece of Dorito before burning and after burning. If the masses are different briefly explain why this could be? ● 6.In this experiment, discuss what happened to the energy stored in the Dorito.	Students will use their data to calculate the data for Table 2 and then use that data to answer questions that help them relate the experiment to energy transfer in an ecosystem.
Resources for this segment & SAFETY considerations			
10min	Class Discussion	Using the questions above, provide them on PowerPoint slide. Teacher will call upon different groups to talk about what they found for each question. Ask other groups if the disagree or agree.	Students will explain the answers they got for the questions in the lab.

			As a whole the class will look at each of the answers and the answers will be recorded on the PowerPoint slide by the teacher.
Resources for this segment & SAFETY considerations			