Popcorn Energy Flow Lab

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Introduction: This activity requires the students to build 3D models of energy flow through an ecosystem. The most powerful part, instructionally, occurs when I have them teach me about energy flow using their models. During these interchanges they see that there is a top to the pyramid, not because their teacher said so or because of the picture in the text, but because of inherent inefficiency in energy transfer between trophic levels. Popcorn is messy, but very useful because each piece can be easily broken to obtain the amount needed to move up the pyramid.

Georgia Performance Standards: SCSH2, SCSH4, SB4 A and B

Time Considerations: 1 to 1.5 50 minute class periods, depending on number of groups.

Materials:

- One bag of ready to eat popcorn per group- I use Smartfood unless there is a cheaper generic version available.
- A variety of containers to represent trophic levels-I use whatever is on hand, but some examples are plastic cups, plastic petri dishes, paper bags, Ziploc bags, old film canisters, etc. I stick to plastic so the kids don't need goggles.
- Several electronic balances set up around the room so students can calculate the "amount of energy" proceeding from one level to the next.
- Broom and dustpan
- Clorox wipes (the waste energy gets all over the lab tables and leaves a greasy residue)
- Fun Stamp-I have them teach me about energy flow and then ask them difficult questions. (What or who in an ecosystem is represented by this level? Why does only 10% make it from one level to the next? Why is there seldom more than 4 trophic levels?) If they are successful, I put a stamp on their sheet-and then they are allowed to answer the questions in the lab packet. This makes grading easier when they submit the handouts.

Issues: The students get frustrated initially, because there is no one formula for success. Frequently they forget they need to mass only the energy and *not* the container they have on the balance. So, remind them to subtract. Overall, this has proven to be a great way of making sure the students are understanding energy flow as opposed to only memorizing the diagram in the text.

Dr. Scott

Biology

Popcorn Energy Flow Lab—30 points

Directions: In this lab we will create a model of energy flow through an ecological system. We will use popcorn and various containers to represent energy flow through each trophic level. You will need paper and a calculator. You will get lots of practice converting to metric, within metric, and calculating percentages.

1. You will need to work in groups of 2 or 3. You may choose your own groups—but choose wisely! There will be much opportunity for distraction! Each group should have a leader, sweeper, and time keeper/measurer.
2. Obtain 1 bag of popcorn from the Energy Supply area. Be sure to note special information on the bag (i.e. mass or volume). This information may prove useful when you need to perform calculations. DO NOT THROW THE BAG AWAY!
3. Select containers from the materials at the trophic building supply store. You will use these to build a model of energy flow. You might want to consult the energy pyramid on page 72 as you are planning.
4. Work to create a model of energy flow using your materials. You must write up your procedure such that another scientist could replicate your model. This means each step needs to be justified and explained thoroughly.
5. Special hint---remember only 10% of energy that enters a system makes it to the next trophic level. You need to be able to quantify the amount of energy that leaves a system as waste and that which makes it to the next trophic level. This is where the balances and calculator come in.
6. When you are satisfied your model, you will need to show it to me, and walk me through it as if I were your student. I will sign your sheet, and then you will be able to take it home to complete your calculations.
7. Each student will submit a completed lab hand out.

In our Model, energy is represented by _____ and trophic levels are represented by _____.

How did you calculate the amount of energy lost between trophic levels in your model? Provide an example here.

Steps for conducting our Energy Flow Model:

A Diagram of our Energy Flow Model—complete with numbers (i.e. What percentage makes it to each trophic level?)

HOW WE KNOW our energy flow model is representative of energy flow in nature:

Why did Dr. Scott have us complete this lab?