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CEP 811

Edible Electrolyte Lesson Plan in Theory

Objective

Build an Edible Electrolyte Circuit while demonstrating knowledge of electrons, electricity, ions, and the movement of electrons through a circuit.

Materials

- 1 squishy circuit kit per group
- Extra batteries
- Food (tomatoes, bananas, lemons, potatoes, celery, etc)
- Insulating dough
- Conductive dough
- Laptop for research

Background Information

The chemistry behind electrolytes.

Electrons can flow through material that allow the transfer of electrons. Ions, for example, have either a negative or positive charge. They, by nature of their charge, encourage the flow of electrons by repelling electrons (if an anion) or attracting electrons (if a cation). Many of the foods we eat contain ions (also known as electrolytes), thus, these foods are conductors of electricity. Edible electrolytes are necessary to perform various biological functions at the cellular level. Essentially, we need electrolytes in food to live! The Edible Electrolyte circuit demonstrates how common foods can conduct electricity.

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The physics behind the edible electrolyte circuit.

Electrons flow from the negative end of the battery to the positive end. We can create a circuit through which electrons flow by attaching various conductors (food in this case) together with buzzers, motors, and LED lights. When the buzzer, motor, and LED lights turn on, this demonstrates electrons (or electricity) is not only flowing through them, but also through the food. Almost everyone knows bananas are known for having potassium (K+) and milk has calcium (Ca2+). These ions are responsible for the movement of electrons!

Activity

Phase 1.

Choose a lab partner you can meet with after school. Using the Squishy Circuits website (http://courseweb.stthomas.edu/apthomas/SquishyCircuits/), make insulating and conducting dough. Note: Make sure you are equipped with the necessary supplies! Bring your two types of dough to school on _____(Date)_____.

Phase 2.

Using a laptop, refer to the squishy circuits website (http://courseweb.stthomas.edu/apthomas/SquishyCircuits/), and start learning by creating circuits! Advance to phase 3 when you feel you have acquired enough knowledge about circuits.

Phase 3. Using the provided food, start creating a model of a circuit! Your model should display the conduction of electricity (i.e. buzzers buzz, motors spin, LED lights are on!). During your exploration…

1. Record your observations
2. Sketch a clear and self-explanatory model of your circuit.

Phase 4.

In your own words, thoughtfully and thoroughly answer the following questions.

1. Clearly explain what you have learned about electrolytes.
2. Why can we use food in our creation of a circuit?
3. Referring to question 2, explain what is occurring using chemistry terminology.

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In the lesson plan above, many educational learning theories have been utilized. This lesson is overall based on Dr. Punya Mishra and Dr. Matthew Koehler's TPACK model. Mishra and Koehler (2008) stress the importance of applying exploration and creativity within learning. This Edible Electrolyte lesson allows students to create and explore while taking learning into their own hands (Bransford, Brown, & Cocking, 2000); students are provided with laptops to do their own research and look up any educational information they desire. In addition, students are provided with choices and they can customize their own circuit model. Customization, along with hands-on learning (via creating circuits and using technology), will foster motivation to learn (Culatta, 2013). According to Brandford et al. (2000), motivation is critical for learning. Learners will likely be engaged because they care (Gee, 2013).

According to Gee (2013) and Bransford et al. (2000), students need to feel safe in their classroom environment to take risks and promote learning; I believe this lesson allows

students to feel a sense of safety because they are given the opportunity to explore without judgement. If a student feels "stuck," he/she can ask the teacher for help. Ideally the teacher will not simply give them answers but rather demonstrate metacongition to guide them (Bransford et al., 2000). Demonstrating metacognition will help students learn the act of critical thinking which will aid them in solving problems.

Lastly, the Edible Electrolytes Circuit lesson plan is transferable to many subjects (i.e. chemistry, physics, biology, etc.). Brandford et al. (2000) says that knowledge should transferable and multifaceted. This ensures that learning is not superficial, but instead leads to mastery.

References

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