Electric Marbles and Happy Atoms

Overview

This game is great for introducing the basic concepts of electricity to young children. This is a circle activity where the children pretend they are metal atoms conducting electrons. The rules in this game are patterned after the rules scientists observe in nature. The behavior modeled in this activity provides a very accurate analogy for future learning.

Questions to Answer

- What is a electrical current?
- What is the connection between an electrical current and work?
- What is the purpose of a switch?

Objectives

- Describe an analogy for electrical current
- Describe the function of a switch in a circuit
- Relate the connection between electrical current and work

Materials

- 30-50 Marbles

Procedure

Organize the children in a circle and tell them the rules:

> **Rule 1:** Each student is an atom of a conducting material, copper is a good example. Each atom has a certain number of atoms, no more, no less. In this game, each atom has one electron. We are unhappy if we have no electrons or two electrons. We are happy ONLY when we have one electron.

Rule 2: Electrons can be passed only to the atom next in line. There will be no sparks (no throwing electrons to any other atoms.)

Rule 3: The battery will pass electrons from one side to the other through the line of atoms if and only if there is a continuous path of atoms.

Activity I: Making an electric current

1. The teacher is the battery. You will begin by passing out one electron. Don't tell the students what to do. Have them reason it out. They want to remain happy so what do they need to do to become happy after you hand them the electron. (They might want to hand the electron back to you! Tell them that this is not possible since you already have another electron ready to go.)

2. Once the current (movement of marbles) is established, continue until you run out marbles. The faster they pass the marble, the higher the current! (Extension: An ampere is a measure of electrical current and is equivalent to 1 coulomb per second. You could count the number of marbles per second, thus measuring the current.) What is the condition called when you (the battery) runs out of electrons? (A dead battery)

3. Recharge the battery by moving the electrons back to the battery.

Activity II: Making a useful circuit

1. Break the circuit (Remove one student from the circle) and insert a device that will use the electrical current (Have the removed student do something everything an electron flows past. (Idea: The student could ring a bell, turn on a light, lift something or pump water) (Extension: You could graphically show the relationship between higher current and more work done. Pumping water might be a great example. The more current, the more water pumped.)

2. Add a switch to the circuit (A person leaves and returns to the circle) and observe what happens to electron flow and work when the switch is off. (Extension: You could simulate a dimmer switch by having a student slow down the number of electrons that can flow through the circuit.

Summary

What do we mean when we say electrical current is flowing?

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Describe what happens when electricity is turned on allowed to flow in a wire?

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What is actually flowing in a wire when electricity is flowing?

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What happens to the electrons when a switch is turned off and on?

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What happens to the available electrons when a battery is dead?

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What is the connection between electrical current and work?

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