Ontario Council For Technology Education

Electric Switches

Grade Level: 6

Science and Technology Topic: Electricity and Electrical Devices

Introduction/Context:
This is an open-ended project where students design and make various types of electric switches that will control the flow of electrical energy, which operates an output device (light, buzzer motor). The activity begins with an investigation into the operation of the various types of commercial switches within the student's environment (e.g., slide, push to make, push to break, reversing, tilting). Students are asked to make a several types of switches that will complete a circuit to operate an output device.

Prior Knowledge and Skills:
- Parts of a circuit
- Open and closed circuits
- Input and Output
- Safe handling of hand tools and materials as well as safe procedures for working with electricity
- Design Process

Tools and Materials:
- Jinx wood
- Paper clips
- Paper fasteners
- Wire – single strand
- Battery holder
- Fastening materials – glue, tape,
- Light bulb and light holder
- Buzzer
- Motor
- Batteries - your choice
- Tin foil
- Card stock
- Tubing – paper towel,
- Film canisters
- Saws
- Clamps
- mitre boxes
- Easi-cutters
- Wire cutters
- Clothes pins
- Other similar found materials

Curriculum Expectations:
Big Ideas:

- Electrical energy can be transformed into other forms of energy. (Overall expectations 2 and 3)
- Electrical energy plays a significant role in society, and its production has an impact on the environment. (Overall expectation 1)

Overalls:
1. evaluate the impact of the use of electricity on both the way we live and the environment;
2. investigate the characteristics of static and current electricity, and construct simple circuits;
3. demonstrate an understanding of the principles of electrical energy and its transformation into and from other forms of energy.

Specific:
2.1 follow established safety procedures for working with electricity (e.g., ensure hands are completely dry when working with electricity; be aware of electrical hazards at home, at school, and in the community)
2.2 design and build series and parallel circuits, draw labeled diagrams identifying the components used in each, and describe the role of each component in the circuit
2.4 design, build, and test a device that produces electricity
2.5 use technological problem-solving skills to design, build, and test a device that transforms electrical energy into another form of energy in order to perform a function (e.g., a device that makes a sound, that moves, that lights up)
2.6 use appropriate science and technology vocabulary, including current, battery, circuit, transform, static, electrostatic, and energy, in oral and written communication
3.5 identify ways in which electrical energy is transformed into other forms of energy

Learning Goals (student-friendly language):
I will design and build different kinds of switches, which can be used to control a light, speaker or motor.

Activity Description:
Our class is going to be making some projects that are powered by electricity. When making these items we will need to use a switch to turn them on and off. Store bought switches can be very expensive. If the teacher spends money to buy switches there will not be enough money to buy building materials. To help save money our class will design our own switches. Our task is to design and build at least three different types of switches.

Your prototype(s) (model):

- must open and close a circuit
- must operate an output device

A Design Brief containing the following information must accompany your vehicle:

- a clear, concise statement of the problem to be solved
- 3 sketches of possible solutions to the problem
- an explanation and the reasons for your plan choices
- an evaluation of how well your solution solves the problem
- a Technical Drawing (a neat, accurate drawing of the final design which includes labels and dimensions)

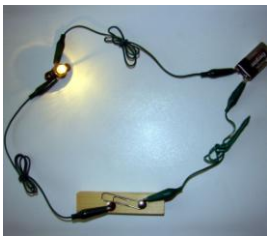
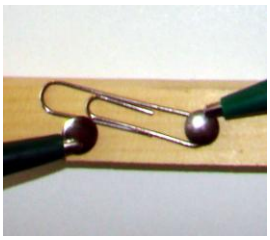
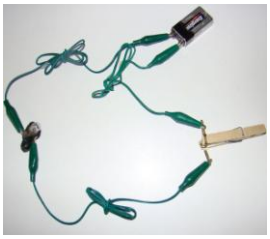
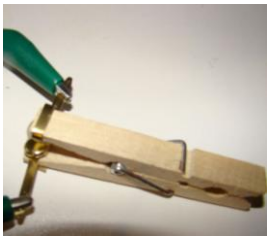
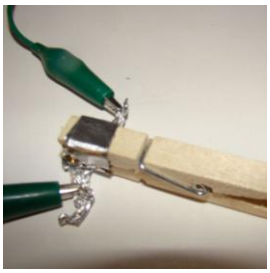
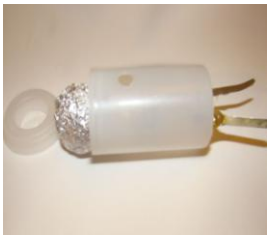
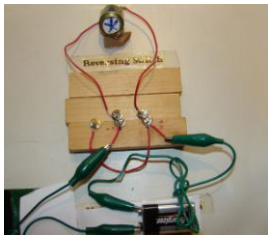
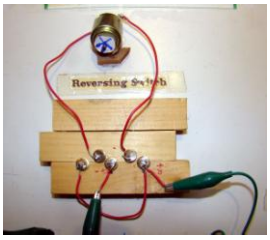
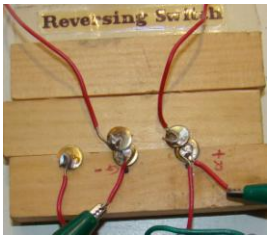
Assessment and Evaluation (including Criteria for Success):

Evidence of Student Learning: design notes and drawings, working prototype, understanding of how electrical circuits work, appropriate choice of materials, demonstration of knowledge of design process with a particular emphasis on testing (e.g., a design brief recording process of technological problem solving), presentation of design and final product with suggestions for improvement

Criteria: safe, appropriate, and effective use of materials and tools, design specification requirements are met, presentation shows understanding of key learnings, including consideration of economic and environmental factors that determine the suitability of materials for use in manufacturing a product

Completeness & Accuracy of Planning Sheets	/20 or level 1- 4
Constructive Use of Class Time	/20 or level 1- 4
Safe Use of Tools & Equipment	/20 or level 1- 4
Responsible Use of Materials	/10 or level 1- 4
Performance of the Model	/10 or level 1- 4
Technical Drawing	/20 or level 1- 4
Total	/100 or level 1- 4

Samples of Various Switch Designs:

	Open Circuit	Closed Circuit	Switch Design	Switch Materials
Slide Switch				• Wood • Tacks • Paper clip
Push to Make Switch				• Paper Fastener • Clothespin • Hot Glue
Push to Break Switch				• Tin Foil • Clothespin • Hot Glue
Tilt Switch				• Film Canister / Pill Bottle • Paper Fastener • Hot Glue • Tin Foil Ball
Reversing Switch				• Wood • Tacks • Wire