Ontario Council For Technology Education

Kaleidoscope

Grade Level: 4

Science and Technology Topic:
Understanding Matter and Energy: Light and Sound

Introduction/Context:
This is an open-ended project where students use technological problem-solving skills to design, build, and test a creative form of artistic design - a kaleidoscope that makes use of the properties of light. The activity begins with an investigation of toys and items (kaleidoscope, microscope, and periscope) Which use mirrors and which demonstrate the basic properties of light (i.e. show that light travels in a straight path and how light reflects off of shiny surfaces)
The You Tube video entitled "The Star FK Radium - "Blue Siberia" can provide students with a clear view of work seen through a kaleidoscope.
For assistance with understanding the directions for one way of making a Kaleidoscope visit the following web site:
http://www.youtube.com/view_play_list?p=0DDA594601346A7E

Prior Knowledge and Skills:
- Measuring and Layout
- Safe handling of hand tools and materials
- Understanding the terms: reflection, translucent, and opaque

Tools and Materials:
- Dowel
- Mirrors
- Tape
- Cardstock
- Markers
- Beads, Sparkles, Sequins
- Paper punch
- Cardboard tubes
- Clear plastic film (overhead transparencies)
- Saw
- Clamp

Curriculum Expectations:

Big Ideas:
- Light and sound are forms of energy with specific properties.

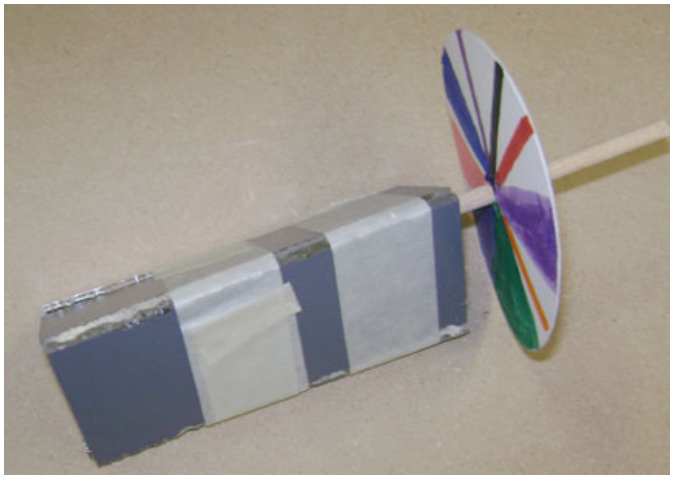
Overall:
1. investigate the characteristics and properties of light and sound;
2. demonstrate an understanding of light and sound as forms of energy that have specific characteristics and properties.

Specific:
2.1 follow established safety procedures for protecting eyes and ears (e.g., use proper eye and ear protection when working with tools)
2.2 investigate the basic properties of light
2.4 use technological problem-solving skills to design, build, and test a device that makes use of the properties of light (e.g., a periscope, a kaleidoscope)

Learning Goals (student-friendly language):
I can make a device, which uses light to shows interesting patterns.

Activity Description:
Sir David Brewster invented the kaleidoscope in 1815 while he was conducting experiments to learn about light. Planning to use it as a science tool, the kaleidoscope was quickly copied as a toy. The word "kaleidoscope comes from the Greek language and means "observer of beautiful forms." The Royal Ontario Museum and the Art Gallery of Ontario are planning a 200-year anniversary celebration of the invention of the kaleidoscope. The committee for the event is looking for samples of unique, one-of-a –kind kaleidoscope designs. Knowing that grade 4 students are studying light in their Science and Technology classrooms they are asking students to create kaleidoscopes and submit them to the Museum for display.
Your task is to build a prototype or model of a kaleidoscope. You will need to prepare a design portfolio that includes the information needed to complete the building project. Information to include would be: the plans/diagrams, instructions, materials list, problems that might be encountered and how to solve these and any other additional advice you might feel is necessary to know for making a kaleidoscope.

Photograph:



A Sample Kaleidoscope Project

Assessment and Evaluation (including Criteria for Success):
Evidence of Student Learning: design notes and drawings, working prototype, understanding of properties of light, appropriate choice of materials, demonstration of knowledge of design process with a particular emphasis on field 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