a WOW Lab

BLUEPRINT

Styrofoam Plate Speaker

Quebec - Achievements and Competencies

Learning Outcomes

Cycle 2 (Gr. 9-10)
Waves
Electromagnetism

The Quebec Achievements and Competencies are based on the Progression of Learning Outcomes derived from the Quebec Education Plan set by the Ministere de l'Education, du Loisir et du Sport.

Specific Expectations

GENERAL EDUCATION PATH

CYCLE 2 (Gr. 9-10) — Secondary 3

MATERIAL WORLD

E. Waves

a. Frequency

i) Defines the frequency of a wave as the number of cycles per second (Hz)

ii) Associates the frequency of a sound wave with the pitch of the sound (e.g. a low-frequency wave produces a low-pitched sound)

In *Styrofoam Plate Speaker*, students build a speaker using wire, a magnet, cardboard, and Styrofoam. Through this activity, students will learn about sound waves and how the speaker works. They can define frequency in the context of sound as the number of vibrations per second, measured in Hertz (Hz). They can discuss that pitch represents how the ear perceives different frequencies, associating that low frequencies have a low pitch and high frequencies have a high pitch.

c. Amplitude

i) Defines the amplitude of a sound wave as the loudness of the sound

As students discuss sound waves, they will discuss the term amplitude. When an object vibrates, the amplitude of vibration is the maximum displacement of the object from its origin. The loudness represents how the ear perceives different amplitudes. Small amplitudes have a quiet sound and large amplitudes have a loud sound.

a WOW Lab

BLUEPRINT

Styrofoam Plate Speaker - Quebec - Achievements and Competencies

CYCLE 2 (Gr. 9-10) — Secondary 4

MATERIAL WORLD

F. Electricity and electromagnetism
  2. Electromagnetism
    a. Magnetic field of a live wire
      i) Describes the magnetic field produced by a current-carrying wire (right-hand rule or left-hand rule)
      ii) Names ways of modifying the intensity of the magnetic field produced by a current-carrying wire (type of wire, current intensity)

Students will learn that the electric current moving through the wire creates a magnetic field. Students can discuss factors that can change the force and direction of the magnetic field.

EST Secondary 4

MATERIAL WORLD

F. Electricity and electromagnetism
  2. Electromagnetism
    c. Magnetic field of a solenoid
      i) Describes the magnetic field produced by a solenoid (right-hand rule or left-hand rule)
      ii) Names ways of changing the intensity of the magnetic field produced by a solenoid (nature of the core, intensity of the current, number of turns)
      iii) Explains the use of solenoids in technological applications (e.g. earphones, electric motor, magnetic crane)

In *Styrofoam Plate Speaker*, students create a solenoid by tightly coiling copper wire around a cardboard tube. When the solenoid is connected to the amplifier, a current flows through it and a magnetic field is created. This causes the coil, and the paper plate attached to it, to move, producing a sound. Students will learn that the greater the current, the stronger the magnetic field. They will discuss other factors that may affect the intensity of the magnetic field.

APPLIED GENERAL EDUCATION PATH

CYCLE 2 (Gr. 9-10) — Secondary 3

MATERIAL WORLD

E. Waves
  a. Frequency
    i) Defines the frequency of a wave as the number of cycles per second (Hz)
    ii) Associates the frequency of a sound wave with the pitch of the sound (e.g. a low-frequency wave produces a low-pitched sound)

a WOW Lab

BLUEPRINT

Styrofoam Plate Speaker - Quebec - Achievements and Competencies

In *Styrofoam Plate Speaker*, students build a speaker using wire, a magnet, cardboard, and a Styrofoam plate. Through this activity, students will learn about sound waves and how the speaker works. They can define frequency in the context of sound as the number of vibrations per second, measured in Hertz (Hz). They can discuss that pitch represents how the ear perceives different frequencies, associating that low frequencies have a low pitch and high frequencies have a high pitch.

c. Amplitude
  i) Defines the amplitude of a sound wave as the loudness of the sound

As students discuss sound waves, they will discuss the term amplitude. When an object vibrates, the amplitude of vibration is the maximum displacement of the object from its origin. The loudness represents how the ear perceives different amplitudes. Small amplitudes have a quiet sound and large amplitudes have a loud sound.

CYCLE 2 (Gr. 9-10) — Secondary 4

MATERIAL WORLD

F. Electricity and electromagnetism
  2. Electromagnetism
    c. Magnetic field of a solenoid
      i) Describes the magnetic field produced by a solenoid (right-hand rule or left-hand rule)
      ii) Names ways of changing the intensity of the magnetic field produced by a solenoid (nature of the core, intensity of the current, number of turns)

In *Styrofoam Plate Speaker*, students create a solenoid by tightly coiling copper wire around a cardboard tube. When the solenoid is connected to the amplifier, a current flows through it and a magnetic field is created. This causes the coil, and the paper plate attached to it, to move, producing a sound. Students will learn that the greater the current, the stronger the magnetic field. They will discuss other factors that may affect the intensity of the magnetic field.

Techniques

A. Technology
  2. Manufacturing
    f. Assembling and disassembling
      i) Identifies and gathers the parts and hardware
      ii) Chooses the appropriate tools
      iv) In the case of electrical circuits, identifies and gathers the electrical components
      viii) Connects the components using wire, connectors or solders

a WOW Lab

BLUEPRINT

Styrofoam Plate Speaker - Quebec - Achievements and Competencies

Strategies

A. EXPLORATION STRATEGIES

3. Referring to similar problems that have already been solved
4. Becoming aware of his or her previous representations
6. Formulating questions
7. Putting forward hypotheses (e.g. individually, in teams, as a class)
8. Exploring various ways of solving the problem
9. Anticipating the results of his or her approach
10. Imagining solutions to a problem in light of his or her explanations
11. Taking into account the constraints involved in solving a problem or making an object (e.g. specifications, available resources, time allotted)
12. Examining his or her mistakes in order to identify their source
13. Using different types of reasoning (e.g. induction, deduction, inference, comparison, classification)
14. Using empirical approaches (e.g. trial and error, analysis, exploration using one's senses)
15. Ensuring that the procedure is appropriate and safe and making the necessary adjustments

B. INSTRUMENTATION STRATEGIES

4. Using different tools for recording information (e.g. diagrams, notes, graphs, procedures, logbook)
5. Using a variety of observational techniques and tools

C. ANALYTICAL STRATEGIES

1. Identifying the constraints and important elements related to the problem-solving situation
2. Dividing a complex problem into simpler subproblems
3. Using different types of reasoning (e.g. inductive and deductive reasoning, comparison, classification, prioritization) in order to process information
4. Reasoning by analogy in order to process information and adapt scientific and technological knowledge

D. COMMUNICATION STRATEGIES

3. Exchanging information
4. Comparing different possible explanations for or solutions to a problem in order to asses their relevance (e.g. full-group discussion)