SCIENCE NORTH SCIENCE NORD
SUDBURY, ONTARIO, CANADA

Exceptional Electromagnets Part 3 **Grade 9 Applied – Electrical Applications**

Lesson Plan

Assessment	AFL, peer assess., rubric
Cross-curricular	Technology

Big Ideas

- Static and current electricity have distinct properties that determine how they are used.

Learning Goals

- Learn to conduct our experiment and collect our results
- Learn to make graphs from our results
- Learn how to understand what our graphs show.

Materials

- Materials from original electromagnet (see Exceptional Electromagnets Part 1)
- Material for inquiry activity brought from home (by the student) or obtained with the school by the teacher
- Exceptional Electromagnets 3 (Inquiry Writeup and Summative Assessment)

Safety Notes

Always disconnect battery between tests.

Specific Expectations

A1.1 formulate scientific questions about observed relationships, ideas, problems, and/or issues, make predictions, and/or formulate hypotheses to focus inquiries or research
A1.2 select appropriate instruments and materials for particular inquiries
A1.4 apply knowledge and understanding of safe practices and procedures when planning investigations; ... safe operation of electrical equipment, ... with the aid of appropriate support materials.
A1.5 conduct inquiries, controlling some variables, adapting or extending procedures as required, and using standard equipment and materials safely, accurately, and effectively, to collect observations and data
A1.6 gather data from laboratory and other sources, and organize and record the data using appropriate formats, including tables, flow charts, graphs, and/or diagrams
A1.8 analyse and interpret qualitative and/or quantitative data to determine whether the evidence supports or refutes the initial prediction or hypothesis, identifying possible sources of error, bias, or uncertainty
A1.9 analyse the information gathered from research sources for reliability and bias
E2.1 use appropriate terminology related to static and current electricity
E2.4 design, draw circuit diagrams of, and construct simple series and parallel circuits
E3.3 identify the components of a simple direct current (DC) electrical circuit (e.g., electrical source, electrical load, switch, fuse), and describe their functions

Description

This is **lesson three** of a series of three lessons on electromagnets. The students will test a dependent variable of their choosing. Students should have a basic understanding of series circuits, electric current, battery function, and properties of conductors. They should have completed Exceptional Electromagnets Part 1, making an electromagnet.

Introduction

- Before class begins the teacher will have read the student Inquiry Plans and written descriptive feedback on them.
- Depending on the Independent Variable (IV) that students choose to manipulate, and the availability of school materials, teachers may need to gather materials that students have planned to use but cannot bring from home (ex. different thicknesses of copper wire).
    - If these materials are not available in the school the teacher should indicate possible modifications or new directions of inquiry in the descriptive feedback.
- REVIEW INQUIRY PLAN: Students will receive their Inquiry Plan (completed the previous day) from teacher.
- They will meet in their inquiry group and carefully read over the descriptive feedback provided by their teacher.
    - As it was completed in pencil, students will erase and make any necessary changes indicated by the teacher.
    - They will show their teacher that they have understood the feedback and made the necessary changes before moving on.

Action

GATHER MATERIALS:

- Students will gather their electromagnet, completed in Exceptional Electromagnets Part 1, to act as their control, as well as any components needed for their Inquiry experiment.
- Students will move to their place for lab work in their groups.

EXPERIMENT:

- Under the teacher's supervision, students will follow their planned experimental procedure, changing their Independent Variable through several trials while recording the effect on their Dependent Variable (number of paperclips held, which is the same for all groups).
    - Note: the DV is the same for all groups to facilitate students being able to easily discuss their findings between groups.

GALLERY WALK:

- After collecting all data, students will record their experimental question (this can be found on their Inquiry Plan).
- Half of the group members will stay with their question while half will rotate around the room, group to group.
- At each stop, the group member(s) remaining will read their question and briefly describe what they tried and what they learned.

- Once a full rotation has happened, group members will switch places and the full rotation will start again.
    - The intent of this Gallery Walk is twofold. It allows students to see what others have learned while also giving them time to verbally practice discussing their conclusions.

INQUIRY WRITEUP & SELF ASSESSMENT:

- Students will receive 'Inquiry Write-up' from their teacher.
    - This is the summative assessment for the Inquiry experiment and should be completed individually with assistance from the teacher or support staff.
- Students will also receive the 'Inquiry Summative Assessment' and should circle how they feel they have performed on the rubric as a self-assessment.
    - If students work quickly they may have these completed, but more likely students will need to complete this work at home or in successive school periods.

Consolidation/Extension

- The teacher should assess student work using 'Inquiry Summative Assessment' including their own assessment on the same page as the students' completed self-assessment.
    - NOTE: 'Inquiry Summative Assessment' is based upon Ontario Science Curriculum Achievement Chart but has been modified to be specific to the current activity.
- In subsequent class periods, students should retrieve their Frayer Model from the previous lesson and add what they have learned from their own, and other students', experiments.