

# Science Lesson Plan for Grade 5

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Research Theme: Considering how a science class should be in the future.

## 1. The Unit : Electric Magnet

### 2. Background of Research Theme

The stream of a typical science lesson has been as follows: Based on the problem presentation of “how to make a stronger electric magnet”, students make an experiment plan. Then they actually implement the experiment as planned and give a result. The conclusion is that the more number of winding a coil is or the stronger electric current is, the stronger an electric magnet becomes.

From now, however, the problem solving and expressing an idea need to be included in the composition of the unit by making good use of the experiment data, acquired knowledge and learned methods. This is because I think that fully utilizing what they learned so far means the very true learning ability of children.

For setting up some activities for that purpose, one of the most important pillars would be ‘systematicity’. For today’s activity, I tried to consider how the composition of unit would be when emphasis is placed on the systematicity

Learning content for third and fourth grades: Due to electric current carried from one side to the other, a miniature light bulb gets turned on or a motor starts to be activated.

By connecting electric batteries in series, more electricity gets carried. A magnet attracts iron. Also it could be utilized as a compass.

**[Introduction]** To learn that magnetic force is generated when a copper wire gets charged with electricity. Moreover, students make electric magnets and compare its nature with that of permanent magnet that they already learned so far.

**[Investigation]** Firstly students make a prediction about how to strengthen an electric magnet and then carry out an experiment. Note that the length of the copper wire should be unified among students. They are encouraged to think of conditions for generating stronger magnetic force such as the number of winding a wire, the strength of electric current or the way of winding through implementing experiments.

**[Application]** With use of results of experiments done so far, create an electric magnet which generates the strongest magnet force by utilizing only prepared materials. In addition, learn that an electric magnet could be applied to a motor and try to probe the structure of a motor.

Learning content for sixth grade: Being able to generate electricity by making use of a motor. Utilizing electricity.

### 3. The plan of this lesson

First phase: Compare a permanent magnet and a electric magnet

From first to second lesson: Making an electric magnet and find what they have in common and what they differ.

Second phase: Try to find how to make a stronger magnet

From first to fourth lesson: Making a table for difference of magnetic force according to the number of electric battery, the number of winding of the coil and thickness of a copper wire.

Fifth lesson: Under determined conditions, thinking of how to make a stronger electric magnet and making it.

Third phase : Probe the structure of a motor.

From first to second lesson : After making a prediction about the structure of a motor, breaking it down and observing its structure.

#### 4. Stream of the lesson

(1) Objectives:

- ① Students learn to think about how to make a stronger electric magnet under particular conditions by making use of what they have learned so far and data obtained by experiments.
- ② Students examine results of experiments and deepen their understanding about electric magnets through discussing with classmates and reviewing the results of experiments.

(2) Preparation: Electric batteries, boxes for electric battery, enamel wires (0.4 or 0.5 mm), nails, thick aluminum sticks, iron bolts, U-shaped nails, bobbins cubes made of metal such as aluminum and iron, stand, drawing paper

(3) Stream

Learning contents and related activities	Remarks on teaching
<p>1 Reflect conditions for making a stronger electric magnet.</p> <ul style="list-style-type: none"> <li>• increase the number of winding a coil</li> <li>• insert an iron core</li> <li>• increase the number of electric batteries</li> <li>• make an enamel wire thicker</li> <li>• change a core</li> </ul> <p>2. Think in a group how to make a strong electric magnet under specific conditions.</p> <ul style="list-style-type: none"> <li>• It is the most important to increase the number of winding a coil so let's change from a nail to a core.</li> <li>• A thicker core is better but it wouldn't be good either if it's too thick so we might be able to use a bolt.</li> <li>• Using even a same aluminum stick, a thicker one might become stronger.</li> <li>• It seems stronger when a wire is winded tightly so we've decided to use a bobbin.</li> </ul> <p>3. Make an electric magnet based on the way they came across in a team.</p> <p>4. Compare the strength of electric magnets made by each group.</p> <ul style="list-style-type: none"> <li>• To make a stronger electric magnet, .....</li> </ul> <p>5. Conclude and organize the ways of making a stronger electric magnet.</p>	<p>Reflection: Make a presentation about what kind of methods they found in order to make a stronger electric magnet.</p> <p>Raising question: How can you make a strong electric magnet?</p> <p>★Materials</p> <ul style="list-style-type: none"> <li>• one electric battery</li> <li>• 5 meters of enamel wire</li> </ul> <p>★Preparation</p> <ul style="list-style-type: none"> <li>• thick aluminum stick</li> <li>• an iron bolt</li> <li>• U-shaped nail      • bobbin</li> <li>• nails</li> <li>• cubes made of metal such as aluminum and iron</li> <li>• 5 meters of enamel wire (thickness:0.4mm or 0.5mm)</li> </ul> <p>○Make students to select the effective way based on data by experiments in the past</p> <p>○Tell students that they can change something if there are parts where they want to improve.</p> <p>○Stabilize an electric magnet on the stand so that it could be easier to compare the number of clips attracted in each case.</p>