Teacher reviews

Students enjoyed creating mechanical constructions very much, as it was motivating for the students to construct something themselves that is functional at the end. This was reported by all the teachers who implemented this GP. The Czech teacher mentioned furthermore that during the hands-on construction exercise some of his students realized that they were not very good at handy work, as they were not used to it. This made them realize that they should try to do more things by hand instead of by computer whenever this is possible.

The SPICE project

SPICE was a two-year project (December 2009 – November 2011) carried out by European Schoolnet (http://europeanschoonet.org) together with Direção Geral de Inovação e Desenvolvimento Curricular (http://sitio.dgidc.min-edu.pt/Paginas/default.aspx) from Portugal and Dum Zahranicnich Sluzeb MSMT (http://www.dzs.cz/) from the Czech Republic.

The primary objective of the SPICE project was to collect, analyse, validate and share innovative pedagogical practices, particularly those using inquiry-based learning, whilst enhancing pupils' interest in the sciences. SPICE supported this objective by singling out, analysing and validating good practice pedagogies and practices in maths, science and technology (mostly ICT-based) and disseminating them across Europe. SPICE involved 24 teachers from 16 different educational systems (from 15 different countries). This teachers' panel helped the SPICE partners in defining good practices that were then tested in classes by 41 teachers during the school year 2010-2011.

For more information see: **http://spice.eun.org**

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ELECTRIC MOTORS

Author: Beata Jarosievitz
Subject: Physics
Country of creation: Hungary
Countries of testing: Czech Republic, Slovakia and Romania

Aims of the Good Practice (GP)

Students should work in groups and learn the basic principles of electric motors.
Students get experience in the preparation of the hands-on experiments and build a working model of an electric motor for classroom use.

Teaching material

Internet.
A strong neodymium magnet; copper wire; around 10 cm of insulated wire; a large nail; battery - not a rechargeable one; paperclips; small metal objects; a nail (or a bolt); a rubber band; a coil.
Links to the different experiments:
http://videa.hu/videok/tudomany-technika/1st-experiment-electric-motors-BklV069QG7MbWBQJ
http://videa.hu/videok/tudomany-technika/3rd-experiment-homopolar-motor-ikicKqBDLSvRn8tk
http://videa.hu/videok/tudomany-technika/3rd-a-experiment-homopolar-motor-23YGwBPGkI2u9zYZ
http://videa.hu/videok/tudomany-technika/electromagnet-sGspNt6IMJKme3Pf
http://videa.hu/videok/tudomany-technika/1st-experiment-clip-motor-paper-oyn7khJjAbf9DqSy

Age of the students

13-16.

Preparation and teaching time

Class time: 1 x 50 min period.

Lesson Plan

Procedure

1. Students should be divided into groups of three. Each group chooses a reporter, chooses one experiment, and collects the required materials (from a little box, prepared in advance).

2. Each group opens the website indicated in their worksheet, and watches the video of the experiment. After seeking the video, students start to reproduce the experiment and create the motor as indicated in the video. One student from each group records the experiment with a digital camera (taking a photo and video). Another student designs a short presentation (one slide) about their experiment, containing the recorded video and the photo.

3. The reporters from every group present their observations and conclusions in front of the class and show the prepared slide with their photo and video (5 minutes / group).

4. Students compare different experiments made in the class in parallel groups, and discuss the different observations and conclusions presented.

Example of experiment

A very small motor:

1. Attach the magnet to one end of the battery.
2. Press and hold the top end of the wire to the top end of the battery, making an electrical connection from the top battery end to the wire.
3. Lightly touch the side of the magnet with the free end of the wire.

Make a prediction. Use the right-hand rule to determine the direction of the force and current, and draw a guess in the picture.
Record your experiment using a digital camera.
All photos and video files have to be used for a small report (a slide presentation).
Proceed with the 2nd, 3rd, etc. experiments.

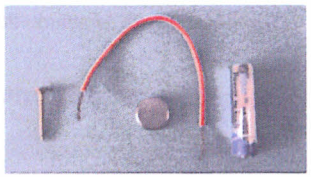


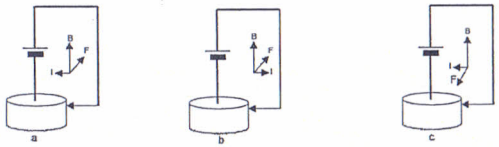
Image 1: Picture of the materials
by Beata Jarosievitz

Questionnaire

The paper clip motor works with
Alternating current / Direct current / Without current, it needs only a battery.

The screw motor runs if
Both electrical connections are at the edge of the magnet.
Both electrical connections are at centre of the magnet.
One electrical connection is at the edge of the magnet and one is at the centre.

Which is the correct direction of the arrows?



a.
b.
c.

Tick from the following list of materials the ones that are not needed to make an electromagnet.
Paper clip.
Permanent Magnet.
Around 10 cm of insulated wire.
A nail (or a bolt).
6-Volt Battery or 1.5 Volt Battery.

Can we use the force acting between a current in a coil and a permanent magnet to do work?
Yes / No.

Wrapping a wire around an iron core and running a current through it produces a strong magnetic effect; this is called an electromagnet.
Yes / No.

Materials can be grouped into conductors and insulators. Can you choose the insulators from the following list?
Metals / Carbon / Glass / Distilled water / Human body / Tap water / Plastics.

You can find a magnet in
A rocking chair / A pencil / A picture / An electric can opener / A computer / A flash memory stick.

An electric generator creates electricity from motion.
True / False.