

Magnetic Fields



School subjects
Physics
Age of students
This is a good hands-activity for girls aged 12 – 16 years old to learn about the magnetic fields.
Aim of the activity
This learning unit helps students to be introduced to what is a fascinating topic in science – Field Theory. It fosters directly or indirectly students’ skills through hands-on activities. This leads to a taster of present-day research related to this theme. The project generated feedback about these hands-on activities and about how suitable their design was to guide students from concrete operations to abstract conceptualization of scientific theories that have revolutionized the world.
Background
A scientist of the Faculty of Science in Malta University, Department of Physics, guided the participants in getting a basic understanding of non-contact forces and magnetic fields. This was done through a hands-on activity using ring magnets and a sealed bauble containing iron filings. These resources were part of a kit provided to students so that they could do some experiments at home.
Following these hands-on activities the presenter introduced the use of Electromagnetic Fields [EMF] for telecommunications and medical applications. A video ‘My WAVE’ was used to help students visualize the interaction of fields with molecules and to show the resultant friction and heating effects.

The researcher also talked about her research related to the use of electromagnetic radiation in medical diagnostic and therapeutic treatment. She shared how she combines family life, work and other commitments.

Activity

Introduction: presenter, a female lecturer and researcher on electromagnetics introduces herself & her career path, acting also as a role model.

Activity 1: the first task for the girls is to make a list of objects at their homes that are magnetic and non-magnetic. Reconvene and students will discuss what they have listed.

Activity 2: Further, a pencil and some ring magnets are used to show magnetic levitation

Questions to be discussed:

- What is force?
- What are some different types of forces?
- Show the image of levitating ring magnets and ask - How is it possible that ring magnets float?
- What are the forces involved to create this levitation?

Activity 3: In the next activity the following question is made to a topic: what makes pencil to levitate?

- Visualising the magnetic field using baubles and iron filings.
- For this experiment the baubles containing the iron filings are sealed using tape or glue.
- Use a bauble 1/3 filled with iron filings and ring magnets to bring out the presence
- of a 3D magnetic field around ring magnets

Activity 4: introduction to the use of EMF for telecommunications:

- Present to students a signal using Spectrum analyser
- Explain the basics of this analyser

Activity 5: This activity shows medical applications: Interaction with molecules, friction and heating:

<https://mail.google.com/mail/u/0/#search/lourdes.farrugia%40um.edu.mt/KtbxLwHHlvbHjBzvwDmKdNJJDvfkfNpkkL?projector=1>

Time necessary

The time needed for this this learning unit is 60 minutes:

Introduction – 5 minutes
 Activity 1 – 10 minutes
 Activity 2 – 15 minutes
 Activity 3 – 15 minutes
 Activity 4 – 10 minutes
 Activity 5 – 5 minutes

Learning outcomes

At the end of the programme, students can:

- Show an understanding of non-contact forces and magnetic fields.
- Show how magnetic fields can be used to explain non-contact forces
- List applications of this in medicine

Materials necessary and their costs

The costs of the materials for these activities

- Fillable Baubles 17.00 Eur for 30 pcs
- Ring magnets 12.00 Eur for 100pcs
- Iron Filings – 7.00 Eur for 1 kg

