

6-8
years

pri-sci-net



inquire
investigate
evaluate
connect

Science Content:

Physics

Target Concepts/Skills:

The magnetic power of different magnets, introduction to the intensity of magnetic fields

Target Age group:

6-8 years

Duration of activity:

3 x 45 minutes

Summary:

Children express their ideas about magnetic and non-magnetic materials. All magnetic are metals, but not metals are magnetic. The research question posed is: 'How can you measure which of two chosen magnets is the "stronger" one? Children are directed to design their investigation. They then test the magnetic power of different magnets, first by testing the distance from which paper clips are attracted. They then test whether magnets still attract objects through obstacles of different thicknesses e.g. paper, books etc. which are placed between the magnet and the magnetic material. The concept of 'magnetic power' is introduced.

Objective:

By the end of the activity children should be able to:

- Identify magnetic and non-magnetic materials;
- Measure the strength of different magnets;
- Test how magnets can act through different materials;
- Provide practical explanations to distinguish the different strengths of magnets.

Resources:

- 10 everyday objects made of different materials (some should be magnetic and some not);
- Magnets of different strengths of magnetic field;
- Materials e.g. paper, book of different thickness.

Magnetic Power

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Magnetic Power

1. Engage (Forming hypotheses)

Children work in groups of 4-5. The teacher prepares 10 objects made of different materials for each group. The objects should be chosen from everyday used materials. Some of the objects should be made of magnetic materials and some of them of non-magnetic materials. The teacher asks the pupils to think about magnetic properties of the objects. Pupils have to divide them into two groups – magnetic and non-magnetic objects according to their previous knowledge. The pupils are asked to discuss their ideas between themselves in the working groups. They are also asked to note down the result of their discussion in a form of their predictions (they use the attached worksheets – task 1). During this activity, the teacher can recognize pupils' preconceptions about magnetic and non-magnetic materials. After finishing the first task, the teacher gives two magnets of different intensity of magnetic field to each group and the second task for the pupils is to verify their predictions.

Further they have to note down the results and highlight those objects which behaved differently to their predictions (they are solving task 2). The revision of the preconceptions helps the pupils to start discussion about reasons of magnetic

behaviour of different kinds of objects (materials). The teacher then asks the pupils to describe the results. He/she direct the pupils to generalize findings about magnetic and non-magnetic materials. The teacher then focuses on the objects which behaved differently to what they have predicted. The teacher can use supporting questions like: try to explain; why some of the materials have been attracted by magnet even you predicted they should not be attracted. Students can then search for information about magnetic and non-magnetic metals in different kinds of information sources (45mins of science lesson is finished).

Children now notice that one of the magnets is “stronger” than the other. As they already have a lot of experience with magnets, they do not pay extra attention to this fact. On the other hand, it is possible to move forward this naive concept of “magnetic power”. The teacher should pay pupils attention to the mentioned information by formulating a research problem: How can you find out, which of the two magnets is the “stronger” one? The research problem is formulated and the inquiry process can start.

2. Inquiry (Designing and running experiments and observations)

Teacher asks the pupils to propose a procedure for finding out which of two chosen magnets is the stronger one (task 4 of worksheets). Pupils can propose one or more procedures. After finishing the work on the proposals, teacher asks the pupils to write down the proposals and prepare for presentation in front of the whole class. While group of pupils presents their proposal, other groups should try to criticize the presented proposal to make it more precise. Teacher should promote the discussions about proposals by asking the presenting pupils to specify the exact way how they would like to realize the measurement. The teacher is a model of inquiring person for the pupils and this way the pupils can slowly adapt teachers' behavior to own acting.

Further he/she asks the pupils to find out whether their proposals works or not; he/she directs the pupils to find out whether they can measure “power” of magnets by using procedure they have proposed. In a case we would like to develop the measuring

skills we should direct the research problem to measuring activities – the research problem is aimed at quantification or exact comparison. According to pupils' abilities, different kinds of ideas can occur. After that the pupils present the way of how they were finding out which of two magnets is the “stronger” one, they presented the result and the data in which the results are grounded in. They need to argue for their results, that is why they perceive the exact measurement as very important part of their investigation. After that pupils work on task 5 of the worksheets. The task emphasizes some important aspects of scientific measurements. Pupils are asked to measure the “power of the compared magnets” by procedure prepared by teacher. They can compare the results they obtained in task 5 with results of measurement they obtained by using own procedure of measurement.

The pupils analyze the results.

Magnetic Power

3. Evaluation (Evaluating evidence)

While the pupils construct the results of measurements, the teacher asks them to argue by obtained data (task 6 in the worksheets). The teacher can help the pupils to discuss the results and potentially direct them to the further investigation by using specific questions. Would it be possible to increase or decrease the distance from which the magnet attracts the magnetic objects? Try to explain how and why you think so (task 6 of the worksheets). And the inquiry process continues. The pupils deal a research problem aimed at principle of the previously measured “magnetic power”.

After that the pupils summarize the obtained results (task 8 of the worksheets). They respond to following questions: Did the

obstacles stop the magnetic attraction? Is it possible to influence the magnetic attraction by using obstacles? What determines whether the magnet will attract the magnetic object or not? Pupils should note the important findings and discuss them in the whole class discussion. The teacher makes general conclusion using the pupils' findings. Pupils will find out that the only reason of attracting magnetic materials by magnets is distance between the magnet and the magnetic objects and this distance from which magnets attract magnetic objects is different for different magnets but same for the same magnet. Teacher can introduce term “intensity of magnetic field” to use it instead of naive term “magnetic power” (135 mins of science lesson is finished).

Magnetic Power

Worksheet

Task (1): Divide the objects into two groups – magnetic and non-magnetic materials

 objects attracted by magnet	 objects not attracted by magnet

Task (2): Using magnets to test your objects. Write down the results. Mark those objects which behaved differently to what you thought.

 objects attracted by magnet	 objects not attracted by magnet

Magnetic Power

Task (3): Formulate results which are supported by data obtained in the previous observation and by previous knowledge reasoned in the discussion. What can you say overall? – what kinds of materials are magnetic and which ones are not.

Task (4): How can you find out which of two chosen magnets is the stronger? Find out whether your proposal is working or not; find out if you can measure “power” of magnets by using your proposed procedure.

Task (5): Choose two magnets which seem not to be of same “strength”. Use the ruler to find out the distance from which the magnet attracts the magnetic objects. Repeat the measurement 4 times. Write down the results.

object	distance of object and magnet in the moment of its attraction							
	magnet 1				magnet 2			
	measurement							
	1	2	3	4	1	2	3	4
paper clip								
key								
coin								

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Task (6): Which magnet is the “stronger” one? Indicate how did you find it (refer to data you have obtained in the previous task). Would it be possible to influence somehow the distance from which the magnets attracts the magnetic objects? If yes, try to explain how.

Task (7): Do magnets attract magnetic material also trough different objects and materials? Express your predictions and validate them afterwards.

Obstacle	Is the object attracted by magnet trough the obstacle?			
	prediction		verification	
Paper	yes	no	yes	no
Book	yes	no	yes	no
Door	yes	no	yes	no
	yes	no	yes	no
	yes	no	yes	no
	yes	no	yes	no

Task (8): Summarize the obtained results. Does the attraction change when using obstacles? What did you notice? Write down your important findings.