WHAT OBJECTS DO MAGNETS ATTRACT?

PLANNING YOUR EXPEDITION

As an extension of "What Is A Magnet?" or standing alone, this activity is intended to allow students to explore the magnetic qualities of various materials. Maintaining the groups set up for the previous activity provides continuity and a forum through which students can test ideas. Articulating theories about magnetism before testing them can save time and will help students make sense of what they are trying to accomplish.

Creating a data table and then using this data to answer a question or solve a problem is a skill that is used frequently in the science classroom. Recording the data table in the Alpha Log enables students to use the data again and again, if necessary. Whether the students come up with their own action plan or, whether you provide the parameters within which they will work, a data table is recommended. Students will then be asked to classify the data and use it in a writing assignment.

Students might choose other ways to present data based upon personal learning styles. It is important to the understanding of complex concepts, such as magnetism, that the information collected makes sense to every student. Creative ways to demonstrate mastery could be through the use of graphic organizers, concept maps, lists, graphs, or computer-generated representations of the data.

The concept of atoms could be introduced or reintroduced here depending upon the class level and students' prior experience. The CD-ROM offers graphically-presented background information on atoms in a way that is understandable for a middle school student.

1. Groups of 2-4 students are assigned specific roles: recorder, spokesperson, materials manager, and technology specialist (see discussion on group roles in "Classroom Issues"). Discuss the task with the whole class, beginning with the question, "What objects in and around this room are attracted to a magnet?" Instruct groups that they will be responsible for recording observations, confirming the data, and then presenting it to the class.
2. If the groups have previously completed "What Is A Magnet?" they will use the plan already designed and approved by you to test their theory or theories about magnetism.
3. Students will investigate at least 15 items in and around the classroom, predicting whether each one will be attracted to a magnet and recording the results on a data table or other method of data collection preapproved by you.
4. When all information has been collected, groups will design a method of presenting the results to the whole class.
5. Groups should be encouraged to use technology other than paper and pencil to present their findings (for example, a computer, overhead projector, or instant photographs). At this point, students could role-play, write song lyrics, or suggest other ways of presenting their findings. However,

the presentation should be substantive, including that magnetism is the result of the movement of electrons, that some materials are attracted to magnets and others are not, that these materials can be classified, and that magnets have a north and south pole.

BACKGROUND INFORMATION (see also Background Information "What Is A Magnet?")

All matter is made of atoms. Atoms can be broken down into three smaller particles: protons, neutrons, and electrons. It is one of these smaller particles, the electron, that is very important to magnetism, since only it is able to move around in magnetic materials. The movement of protons is so slight that they are of little consequence to the discussion of magnetism.

In most materials, electrons occur in pairs. However, some materials have unpaired electrons. Unpaired electrons can move freely through some metals, and they arrange themselves so that they spin in the same direction, causing the metals to become attracted to a magnet. The alignment can occur in natural or manmade materials.

EXCURSIONS

Have students create an invention that uses magnetism, describe the purpose of the invention, who would be most likely to use it, how it works, and the purpose of using magnetism as part of the invention.

SC.C.2.3.1-3, 6

LA.B.1.3.1-3

Using the results from the interview questions (homework assignment) students create posters to be displayed around the school, making sure that there is included in this display a way to educate others as to what magnetism is and its everyday applications.

SC.C.2.3.2, SC.H.3.3.5-7

LA.A.2.3.5, LA.B.2.3.3, LA.D.2.3.2,5

Read aloud The Secret Life of Dilly McBean about a boy with magnetic hands. The class could discuss how the novel relates to what they are studying in class. There could be written summaries, drawings, role-playing activities when the book is finished. This is an excellent way to introduce the connection between literature and science, especially discussing that the story itself is enhanced by the knowledge of scientific concepts and facts.

SC.C.2.3.1-3, SC.D.2.3.1

LA.A.2.3.1-4, LA.C.1.3.1-4, LA.E.1.3.1-3, 2.3.1-4, 6

Investigate various authors. Students will find it surprising that many highly successful authors did not set out to write

books and, in fact, may have begun their adult careers in science. For instance. Elaine Konigsberg (E.L. Konigsberg) was a science major at Carnegie Mellon before writing The Mixed Up Files of Mrs. Basil E. Frankweiler and has recently won the Newbery Award for her latest book about a middle school brain bowl team. Arthur C. Clarke (2001: A Space Odyssey) combines both a successful career as a science fiction author and scientist. Michael Crichton (The Andromeda Strain, Jurassic Park) began his career as a medical doctor. Students could come up with others to present to this class or share in Language Arts.

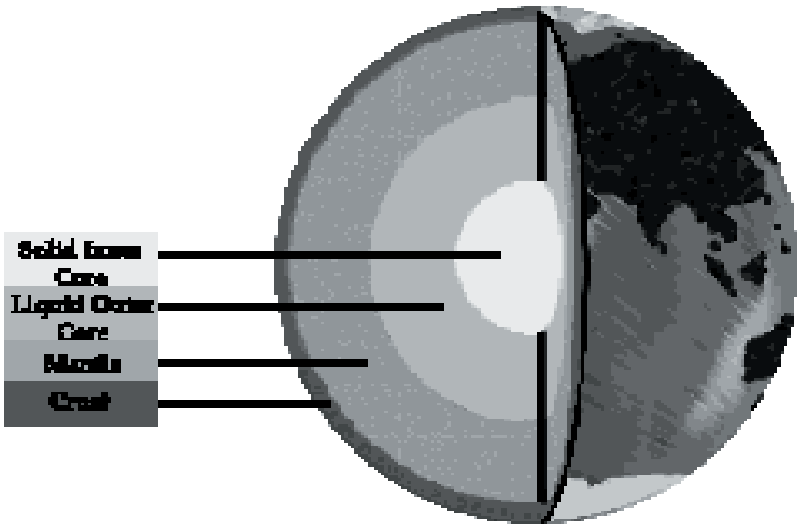
SC.H.3.3.5

LA.A.2.3.4, LA.E.1.3.1-3, 2.3.1-4, 2.3.8

Students research the origin of the word "magnet" using web sites, CD-ROM, or print media. Students will attempt to answer in writing "What's in a name? Does it matter what we call it?" This might lead to discussion of other word origins; for instance in Earth Science, the layer between the crust and the mantle known as the Moho; the names of the different temperature scales; in Life Science, Latin names of animals and plants; in chemistry, the naming of elements.

SC.C.2.3.2-3, SC.H.1.3.1-7, SC.H.2.3.1, SC.H.3.3.5-7

LA.A.2.3.5-8, LA.B.2.3.4, LA.D.1.3.2,4



Notes:

FOR YOUR PLANBOOK: What Objects Do Magnets Attract?

Suggested time: 1-2 hours

Gear: magnets, classroom objects. Have available a variety of objects such as paper clips, aluminum foil, wooden dowels, metal rods, coins, glass, etc., for those students who are unable to bring them to class.

Optional: tape recorder and audiotapes if you choose to record classroom discussions.

National Science Content Standards: A, B, G

Sunshine State Standards Benchmarks: SC.A.1.3.4, SC.A.2.3.2, SC.C.2.3.1, SC.C.2.3.2, SC.C.2.3.3, SC.C.2.3.6, SC.H.1.3.1, SC.H.1.3.2, SC.H.1.3.4, SC.H.1.3.7, SC.H.3.3.6, SC.H.3.3.7

Sunshine State Standards Benchmarks -- Language Arts: LA.C.1.3.1, 1.3.4

Homework: Have students create three interview questions to probe someone's understanding about magnets and magnetism. Sample questions might be: What is a magnet? Why are some materials magnetic while others are not? Where would you find magnetic fields? Are there magnetic fields in nature? Students should conduct at least two interviews with adults (high school age or above) to share with their group.

Homework Assessment: Use homework interview questions to discuss misconceptions about magnets/magnetism, the general public's knowledge of the subject, what the implications are, what information is lacking, etc. Classroom discussions could be tape-recorded and replayed for further clarification after more magnetism activities are completed. In this way students can correct any misconceptions that they might have had at the start of the series of activities.

Assessment: Data collection record includes a table that is easily readable without detailed instructions indicating that students investigated 15 objects after predicting whether or not they will be attracted to a magnet. Tables should indicate that no nonmetals were attracted to a magnet and only some metals (not all) were attracted to a magnet.

Presentation to the class should be creative, well thought out, use technology other than paper/pencil, include a conclusion as to which materials are attracted to the magnet and why, and should reflect participation by all group members.

Alpha Logs include preparation of the data table, interpretation of results, one paragraph listing characteristics of magnets, and conclusions drawn after completing the investigation. There should be some indication that students have improved in their ability to predict which objects are not attracted to a magnet.

A computer-generated table or graph, saved on disk, becomes a part of the general Alpha Log demonstrating use of technology.

Students create a written product (list or paragraphs) that demonstrates how their group classified objects that are attracted to a magnet. This requires that the group found a way to organize and articulate their assumptions.

WHAT OBJECTS DO MAGNETS ATTRACT?

Itinerary

All matter is made of atoms. Atoms can be broken down into three smaller particles: protons, neutrons, and electrons. It is one of these smaller particles, the electron, that is very important to magnetism. Magnetism is a force that can attract or repel objects. This attraction or repulsion is caused by the arrangement of electrons in a material. An object is said to have magnetic properties if it can be affected by a magnet.

In most materials, electrons occur in pairs that spin in opposite directions. However, some materials have unpaired electrons. Unpaired electrons can move freely through some metals, and they arrange themselves so that they spin in the same direction, causing the metals to become attracted to a magnet.

You will be investigating objects in and around your classroom to determine how each one interacts with a magnet. This activity will help you answer the question,

"What objects are attracted to a magnet?" Not only will you answer it, but you will present your answer to the class so that you can check your results against those of the rest of the students. You will be modeling what scientists do in real-world situations. As they work, scientists post their data, or e-mail other scientists to get feedback before they go further. Use either the plan that you developed previously or one suggested by your teacher to test objects and record information.

1. Assign individual roles or keep your roles from the previous activity: a recorder, a spokesperson, a materials manager, and a technology specialist. Each member should enter this role in his or her Alpha Log and the Materials Manager will pick up a magnet.

2. You will need to investigate at least 15 different objects to see whether or not your magnet attracts these objects. Identify the objects in a data table in your Alpha Log. Include in the table your prediction of whether the object will be attracted to the magnet. If you have chosen another form of recording, make sure this has been approved by your teacher.
3. Once you have finished investigating your samples, make a list in your Log of those objects that are attracted to a magnet and those that are not. Share your results with another group. Recheck those items where there is disagreement. Record the new results in your Log with an explanation as to why you repeated the test.

4. Write one paragraph about the characteristics of objects that are attracted to a magnet. If you have difficulty identifying characteristics of objects that stick to a magnet, a table that lists metals, nonmetals, smooth surface, etc., may help you organize your ideas.
5. With the whole group, create a brief presentation of your results. Have your