PRACTICAL APPLICATIONS

PLANNING THE EXPLORATION

These areas of recommended further study address three important issues: first, they are an attempt to bridge the gap between classroom science and real-world science research and development; second, they introduce students to the many and varied careers associated with magnet research; third, they encourage students to become responsible consumers of information. Scientific advances bring both problems and advantages which require that informed citizens understand how these advances impact their lives. Today's citizens must make decisions based on social issues; for example, genetic engineering, reduction of sources for fossil fuels, environmental issues, health concerns, or ethical issues in science research. This Exploration provides opportunities for students to analyze the impact of science and technology on society, to determine their costs and benefits, and to apply classroom work to real-world situations.

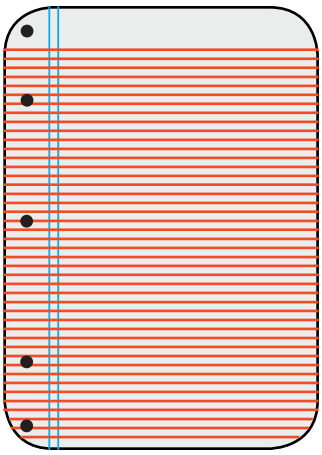
BACKGROUND INFORMATION

Information on the practical applications of magnet science can be found in a variety of sources. Since this Exploration addresses a number of different subjects, the best place to start is with the Alpha Interface. The Alpha Interface (CD-ROM) provides basic information on these issues as does "Build a Simple MagLev Train" and "Build a Magnetic Trash Separator Model." An excellent source for information on some of the topics being covered is the web site at the National High Magnetic Field Laboratory (www.magnet.fsu.edu).

Additional sources of information can be found in a variety of print media: encyclopedias, science encyclopedias, Odyssey Magazine, Earth magazine, Discover magazine, videos (available from the public library), personal interviews, visiting government agencies, writing letters to the editor or to private companies, etc.

MagLab: Alpha

FOR YOUR PLANBOOK



Suggested time: 1+ hours

Gear: CD-ROM for reference

National Science Content Standards: (Depends on whether students complete an assignment on one particular application or whether they look at all seven listed here.) A, B, C (if students take an in-depth look at MRI technology), E, F, G

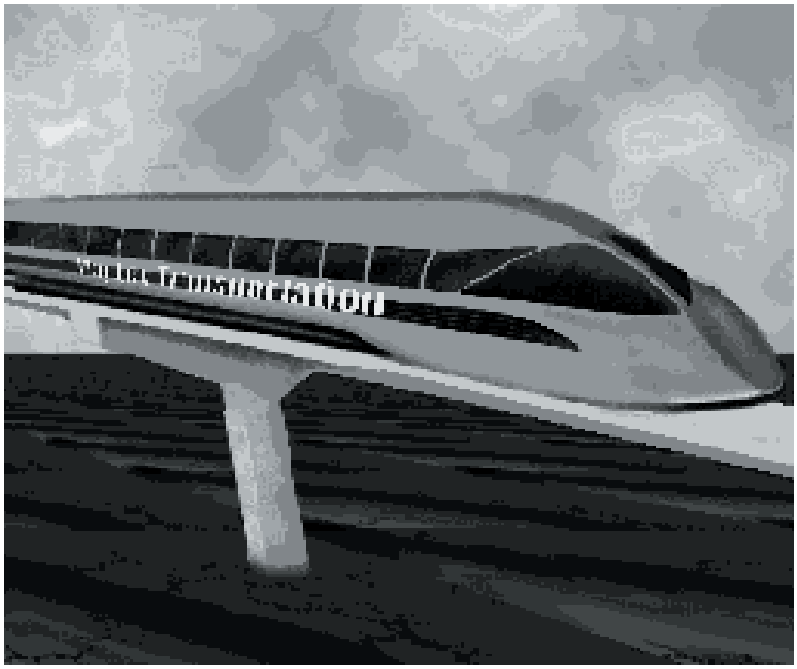
Sunshine State Standards Benchmarks: (Depends on whether students complete one particular assignment or whether they research all seven.)SC.B.1.3.1, SC.C.2.3.1, SC.C.2.3.2, SC.C.2.3.3, SC.C.2.3.4, SC.C.2.3.6, SC.C.2.3.7, SC.D.2.3.1, SC.D.2.3.2, SC.G.2.3.1, SC.H.1.3.1, SC.H.1.3.2, SC.H.1.3.3, SC.H.1.3.4, SC.H.1.3.6, SC.H.3.3.4, SC.H.3.3.6

Sunshine State Standards Benchmarks -- Language Arts: LA.A.1.3.1-4, 2.3.1-8, LA.B.1.3.1-2, 2.3.1-4, LA.C.1.3.1-4, 2.3.1-2, 3.3.1-3, LA.D.2.3.1-7, LA.E.2.3.4-8

Homework: Students will be working on their individual research projects on their own time.

Assessment: Each of the topics could be explored in a number of ways to accommodate individual learning styles. Examples of ways to integrate reading and writing in the science curriculum are given as well as ways to tap into each student's talent.

Some areas for further exploration into the practical applications of magnet science are: *MRI, lithotripsy, MagLev trains, magnetic mining, energy storage, trash separators, magnetic launchers, and the development of superconductors.*



Presentations. Each student, pair of students, or group of students could create a presentation of one of the topics of interest. The purpose of the presentation would be to share what they have learned with the rest of the class members. Completing the task in this manner would yield the most information in the shortest period of time. Students come to class with expertise in one area but leave the class knowing about all seven.

Presentations could be done in a number of formats. Multimedia sharing, perhaps a listing of web sites, or visiting web sites and keeping a diary of sites visited that discuss practical applications of high field magnet science. Role playing (particularly in the case of MRI technology) and models would be appropriate.

Debates could be organized by students to bring to the class issues that are involved in controversy or which have the potential to become controversial. For example, students could debate the use of magnetic mining techniques as a safe, efficient way to remove certain materials from mines. However, the other side of the issue deals with people being put out of jobs that have been traditionally held either in that geographical area or by that particular group of people. Students will be forced to answer the question "What happens to people who know only one skill or business? How will they find work?" If a large number of people are put out of work, what implications does this have for the economy of the area?

Encourage students to channel their natural tendency to take sides to inform a large number of people about the issue in which they believe. If the debate is set up as a town meeting format, other students could represent the voting public and actually take a vote at the end of the debate. Winning and losing is not the issue; informing the greatest number of people of both sides of an issue is.

Write letters to the editor of a local newspaper in support of one of the areas of practical application, e.g., MagLev trains, magnetic mining, energy storage, trash separators, etc. By formulating a way to express themselves, students will be articulating their opinions on issues that affect the environment. Analyzing each of the issues for its potential to improve the quality of life on the planet encourages students to become competent, responsible consumers of information presented by mass media.

Have students create their own *science fiction* based upon one of the practical applications of magnet science. By including a great deal of science fact, students demonstrate that they can distinguish between science fact and fiction. They will be describing and explaining whichever of the technological developments they choose to fictionalize. Students can choose another *genre* with which to work: fantasy, nonfiction, fiction, biography, reporting, etc. as a vehicle for presenting what they have learned.

Students can create *games* that trace the development or use of a particular invention or innovation or that illustrate one or more of the technologies that are being explored. If they are more comfortable adapting a game with which they are already familiar, rather than creating an entirely new game, encourage this as a worthwhile way of modifying work that others have done. This is typical of real-world science discoveries which are often modified as new work is being tested and new theories are proposed.

A *research report* which meets predetermined

requirements on one or all of the practical applications will allow students to discover that, although the disciplines appear to be very different, often the purpose is the same (e.g., to create jobs, provide a more efficient transportation system, advance medical research, or improve the environment). Reports could be created on the computer and include graphics that are shared with the rest of the class.

Students who are talented at creating works of *art* should be encouraged to design a project or piece of artwork that would portray technological advances. Artists are only limited by their imaginations as to the media that they use to express themselves. Creating a piece of art that the student can explain as representative of one or more of the practical applications (MRI, for instance) models how artwork sometimes reflects the time in which it was created.

Those who are interested in art but do not want to create a piece of artwork should be encouraged to investigate and then explain to the class how the Industrial Revolution was reflected in artwork; how WPA-backed art portrayed middle America in the Depression; or how computers have changed how some art is done. *Science in art* and the *art in science* would be challenging topics for more sophisticated or gifted students.