Drexel-SDP GK-12 ACTIVITY

Activity: Science Fair

Subject Area(s) **General Science**

Associated Unit **Scientific Method**

Associated Lesson **embedded**

Activity Title **Scientific Method Activity**

Grade Level 6 (5-7)

Activity Dependency **None**

Time Required **500 minutes**

Group Size **Groups of 3**

Expendable Cost per Group **varies from $0 - $5**

Summary

Students will learn the basic principles of the scientific method through inquiry-based experiments that they design. Students will identify variables in the system and examine what changes in these variables would do to the system. Students will observe changes in physically properties and explain how these relate to the experimental variables. Students record, analyze and present their experimental data. Students present their data and demonstrate their public speaking skills as well as their ability to interpret data.

Engineering Connection

Often engineers follow a “test-and-revise” process that is very similar to the scientific process.

Keywords

Science fair, scientific inquiry, hypothesis, experiment, scientific process

Educational Standards

Science:
3.1.7 A Explain the parts of a simple system and their relationship to each other.
3.1.7 B Describe the use of models as an application of scientific or technological concepts.
3.1.7 D Identify change as a variable in describing natural and physical systems.
3.2.7 A Explain and apply scientific and technological knowledge.
3.2.7 B Apply process knowledge to make and interpret observations.
3.2.7 C Identify and use the elements of scientific inquiry to solve problems.

Math:
2.6.8 A Compare and contrast different plots of data using mean, median, mode, and range.
2.6.8 F. Use scientific and graphing calculators and computer spreadsheets to organize and analyze data.
2.7.8 B Present the results of an experiment using visual representation (e.g. charts, graphs, tables).
2.7.8 C Analyze predictions.

Pre-Requisite Knowledge

Averages and interpreting numerical data. Some prior experience in note-taking is preferred.

Learning Objectives

After this lesson, students should be able to:

- identify variables in the system
- observe changes in physically properties
- record, analyze and present their experimental data
- present their data and demonstrate their public speaking skills
- interpret data.

Materials List

Lesson 1:
4-5 different topics each listed on a piece of paper in a jar
Student worksheet
Laptops/computers

Lesson 2:
Students should each provide their own list of materials per their experiment they design in lesson 1 for their experiments.

Lesson 3:
Poster board
Construction paper
Markers
Rulers

Graph paper

Introduction / Motivation

Students will learn the basic principles of the scientific method through inquiry-based experiments. Students will research their topic via books; magazines and the Internet in order to better understand their experiment. Students will identify variables in the system and examine what changes in these variables would do to the system. Students will observe changes in physically properties and explain how these relate to the experimental variables. Students record, analyze and present their experimental data. Students present their data and demonstrate their public speaking skills as well as their ability to interpret data.

Vocabulary / Definitions

Word	Definition
Scientific Inquiry	The process by which scientists ask questions, develop and carry out investigations, make predictions, gather evidence, and propose explanations.
Research Question	The main question a scientific investigation aims to answer
Hypothesis	An educated guess for the outcome of the research question
Experiment	A procedure designed to test the hypothesis
Analysis	Evaluating and drawing conclusions based upon data collected
Quantitative Data	Numeric information that is measured.

Procedure

Background

Students will learn the basic principles of the scientific method through inquiry-based experiments that they design. Students will identify variables in the system and examine what changes in these variables would do to the system. Students will observe changes in physically properties and explain how these relate to the experimental variables. Students record, analyze and present their experimental data. Students present their data and demonstrate their public speaking skills as well as their ability to interpret data.

Before the Activity

Define the vocabulary words, then ask the students to copy the steps for the scientific inquiry process in their notebook as the instructor discusses each step.

What Makes a Good Project?
A good Science Fair project is an experiment - that means it's a test to find an answer to a question you have.
1. Pick something you are interested in.
2. Come up with a question you can test with an experiment.

Don't do demonstrations or simple reports - use the scientific method!
3. Pick something you can do with only a little help from parents, teachers and friends.
The reason to do a project is because it's fun and you will learn something you didn't know before. Having someone else help too much takes away some of your fun and you don't learn as much. Your project doesn't have to be perfect, just neat and following the scientific method. Don't be afraid to ask for help if you really need it.
4. It doesn't hurt people or animals.
5. It's a project that, even when you are done with it, makes you think of new things you want to know.
One way to tell if you have a good project is to see if the results make you wonder about other things. Did doing the project, or reading or seeing what happened make you think of other questions you are curious about? That's a great project!

With the Students

Procedure:
Lesson 1:
Students will learn the scientific principle. Students will work in teams of 5 -6 based on their seating arrangement in the classroom. They will be given a topic (randomly selected by each group) to perform an experiment on. Once they choose their topic they must come up with a question, design an experiment, and then plan how they will do the experiment, come up with a list of materials, and determine what are the variables in the experiment. A worksheet will be provided for them to fill out for their ideas.

Lesson 2:
Experiment day! Students will review lab safety procedures as well as the scientific method. Students will evaluate what a flow diagram is and how it can be used to represent their experiment inputs/outputs. Students will perform their experiments during this class period. They will be given a worksheet to fill out in order to ensure they are recording the necessary data. All data will then be graphed appropriately so that it can be presented to the class. Students will be reminded to watch for physical changes, think about the variables in their experiment, and guess what would happen if their input variables were to change. What does their data mean? How can they use their results to predict future experiments? Do their results lead to more questions?

Lessons 3 & 4:
Students will present their experiment and results to the class. In order to do this, students will need to display their data in a graph or chart as well as research a brief background on their project topic. Students will be asked to evaluate themselves as well as the other group's presentations. A discussion of what would make a great presentation and how to improve upon their presentations.

Safety Issues

- Supervise the use of all equipment and supplies
- Use safety goggles when working with any liquids, powders or heated materials

Troubleshooting Tips

None.

Investigating Questions

Students will be evaluated by the completion of their experimental design & results worksheet. Emphases will be focused on their ability to determine the variables and how they affect the system. Also of importance will be their ability to present their findings to the class.

Assessment

Pre-Activity Assessment
None

Activity Embedded Assessment
Ask to see the students' notebooks for completeness and require a short status report as an oral presentation

Post-Activity Assessment
- Notebook completeness (vocabulary, experimental data, other notes as necessary)
- Completion of experiment
- Teamwork
- Quality of written report
- Clarity of oral presentation

Activity Extensions

Give the students a topic and ask them to generate a list of scientific inquiry questions related to that topic. Ask the students to prepare their presentation using PowerPoint or other similar presentation software.

Owner

Drexel University GK-12 Program

Contributors

Noelle Comolli

Copyright

Version: Mar 2007