Science Fair

Survival Guide

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Table of CONTENTS

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Ready to discover how things work, get some answers, build something new, and share it with the world? Put on your lab coats and start your Bunsen burners, because we're going to the science fair!

Whether it's in your home, at school, or at one of the official events around the country, science fairs are one of the best active learning experiences. As a scientist, you have the freedom to design a project, do research, conduct experiments, write essays and present your findings.

With this Science Fair Survival Guide in your hands, you're on your way to a stellar project. I will help you choose a project, conduct and analyze the research, write up a report, make a display, and see it through to the judge's table!

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Project Kickstarters

After you decide to enter the Science Fair comes the big decision—finding that perfect topic. It might take lots of brainstorming to find one that interests you, or maybe you have too many cool ideas and need to narrow them down. Here are some good questions to get started.

What interesting topics have I seen in science books, magazines and TV shows?

How do some of my favorite everyday objects work?

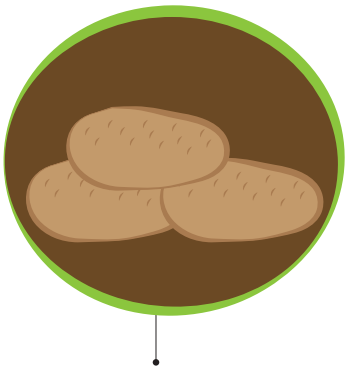
What's a problem I want to find a solution to?

What do I like to do on a daily basis, or for long periods of time?

What's my favorite subject?

For more inspiration, check out What's Your Topic? on page 9!

The Five Types of Projects



1. Experimental

In this type of project, you use the scientific method to propose and test a hypothesis. After you accept or reject the hypothesis, you draw conclusions about what you observed.

Example:
Under what conditions do potatoes grow the fastest?

2. Demonstration

In this type of science fair project, you retest an experiment that has been done by someone else, to show a scientific principle in action. Often, the demonstration will involve manipulating different variables to see what happens with change.

Example:
Build a model that demonstrates ocean currents.

3. Research

In this type of science fair project, you gather information about a topic, write a report, and present your findings with posters and other visual aids. A research project can be an excellent project if you begin with a question and use the data to answer it.

Example:
Test the hardness of minerals using the Moh's scale.

4. Collections

In this type of science fair project, you present a collection of items and discuss the scientific principles and new insight that the collection illustrates.

Example:
Collect leaf rubbings to learn about botany.

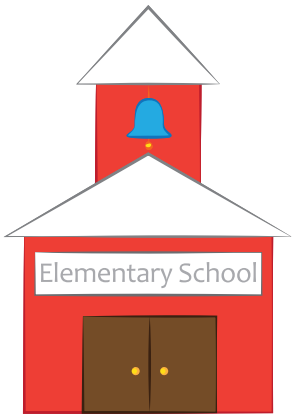
5. Models

In this type of science fair project, you present a model to illustrate a scientific principle or invent something new and better.

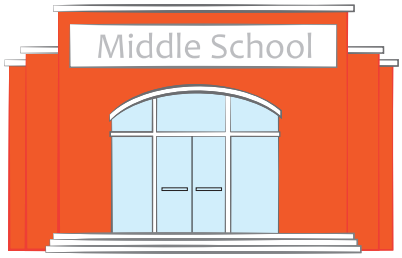
Example:
Redesign an old lighthouse for new purposes.

Schools of Thought

When you're ready to finalize a topic, keep in mind that a project that matches your grade level can determine your success.



In elementary school, the science fair is great for finding answers to questions and exploring the world around you. For example, "Why do birds fly south for the winter?" or "Does chewing gum affect your sense of smell?" are good questions.



In middle school, you will probably conduct in depth research and analysis. You're old enough to work with chemicals and build models. For example, you might build a potato battery, conduct a social experiment or track the growth of plants in different parks around the neighborhood.

In high school, projects can be very detailed and advanced, sometimes rivaling the experiments done in real labs. They can still be really fun, like the affect of video games on blood pressure, building a lie detector, or conducting an archeological dig.

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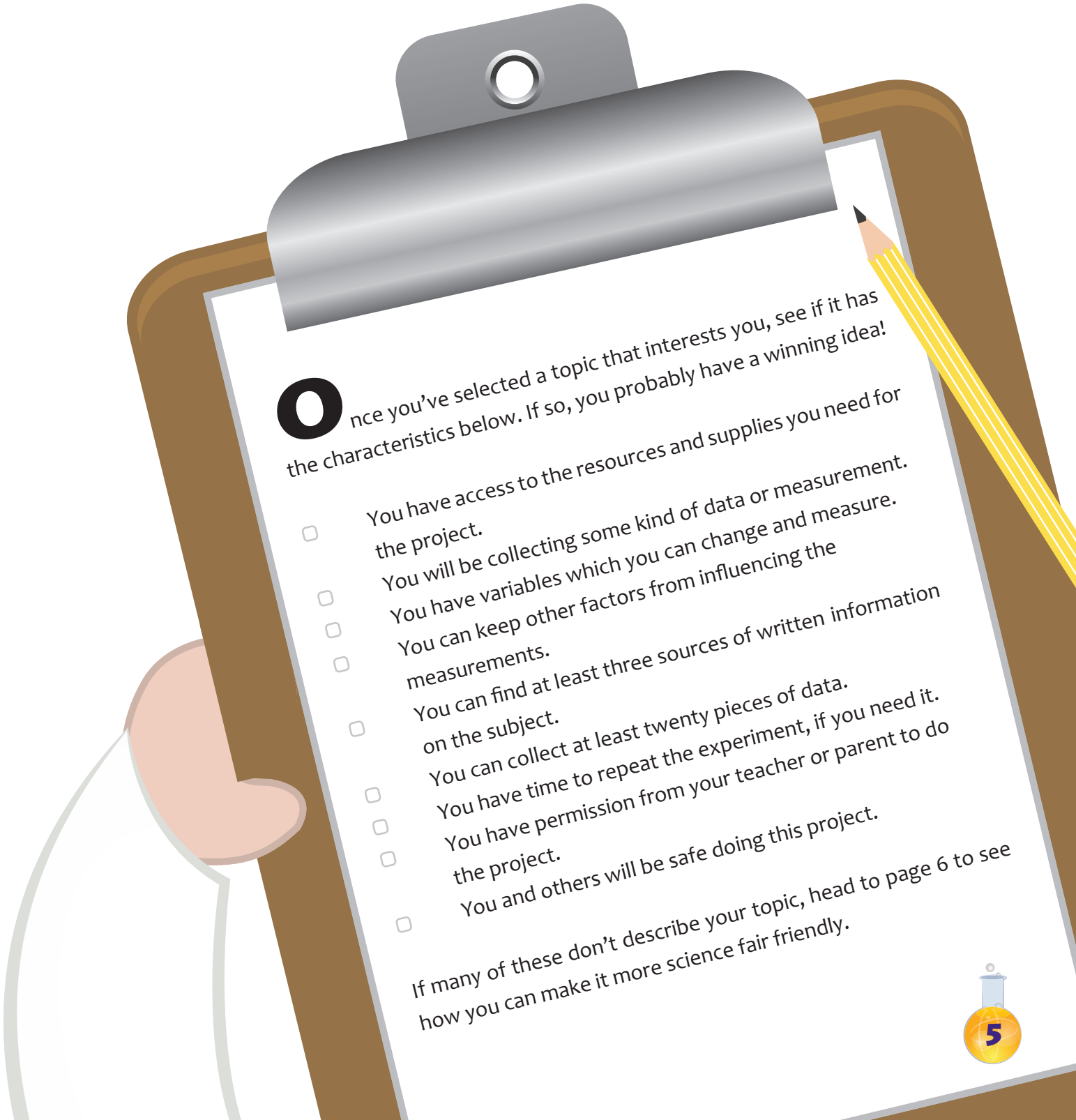
The Great Science Project Checklist



Once you've selected a topic that interests you, see if it has the characteristics below. If so, you probably have a winning idea!

- ☐ You have access to the resources and supplies you need for the project.
- ☐ You will be collecting some kind of data or measurement.
- ☐ You have variables which you can change and measure.
- ☐ You can keep other factors from influencing the measurements.
- ☐ You can find at least three sources of written information on the subject.
- ☐ You can collect at least twenty pieces of data.
- ☐ You have time to repeat the experiment, if you need it.
- ☐ You have permission from your teacher or parent to do the project.
- ☐ You and others will be safe doing this project.

If many of these don't describe your topic, head to page 6 to see how you can make it more science fair friendly.

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Creating a Question

Some of the best science fair projects are sparked by a question. If you have a broad topic that needs fine-tuning, do a little research and come back to the brainstorming board. Here are some ways to develop a topic into a problem worth exploring.

Topic	Relationship	Problem
Birds	Birds and bird feeder position	Does the height of a bird feeder affect the amount of times a bid visits?
Body Temperature	Temperature and time of day	Does body temperature change depending on time of day it is?
Pendulums	Pendulum and length	Does the length of a pendulum affect the number of times it swings?
Erosion	Erosion and plant life	Does the amount of plant life in the ground affect its rate of erosion?

Practice Your Purpose

State the purpose and hypothesis in just a few sentences.
Here's an example:

"The purpose of this project is to determine if earthworms affect the nutrition density of soil. I predict that plants will grow better in soil containing earthworms than in soil without earthworms."

Your turn!

The purpose of this project is _____

_____

_____

I predict that _____

_____

_____

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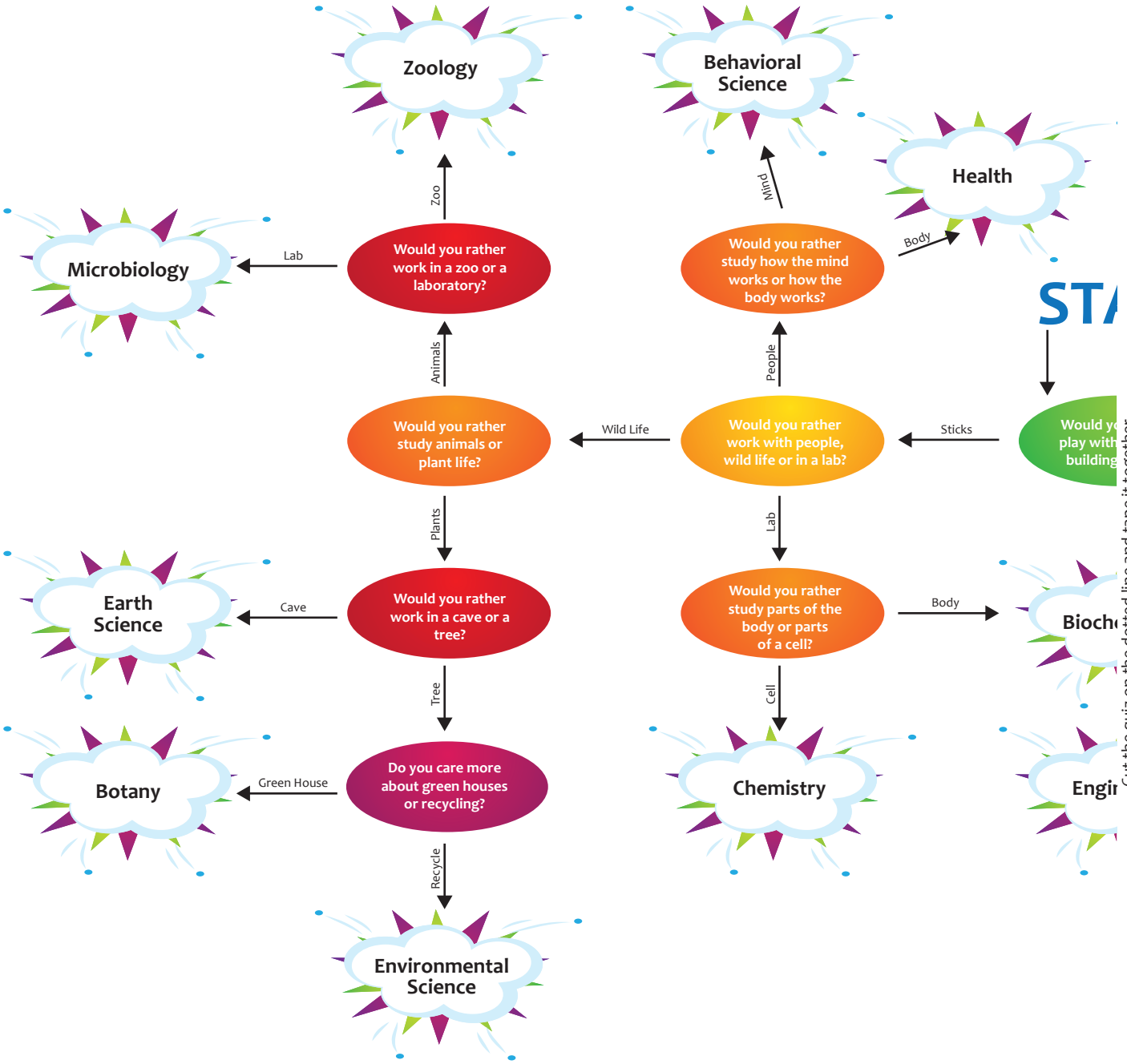

Cut the quiz on the dotted line and tape it together.

Aerospace Science
The study of the Earth's atmosphere and outer space, including aircrafts, planets, satellites, comets, meteors, stars and guided missiles.

Behavioral Science
The study of human and animal behavior, often related to culture, emotions, learning, personalities and logic.

Biochemistry
The study of the processes and properties of organisms and their relation to carbohydrates, lipids, proteins, enzymes, vitamins, hormones and toxins.

Botany
The study of plants and how they grow, reproduce, and react to different stimulus.

Chemistry
The study of the composition, structure and properties of matter, like gas laws, atomic theory, ionization or compounds.

Computer Science
The study of computer hardware and software, including graphics, virtual reality or program coding.

Earth Science
The study of the origin, structure and composition of the earth, including fossils, minerals, land forms, erosion, ocean waves and the weather.

Electronics
A mix of engineering and technology that deals with machines like radios, televisions, circuits, electric motors, solar cells or amplifiers.

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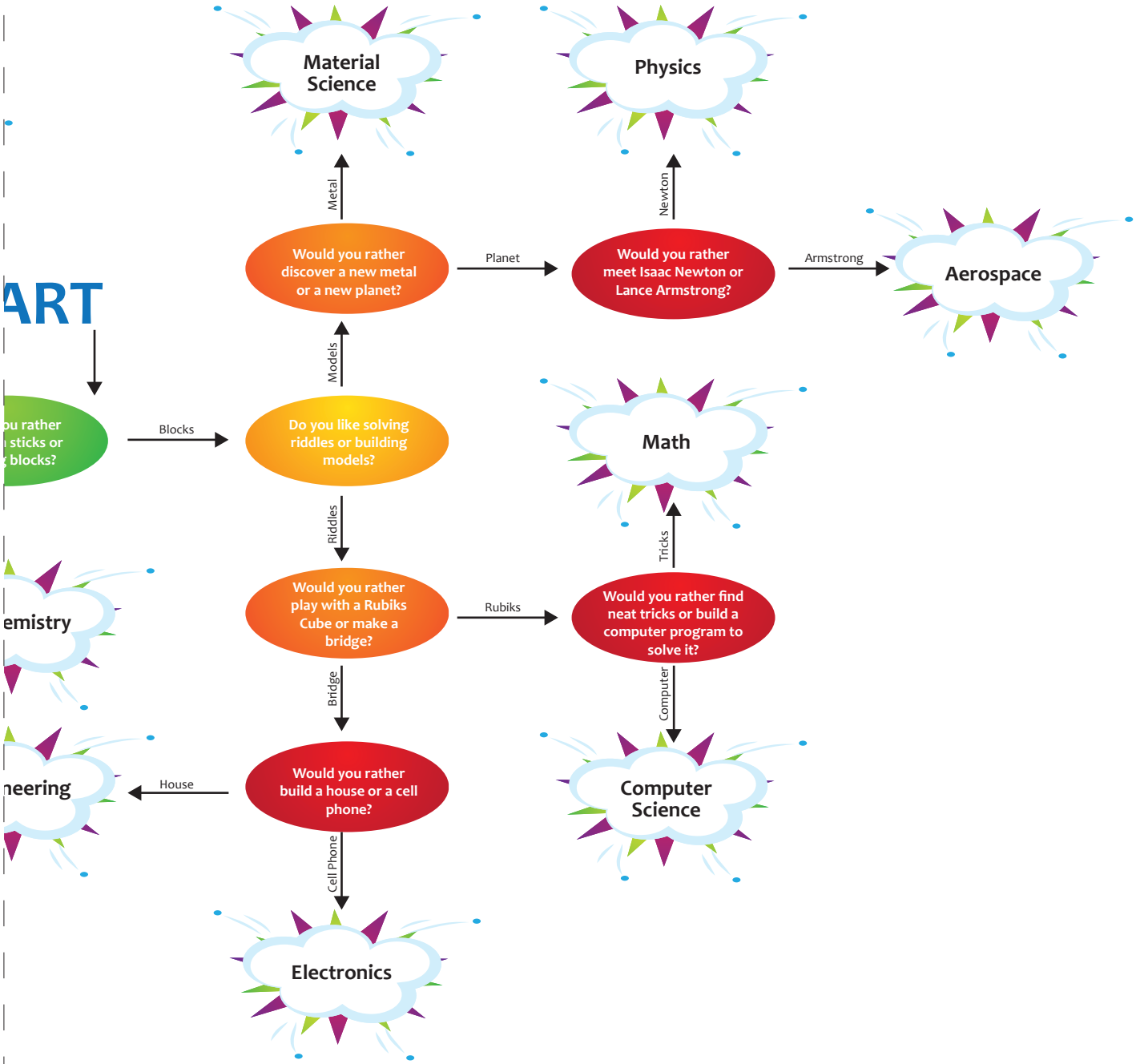

Engineering
The study science in practical topics, like the design of roads, bridges, dams, buildings or machines.

Health Science
The study of the human body and its relation to illness, diet, exercise and wellness.

Mathematics
The study of science dealing with quantities, like algebra, geometry, probability, trigonometry, or calculus.

Physics
The study of the laws governing motion, matter, and energy, such as gravity, pressure, relativity or Newton's Laws.

Environmental Science
The study of natural resources like solar energy, water or soil chemistry.

Materials Science
The study of materials and how they can be created and adapted, such as using plastic in new ways.

Microbiology
A branch of biology that focuses on microorganisms such as bacteria, viruses, yeasts, fungi, or tissue cultures.

Zoology
The study of animals and their anatomy, classification, functions and evolution.

Ready, Set, Research!

The success of your project depends on how well you understand your topic. The more you read up on it and ask questions, the easier it will be to write your report and talk to the science fair judges. Here are some tips to stay on track.

- Keep a bibliography and works cited so you can give credit to every resource.
- Record a new resource every time you find one, so you don't have to go back and redo the bibliography.
- Start a journal to keep all the information and ideas you have.
- Use information from different places, like books, journals, newspapers, computer programs and the Internet. Lots of information is not online, so head to the library to double your knowledge.
- Interview professionals like teachers, librarians and scientists.
- Even if you won't be mentioning it in your report, find out the history of your topic and its significance to society.
- When searching online, be specific and always spell check!
- Look at topics that are related to yours. For example, if you're researching paper airplanes, you could also research flight and birds.
- Make sure the information you find is accurate. Find out who put it there, when it was published, who it was written for, and if it has links to other reliable sources.

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The Scientific Method in a Flash

Cut out these scientific method flashcards for an easy study buddy to take on the go!

Observation

This is the first stage in choosing a topic or problem that you wish to understand.

Example: Every day, my teacher waters the plants in our classroom.

Hypothesis

A question that can be tested by an experiment. This will define the purpose of your experiment.

Example: Plants grow faster with water, and die without it.

Research

The information you collect from your experiences, books, the internet and expert advice.

Example: The life cycle of plants, and how they grow and produce energy.

Variables

The parts of your experiment that you change, to get the results you will then analyze.

Example: Giving plants different amounts of water to track their growth.

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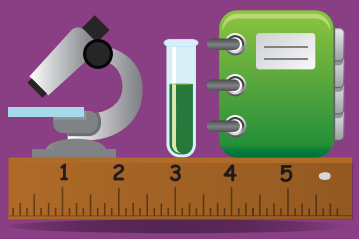
Independent Variables

This variable stands alone and you can control it in order to get the results you need.

Example: The different amounts of water you feed your plants.

Experiment

An experiment is a tool that you design to find out if your hypothesis was right or wrong.



Example: Tracking the growth of your plants over two weeks, and keeping a log of their growth.

Dependent Variables

This variable changes depending on other factors, usually your independent variable.

Example: How many millimeters each plant grows each day.

Data

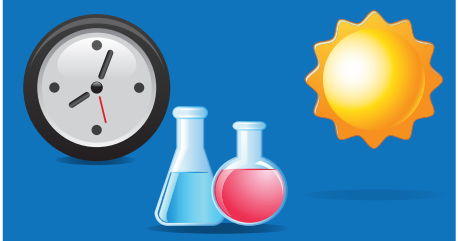
Observations you gather during the experiment. Analyzing them at the end will ultimately help you draw a conclusion.

H_2O	Height
0 ml	0 cms
5 ml	2 cms
10 ml	1 cms

Example: a chart

Controls

The parts of your experiment that will not change, so your esults are only affected by the variable.



Example: Keep the type of plant and amount of soil and sunlight the same.

Conclusion

This is a summary of the experiment's results, and how they match up to your hypothesis.

Example: The plants that received 2 oz. of water each day grow the most.

A Sample of Science

DO PLANTS NEED WATER?

OBJECTIVE

Determine whether plants will grow if they are watered with various liquids.

The purpose of this experiment is to find out whether plants really need water to grow or whether they just need to be kept wet.

HYPOTHESIS

Plants will grow better in plain water than in milk because of the different levels of nutrients in milk that the plants may not need to thrive.

MATERIALS AND EQUIPMENT

- Green Bean Seeds
- 2 Containers
- A marker
- Potting soil
- Milk
- Water
- A measuring cup

INTRODUCTION

Plants need sunlight, nutrient rich soil and water to grow. Though the quality of the water has an effect on the plant's health, there are many plants that are able to grow even when they are given water that is polluted or that has some salt content. Most plants are unable to grow out of water that is as salty as the ocean, though there are a few varieties that can. Water is not always in abundant supply, and when it comes down to making sure that people have enough to drink, sometimes plants are asked to go without. Farmers have turned to using brackish water, or water that has a low salt content, for their crops. Understanding what types of fluids plants can use can help scientists learn more about how to meet the needs of plants as well as people in times of draught.

EXPERIMENTAL PROCEDURE

1. Label the containers, "Water/Control," "Milk."
2. Fill the containers with potting soil.
3. Plant three seeds in each of the pots as directed on the back of the seed package.
4. Measure out 1/2 cup of water and give it to the plants in the "Water/Control" container.
5. Measure out 1/2 cup of milk and give it to the plants in the "Milk" container.
6. Place the plants in a warm, sunny place outdoors or in a window.
7. Repeat steps 4-8 every other day.
8. Record the growth of the plants on a chart.

PLANT GROWTH CHART

Control

Data

HEIGHTW	WATER	MILK
DAY 1	0"	0"
DAY 2	.25"	0"
DAY 3	.5"	.25"
DAY 4	.1"	.5"
DAY 5	1.5"	1"

DO PLANTS NEED WATER?

REPORT

Purpose

The purpose of this experiment is to find out whether plants really need water to grow or whether they just need to be kept wet.

Hypothesis

I believe that the plants will grow better in plain water than in milk because of the different levels of nutrients in milk that the plants may not need to thrive. I also suggest that milk may leave an unwanted residue in the soil. My hypothesis can be accepted as true because plants grown in pure water grew 1/2" taller after five days and a milky coating lingered on the plants.

Procedure

I used green bean seeds placed in potting soil and tracked their growth over the course of five days while using either water or milk to stimulate their growth. I placed each pot near a warm sunny window and gave each pot either 1/2 cup of water or milk every other day.

Conclusion

Overall, plants grown in water as opposed to milk grow 1/2" taller while plants grown in milk failed to thrive as well and appeared less healthy looking.

Best in

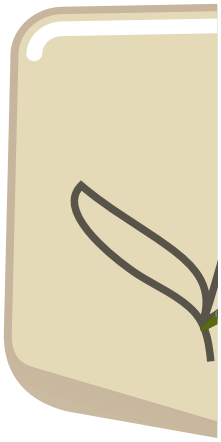
Spudta
Gro

The project is presented on a strong, three-sided display board, with either a black or white background.

Everything is typed up except drawings and sketches. Graphs and charts created in a computer program give judges a visual of your data.

Sketches are always drawn in pencil first and retraced in marker or pen.

Bright boarders line the print material to add a pop of color.



Cut and tape this page and the next one together.

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Show

A catchy, clearly written title in the center of the board.

Every word is spelled correctly. ("Affect" is used as a noun, while "effect" is a verb.)

Large, quality color photos with labels underneath are great for recording your progress.

All the pieces are glued on straight and evenly spaced. There isn't too much crowding or white space. Laying out all the pieces before you start gluing saves time in the end!

Additional items, like your science journal, materials, and models are placed on the table in front of your board.

Science is all around us. Any time you ask a question, explore a new place, or take a closer look at an object, you acting as a scientist! Now that you have the tools for a blue ribbon project, get out there and explore the world!