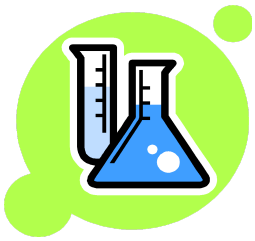

Science Fair Project
Student's Guide

Grade K – 4th
Revised October, 2017

Project Categories and Ideas

Students are to design an experiment to investigate a question or problem. **A MODEL OR DEMONSTRATION IS NOT AN ACCEPTABLE PROJECT.**

Aerospace Science is the science of the investigation of the earth's atmosphere and outer space. This would include the design, manufacture, and operation of aircraft.

How does weight affect the flight of airplanes?
What kind of fabric makes the best parachute?
Does the fin shape of model rockets have any effect on altitude?

Astronomy is the science dealing with all of the celestial bodies in the universe, including the planets and their satellites, comets and meteors, the stars and interstellar matter, the star systems known as galaxies and clusters of galaxies.

Conduct a mathematical study of the chemical composition of celestial bodies.
What are the effects of solar flares on radio or TV transmissions?

Behavioral Science* is the science that studies the demeanor or deportment of humans and other animals by means of observable response and the interpretation of the same as offered by the social sciences: sociology, psychology, etc.

Does color make a difference to taste?
Does age affect reaction time?
How does playing video games affect pulse rate?
Do boys or girls have better short term memory?

Biochemistry* is the branch of chemistry relating to the processes and physical properties of living organisms.

Which foods contain the most starch?
Which bread molds the fastest?
Does cake or dry yeast work better?

Botany is the division of biology that deals with plant structure, reproduction, physiology, growth, classification, and disease.

Do magnets affect plant growth?
Which method grows plants better – hydroponics or soil?
How does soil composition affect seed germination?
How do different colors of light affect plant growth?

Chemistry is the science that deals with the structure, composition and properties of substances and their transformation.

What is the pH of different soaps (detergents)?
What colors are really in black ink?
Which substances clean pennies the best?
What types of cups insulate the best?
Which detergent breaks down oil the fastest?

Computer Science includes the study and development of computer hardware, software engineering, internet networking and communications, graphics, simulations/virtual reality or computational science.

Is there a big (significant) difference in computer speeds?
Write an original program for tutoring a foreign language.
Develop a program to do repetitive experiments/tests.

Consumer Science* is the study of comparisons and evaluations of manufactured or commercial products.

Which antiseptic kills the most germs?
Which toothpaste removes the most stain?
Which brand of soda has the most fizz?
Which glue holds the best?
Which dishwashing liquid makes the most suds?
Which type of surface is best for in-line skates?

Earth Science is the science concerned with the origin, structure, composition and other physical features of the earth.

What is the best drainage material?
What material makes the best water filter?
How can water be made wetter?

Electronics is the branch of engineering and technology that deals with the manufacture of devices such as radios, television sets and computers.

What types of materials make the best amplifiers?
Which type of wires has the least resistance?

Engineering is concerned with the practical application of scientific knowledge in the design, construction and operation of roads, bridges, harbors, buildings, machinery, lighting, heating and communication systems.

Which retaining wall design is the strongest?
Which bridge design is the strongest?
Which wood absorbs the most water?

Environmental Science is the study of the protection and care of natural resources.

How does acid rain affect plants?
How does color affect a compost bin's effectiveness?
What is the best shape for a compost bin?

Health Science* is the science concerned with the study of the human body and good health practices.

Which aerobic exercise has the greatest effect on heart rate?
Which hand soap kills bacteria the best?
Which antacid works the best?
How do your daily activities affect your height?

Materials Science is the study of materials, nonmetallic as well as metallic, and how they can be adapted and fabricated to meet the needs of modern technology.

Which materials are best to carry a current?
Which type of decking weathers the best?
Plastic or wood – Which one would you use?

Mathematics is the science dealing with measurement, properties, and relationships of quantities as expressed in numbers or symbols.

What numbers appear most frequently in the lottery?
Does the first selector or the second selector have the better chance of selecting the correct number?

Microbiology* is the branch of biology concerned with the study of microorganisms.

Do microorganisms really speed up decomposition?
Which is the best disinfectant?
Do antibacterial soaps really work better than plain soaps?

Physics is the science that deals with the laws governing motion, matter and energy under precise observation.

Which insulation retains the most heat?
Does the shape of the container affect freezing time?
At what temperature will Silly Putty stretch the most?

Zoology* is the science that deals with animals with reference to their structure, functions, development, evolution and classification.

Can fish be trained to respond on cue?
What is the effect of sugar on mealworms?
What colors attract the most insects?

*Projects in these categories may need an endorsement.

Choosing a Topic

- **Be creative!** Plan a project that is original in plan or execution. The project should express scientific ideas in new or better ways.

- **Be scientific!** Investigate and explore a topic that arouses your curiosity or fascinates you. The library is an excellent place to begin your research.

- The student should consider the research problem in relation to his or her scientific background, desire to contribute to science, the time required for the student, and the availability of resources and materials.

- It is important that each project have a central theme or purpose, that is, to answer a definite scientific question or to solve a problem.

- The demonstration of good science matters much more than the choice of topic. Sometimes the simplest topic offers the greatest challenge to the imaginative and intelligent student

- Start planning early in the year.

- Be realistic about the amount of time needed. Establish a manageable timeline to avoid the last minute rush and stress.

Stating the Purpose

1. Determine the question or the purpose of the experiment.

2. Make certain it is an experiment or investigation and **not a model.**

Example: What is the best insulator to keep ice from melting?

3. State how you will make your measurements and what metric units (if appropriate) you will be using.

Example: I will weigh the ice using a metric scale to determine the weight in grams.

Writing the Abstract

The abstract is a concise summary of your work. It is the first page of your paper.

1. The abstract should be typed in paragraph form, using a maximum of 200 words. There should be 3 paragraphs that address the following. Label each paragraph.

   A. Purpose: What question are you trying to answer?
   B. Procedure: How are you doing your experiment?
   C. Conclusion: What did your tests prove or what were your findings?

2. You must use the correct format for the abstract. A sample abstract is included in this packet. You must use this format when you type the abstract.

Variable

Independent or manipulated variable: This is the part of the experiment that the student changes.

Example: The variable is the use of the various types of insulating materials.

Dependent or respondent variable: What happens in the experiment based upon what was changed?

Example: The amount that the ice melts in a set time period with each type of insulation would be the change.

Variables to control:

1. All of the ice should be the same size and weight at the beginning of each test.
2. The amount of insulating materials used should be the same in each test.
3. The same metric scale should be used each time.
4. The room temperature where the tests are being conducted should be the same.
5. The experimental procedure must be the same each time.
6. The time the ice is left in the insulating materials should be the same each time.

Reference Topics

1. Each type of insulating materials should be researched.
2. How does ice form?
3. What causes ice to melt?
4. What are some of the uses of ice?

5. What are some of the uses of insulating material?

Planning an Attractive Exhibit

- The student should construct the exhibit with the parent, teacher or sponsor providing guidance and encouragement.
- The title should be brief, captivating, and sufficiently descriptive to identify the project.
- Lettering should be neat, easily visible, and uncluttered.
- Make certain all words are spelled correctly.
- Exhibits should be as neat and presentable as possible.
- The exhibits should be colorful.

Correct Order of the Paper

1. Abstract

2. Safety Sheet (ALL safety hazards must be identified.) **All projects must have a safety sheet** and the exact safety form must be used.

3. Endorsements (Only needed if using human or other vertebrate animals.)

4. Title Page

5. Table of Contents with page numbers

6. Acknowledgments (Thank people who helped with the project.)

7. Purpose and Hypothesis

8. Review of Literature (Research)

9. Materials and Methods of Procedure

10. Results (Graphs, charts, data table, etc.)

11. Conclusion

12. Reference List

SAMPLE ***SAMPLE***

ABSTRACT

The Illinois Junior Academy of Science

CATEGORY _____*Botany*_____ **STATE REGION #** _____*12*_____

SCHOOL _____ **IJAS SCHOOL #** _____12115_____

CITY/ZIP _____ **SCHOOL PHONE** _____

SPONSOR _____

NAME OF EXHIBITOR _____ **GRADE** _____

NAME OF EXHIBITOR _____**GRADE** _____

PROJECT TITLE _____*Those Sprouting Beans*_____

Purpose: I want to find out at what temperature bean seeds sprout the best.

Procedure: 1. ***Place 1 paper towel in each of 9 plastic bags.***
2. ***Pour 1 tablespoon of water on each paper towel.***
3. ***Put 3 bean seeds from the same package in each plastic bag on the wet paper towel.***
4. ***Close the bags.***
5. ***Put 3 plastic bags in the refrigerator, 3 plastic bags on the counter, and 3 plastic bags on top of the refrigerator.***
6. ***Look at the bags each day to see when the beans sprout.***
7. ***If the paper towels get dry before the beans sprout, add more water.***

Conclusion: The seeds in the plastic bag on top of the refrigerator sprouted first because it is warm up there. The seeds on the counter sprouted next because it was the next warmest place. The seeds in the bag in the refrigerator sprouted last because it was colder in there.

1. Limit Abstract to 3 paragraphs (about 200 words or less). a) Purpose – what you went out to investigate; b) Procedure – how you did it; c) Conclusion – based on your results. LABEL EACH PARAGRAPH.
2. MUST BE TYPED, single-spaced on the front of this form. DO NOT write on the back of this form.
3. Three (3) copies of your COMPLETE paper are required at the State Science Project Exposition. Four (4) copies of your COMPLETE paper are required for the State paper Session Competitions.

Student generated form must be in this same format.

This form MUST be displayed on the front of the exhibitor's display board. It may be reduced to half a sheet of paper.

ABSTRACT

The Illinois Junior Academy of Science

CATEGORY _____ **STATE REGION #** _____12_____

SCHOOL _____ **IJAS SCHOOL #** _____12115_____

CITY/ZIP _____ **SCHOOL PHONE** _____

SPONSOR _____

NAME OF EXHIBITOR _____ **GRADE** _____

NAME OF EXHIBITOR _____**GRADE** _____

PROJECT TITLE

_____

4. Limit Abstract to 3 paragraphs (about 200 words or less). a) Purpose – what you went out to investigate; b) Procedure – how you did it; c) Conclusion – based on your results. LABEL EACH PARAGRAPH.
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SAFETY SHEET

The Illinois Junior Academy of Science

Directions: The student is asked to read this introduction carefully, fill out the bottom of this sheet, and sign it. The science teacher and/or advisor must sign in the indicated space.

SAFETY AND THE STUDENT: Experimentation or research may involve an element of risk or injury to the student and to others. Recognition of such hazards and provision for adequate control measures are joint responsibilities of the student and the sponsor. Some of the more common risks encountered in research are those of electrical shock, infection from pathogenic organisms, uncontrolled reactions of incompatible chemicals, eye injury from materials or procedures, and fire in apparatus or work area. Countering these hazards and others with suitable controls is an integral part of good scientific research.

In the space below, list the principal hazards associated with your project, if any, and what specific precautions you have used as safeguards. Be sure to read the entire section in the *Policy and Procedure Manual of the Illinois Junior Academy of Science* entitled "SAFETY GUIDELINES FOR EXPERIMENTATION" before completing this form.

Signed: _____ (Student Exhibitor)

Signed: _____ (Student Exhibitor)

Signed: _____ (Sponsor*)
*As a sponsor, I assume all responsibilities related to this project.

This Sheet Must Be Typed
This form MUST be displayed on the exhibitor's display board. It may be reduced to half a sheet of paper.

Researching the Topic

- Items that may be used for reference materials:
    - books
    - magazine articles
    - encyclopedias
    - experts
    - company literature/pamphlets
- More than one reference source should be used.
- The research may be written or typed by an adult but it must be in the child's words.
- The research may be handwritten by the child.
- The amount of research depends upon the age of the child, but there must be some research for every project.
- Generally, sources more than 5 years old should not be used.

Reference List

- The reference list should be in alphabetical order by the author's last name.

The information included should list:

a. Author's name
b. Title of source
c. Publication date
d. Page or pages used

CONDUCTING THE EXPERIMENT

Step 1. Before beginning the experiment, you should plan a timeline for conducting the experiment.

Step 2. During the experiment, you should keep a log book. In the log book, state what you did on each date and any observations that you made.

Example of Log Book Format

Date	Activity	Observations
11/2	Watered radish seeds with 5 mls	Leaves starting to appear

Step 3. When you begin collecting data, you will need to prepare a data table. The data table format depends upon the experiment you are conducting.

Step 4. Remember to take **photos** as you are conducting the experiment.

Step 5. Be sure to repeat the experiment or have sufficient representation to assure validity of your results. If you are using plants, for example, you have to have at least 3 plants in each group including the control group. When repeating the experiment, the same procedure must be followed each time.

Step 6. After completing the experiment, you will need to construct graphs or display your results in a clear manner.

a. **Line graphs** are used to show changes in data over a period of time.
Example: A line graph is appropriate to show plant growth.
b. **Bar graphs** are used to compare values or for comparisons for one specific time period.
Example: If you are graphing the weight a garbage bag can hold, a bar graph would be appropriate.
c. The independent or manipulated variable should be on the x-axis and the dependent or respondent variable on the y-axis. Be sure to label your graphs.

Step 7. You should form conclusions based on your results.

a. The first conclusion statement should relate your results to the hypothesis. There are no right or wrong results if your experiment is done accurately. If your results do not support your hypothesis, it's okay.
b. The second conclusion statement should relate to the specific data you
collected.

Step 8. You have now completed the investigation stage and are ready to complete your paper and make your display in preparation for the Science Fair.

THE DISPLAY BOARD

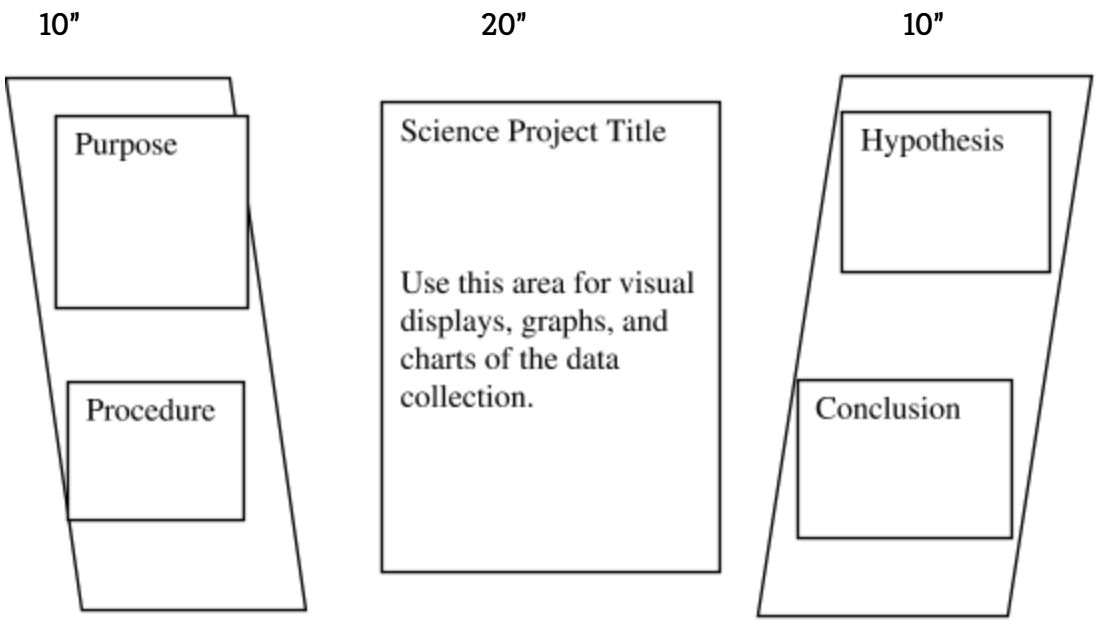
1. SIZE

   A. Maximum

      1. 122 cm (48 inches wide)
      2. 122 cm (48 inches high)
      3. 76 cm (30 inches deep)

   B. 30" X 40" Fome-Cor ® Board is most often used

      1. Approximately 20 inches wide
      2. 30 inches high
      3. Approximately 15 to 20 inches deep



Your paper must be displayed on the table.
Signed safety sheet must be attached to the back of the board.