Science Fair Guide

UCSD COPC Science Enrichment Program

Topic ideas

Research paper format

Board presentation

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School of Medicine

Getting Started:

Pick a topic/project

- What are you interested in?
  - Medicine, People, Sports, Animals, Computers, Games, Food, Electronics, Forensics, Art, Photography, even science areas such as chemistry, biology, physics, math, etc.

- Write down your ideas
-
- Try to form a hypothesis
  - "_____" will "grow 2 cm/explode/kill bacteria/etc." if "_____"is done to it.

- Look over a list of ideas/former projects/websites on projects for suggestions
  - CHANGE something about the project, such as type of metal, plant, bacteria, temperature, number of samples, environment, hours, time, etc.

- Ask a teacher
  - ANY teacher, not just a science teacher: Photography/art/shop/history/psychology, etc.

- Ask a friend or family friend
  - Someone you know that is in a field/job/career that interests you.

- Internet
  - Search '*Google*' or any other search engine (*'Yahoo!', 'MSN',* even *'AskJeeves')* with key words from ideas, or even the words 'science fair projects'. That will give you many links to click on for ideas & to see what's been done already, OR give you ideas what to CHANGE on experiments that have been done.

Getting started: Helpful websites

www.sciencebuddies.org
A great site with a Topic Selection Wizard to help you get ideas for your science project, an *Ask An Expert* online bulletin board, and other resources to help you do a project and be successful in science fair projects.

"What Makes a Good Science Fair Project?":
www.usc.edu/CSSF/Resources/Good_Project.html
This short guide, written by a group of experienced judges for the California State Science Fair, provides guidance for students in identifying the types of projects, as opposed to their subjects, which make good science fair projects.

Discovery Channel School Science Fair Central:
school.discoveryeducation.com/sciencefaircentral/
Subtitled "Creative Investigations into the Real World." This site contains not only a complete guide to science fairs for student, teachers, and parents separately, but also some interesting science articles and a link to the Discovery Young Scientist Challenge for grades 5-8.

www.SuperScienceFairProjects.com
With separate sections directed to students, parents, and teachers, this site has good advice for everyone. The site also attempts to be comprehensive in its coverage from selecting a project, through the final presentation to judges.

Mr. McLaren's Science Fair Survival Page:
www.ri.net/schools/East_Greenwich/Cole/sciencefair.html
An excellent compilation of resources answering the questions "What makes a good project?", "How do you go about doing an experimental science fair project?", and "What further resources are available on the Web?"

Science Fair Projects & Experiments by Branches of Science:
www.juliantrubin.com/branchesofsciencefair.html
Suggestions for science fair projects, divided by field of interest and age.

Virtual Science Fair Project of the Day:
www.science-fair-forum.blogspot.com/
Each day a different science fair project is highlighted.

Cyberspace Middle School Science Fair:
mathforum.org/library/view/1273.html
A great page for getting help with the beginning stages of your science fair project. It includes a "help desk" where you can ask questions, suggestions of possible project topics, and more.

www.all-science-fair-projects.com
A growing and searchable collection of links to project ideas.

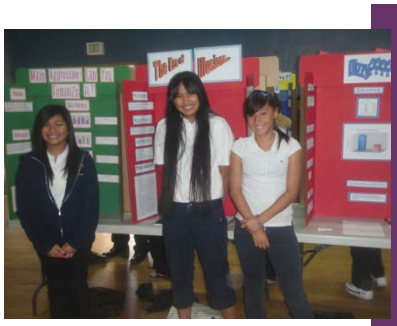
The Ultimate Science Fair Resource:
www.scifair.org
A collection of project and display hints, as well as a collection of links such as are contained on this page.

Science Fair Internet Resources:
www.lib.lsu.edu/sci/chem/internet/science_fairs.html
Compiled by the Louisiana State University library.

Science Fair Home Page:
http://sciencefairproject.virtualave.net
To help Young Scientists and Experimenters put together a solid Science Fair Project based on the scientific method

National Student Research Center Recommended Web Sites:
http://youth.net/nsrc/webs.html
A collection of Web links to sites ranging from suggested science fair project topics to guidance in completing the project.

WWW Virtual Library: Science Fairs:
http://physics.usc.edu/ScienceFairs/
A list of all known science fairs with WWW sites. Fairs range from local to international.



Your Research Paper:
Format

These elements are what you NEED in your research paper:

➔ It **must be typed** in black ink, and in the *Times New Roman* 12pt font **only**.

You must also place these pages in the exact order as listed here:

1. Title Page:
   a. Title (can be a larger point font, like 18-22, depending on the length.) Usually in the form of a question, catchy phrase, and 8 or under amount of words.
   b. Your full name
   c. Grade level
   d. Date of paper
2. Table of contents
3. Abstract
4. Statement of Problem AND Hypothesis: can both be on same page, just spaced and titled separately.
5. Introduction/Background Information & Research/Review of Lit.
6. Materials
7. Procedures
8. Results
9. Charts/graphs
10. Conclusion
11. Application/Future study/limitations: How is experiment important to others; how could it have been better.
12. Bibliography
13. Acknowledgements

Your Research Paper: Components

1. Abstract: (1/2 page = 250 words) A summary of what you did for the whole project. 1st **state the problem,** then the **hypothesis,** then a few lines about your **procedures** (not all the details), did the experiment(s) work, **results** (2-3 sentences), and was your hypothesis supported or not (**conclusion).**

2. Statement of Problem: (2 sentences) What are you trying to find out with your project? What is the overall result that you are working for? It is written as a question.

3. Hypothesis: (1 sentence) This is a statement about what you feel is going to happen with your project: "The plants will grow 2 cm higher when touched than plants that aren't touched."

4. Variables:
    a. Control/Constant: What is normal; it does NOT change. (i.e. same size paper, same starting time, same temperature, same metal, etc.)
    b. Independent: What you are testing (i.e. growth/height, bacteria colonies alive, distance, speed, time). What has changed?
    c. Dependent: The number measurement of the change. (i.e. number of cm worm moved/plant grew/airplane flew; number of colonies, watts of energy, mph speed, etc.)

5. Introduction: (1/2 – 1 page) WHY are you doing this project? What made you pick this particular topic/experiment? Interest? Emotional…someone in family or a friend has had this happen? Also, how is this project important and/or useful to anyone else? What is its application?

6. Background Information/Research: (2.5-5 pages) START THIS PART 1st & EARLY!!! GET IT OUT OF THE WAY!!! What is the history of what you are doing? Has it been done by others? Information about your topic and anything that pertains to your topic. Info that will be helpful in explaining what it is you are doing. Do not plagiarize/copy exactly what the article says. REPHRASE it in your words. Look up other words to use. Just take notes on the important info, not everything. And don't copy every word. Write the important words only.

   REMINDER:* ***References:* Write down the page number, title, author, date, copyright, publisher, volume, internet address of the article/book/magazine/web page that you took notes from!!! Do this as soon as you look over the article & feel it is important for you to use. You need to have a list of references that you have used for your background research to prove you did research your topic.

Your Research Paper: Components (cont'd.)

7. Materials: Make a detailed list of the exact amount and exact name of everything used in your project. (i.e. 50 ml NaOH buffer, 100 sterile cotton swabs, Tryptic Soy Agar ~500 mg, autoclave, (2) 100 ml graduated cylinders, 375 mustard seeds, 3 lbs. 20-50-15 potting soil, 12 adults: 6 males, 6 females, goggles, apron, rubber gloves, etc.)

8. Procedures: (as many as you performed) Numerical list of everything you did, in order. This is done WHILE you do/make something, then write it down so you don't forget what you did. (i.e. 1. Boil 500 ml of DH_2O 2. Add 50g of Nutrient Agar 3. Stir until dissolved 4. Repeat steps 1-3 six more times, etc). Must be written in present, not past, tense. Write the procedures as if someone else is going to perform your project. They need to be able to re-create the experiment EXACTLY how you did it…so be precise.

9. Results: (1-2 paragraphs or ½ page): Give the AVERAGE of your results for each independent variable. (i.e. The plants with 1 touch grew an average of 1.7 cm/day. The plants with 5 touches grew and average of 2.9 cm/day. And the plants with 0 touches (control plant) grew and average of 1.2 cm/day)

10. Data Tables/Graphs: These should have the NUMBERICAL results of all your experiments/tests. Have statistics!!!! Your tables should be all the data that you have in your notebook, and the graph(s) are the results of your testing.
    a. Graphing: The INDEPENDENT variable (what changed) goes on the "X" axis (bottom of the graph) and the DEPENDENT variable (the measurement {cm, mm, in.}) goes on the "Y" axis (side of graph).
        i. Make sure your graphs are colored, have a title, and a legend.
        ii. You should have the average, standard deviation, and probability "t-tests" or chi-square tests. The teachers will show you how on Excel; Statistics are VERY important!!
    b. Tables: The INDEPENDENT variable goes in the 1st column, the DEPENDENT variable goes in the 2nd-whichever columns.

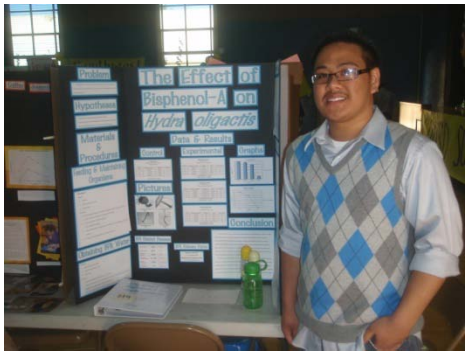
11. Conclusion: (~1/2 page+): Restate your hypothesis. Was it supported by your results? If not, then explain WHY you think your results were different than what you hypothesized.

12. Future Study: (3-5 sentences): What you should have/could have done to make the project better, more reliable, etc. What else can you do to the project to carry on next time?

13. Acknowledgements: (3-5 sentences): Who helped you with your projects? What materials did they provide? Include their full name, title (if they have one), and name of organization they work with. This is basically a "thank you" paragraph.

Statistics:

Analyzing experimental data



Types of Data:

1. Quantitative: represented by numbers and a unit of measurement.

Examples: height, number of seeds, mass of rabbits, etc.

2. Qualitative**:** represented by a word or "number" label

Examples: gender, color, smell, emotions, etc.

TABLE A	Red ground cover
Mean Height	15.0 cm
Range in Height	10.0 cm
Maximum (largest plant)	18.0 cm
Minimum (smallest plant)	8.0 cm
Number	25 plants
	No ground cover
Mean Height	14.9 cm
Range in height	2.0 cm
Maximum (largest plant)	16.0 cm
Minimum (smallest plant)	14.0 cm
Number	25 plants

Statistical Terms:

1. Measures of Central Tendency:
   a. Mean: Average: the sum of each number divided by number of values/cases.
      i. *Ex*: 7+6+5+5+4+3/6=30/6
         Average=5
   b. Median: Middle value; the number that is in the exact middle of the data when data is ranked from highest to lowest.
      i. *Ex.* 15,13,12,11,9,9 Median=11.5
      ii. *Ex.* 10,10,8,7,7,5,4 Median=7
   a. Mode: The value that occurs most often
      i. *Ex.* 7,6,5,5,4,3 Mode=5

2. Measures of Variation: range for a set of quantitative (number) data, and the frequency distribution for qualitative (non-number) data.
   a. Range: find the difference (subtract) between the smallest variable (i.e. plant height). See **Table A** for example

b. Frequency Distribution: shows the number of cases falling into each category of the variable (i.e. color of tomatoes produced with different ground covers). See **Table B** below for example

TABLE B	Red ground cover
Mode	Pink tomatoes
Frequency Distribution	Red: 0
	Pink: 12
	Yellow: 8
	Green: 5
Number	25 Plants
	No ground cover
Mode	Pink tomatoes
Frequency Distribution	Red: 20
	Pink: 5
	Yellow: 0
	Green: 0
Number	25 Plants

Bibliography

1. Books: Slater, Robert B. and Jane D. Slater. The Mammals of North America. New York, Macmillon & Company. 1977, pp. 150-189.

2. Encyclopedia: Athalau, Edward. "The Behavior of Ryal Lions." Enyclopedia Science. Vol.# or Disc# 2(1999). Pp. 120-136.

3. Magazines: Larkesee, L.R. "Must They Be Crazy and Mixed-up", My Times Magazine. June 22, 1985. pp. 25-29.

4. Interview: Smith, Charles. Home Depot, city, state. Personal Interview. October 10, 1998.

5. Internet: Author. Title of Item. http://webaddress/ File name, date of document download.

Backboard Design

Your work should be displayed in the most concise, easily understood and seen, yet artistically creative, manner possible.

The board consists of a 3-section display, with a wider back panel hinged to side panels, which swing forward. Boards come in 2 sizes and different colors. A title board is separate used in order to give you more room on your board for your work and pictures/graphs.

Print size for words in the display (other than subtitles, which sizes are listed above) should be around **22-28 font size** so they can be read from a distance of around 10 ft. by anyone walking by. Font should be "Times New Roman", "Arial", or another clean, simple font. No script, Old English, fancy and difficult to read fonts! Words in both the report and on the board (with exception of the Subtitles on the board) should be in **black ink** only.

1. Backboard: Can be painted, covered w/cloth, felt, paper, plastic, wrapping paper, etc., or plain if you ordered a colored board.
2. Display: NO HANDWRITTEN lettering! Everything needs to look professional. Stencils, stick-on or transfer, computer generated lettering add to the attractiveness and professional look.
3. Labeling: **Each** graph, data table, picture, diagram, and portion of the board, such as "Hypothesis", "Materials", etc. need to be labeled so judges know what they are looking at.
4. Information: Should contain at least these:
    a. Project Title (78+ size font)
    b. Statement of problem (30 font)
    c. Hypothesis (30 font)
    d. Materials (30 font)
    e. Procedures (30 font)
    f. Results & Graphs/Data Tables (30 font)
    g. Conclusion (30 font)

Backboard Example