

# Elementary Science Fair Project Guide (Student Packet)



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### **TIPS FOR PARENTS**

- 1. Be positive about your child's work.
- 2. Be honest with your student. If you don't know the answer, tell your child that you don't know, but offer to help locate a source of information that may help.
- 3. Help your child look for ideas: libraries, Internet, etc.,
- 4. Help seek out people to help: other adults, teachers, professionals
- 5. Help your child collect and save materials. Inexpensive materials found around the home often work best.
- 6. Allow your student to "mess around" with materials without your intervention.
- 7. Allow your student time for thinking, exploring, and doing the experiment.
- 8. Stress "how-to" skills e.g., observing, rather than memorizing facts.
- 9. Examine issues with moral consequences: conservation, pollution, global warming
- 10. Help your student keep a daily log of research activities.
- 11. Go to the Science Fair and take pictures of experiments for future ideas.
- 12. Assist as needed, but let your student do the work.

# **MY SCIENCE FAIR EXPERIMENT**

#### What do I do?

Choose your topic. Get ideas from your teacher, parents, friends, science books, newspaper articles, television, Internet, etc. You are not to experiment on any human or animal without the prior permission of your teacher. Collect and put together your ideas and materials you will need. Follow the Scientific Method as much as possible.

#### What is the Scientific Method?

Scientific Method refers to the process that scientists go through when solving a problem. See page 5 for a more detailed description. It involves the following steps:

1.	State the Problem:	Write the problem clearly, perhaps in the form of a question.	
2.	Present a Hypothesis:	Describe your educated guess of the possible solution (your prediction of the outcome of your experiment) and justify your reasoning.	
3.	Present a Procedure:	Describe how you will go about solving the problem. Include a list of all the materials needed. Do the experiment.	
4.	Present the Results:	Tell what happened in words. Show what you have discovered using tools like charts, tables, graphs, diagrams and pictures.	
5.	State your conclusions:	Write a paragraph that tells whether the experiment solved your problem. Did it prove or disprove your hypothesis? If your hypothesis was incorrect, what might be some of the reasons?	

#### How do I display my experiment?

Your experiment should be placed on a display board that stands by itself, such as on a threesided display, as shown below. It should not be over 48 inches wide when open.

#### Example of display layout:

- 1. Graphs and Charts
- 2. Photographs or drawings and diagrams of your work.
- 3. Notebooks may be placed in front of the project.
- 4. <u>K-3 only</u>: Equipment may be placed on table in front of display. Do not include liquids or smelly items.
- 5. <u>Grades 4-6</u>: No equipment or apparatus.
- 6. Student's and teacher's names should be written **only** ON THE BACK of the display.



### **MY SCIENCE FAIR PROJECT TIMELINE**

	Task	Date Due		
1. (	Choose a problem to investigate.			
2. C	Do some background research and get advice.			
3. E	Develop a hypothesis.			
4. C	Decide on the procedures you will use.			
5. H	Have the experiment approved by your teacher.			
6. N	Make a list of materials you will need and gather materials.			
7. (	Conduct your investigation and collect data.			
8. 0	Organize your data or results.			
9. E	Draw your conclusions.			
10. k	Keep a project notebook (log).			
11. Proofread your work.				
12. Design your exhibit.				
13. 0	Construct your visual aids and exhibit backdrop.			
14. T	Furn in your project.			
15. F	Present your project.			

## SCIENCE SAFETY GUIDELINES

- Follow any instructions given by your teacher.
- Ask questions when you are not sure.
- Wear safety goggles when needed.
- Keep your work area neat and clean.
- Clean up any spills right away.
- Never taste or smell substances unless specifically instructed to do so.
- Handle sharp items and other equipment carefully.
- Handle any chemicals carefully; get permission for their use from your teacher.
- Put materials away when you finish.
- Wash your hands with soap and water when you finish.

### COMPONENTS OF A SCIENCE FAIR PROJECT: THE "SCIENTIFIC METHOD"

1. **Title** (may be the same as the Problem)

2a. **Introduction**, or Background Information (optional, as needed)

- What gave the student the idea? Who helped the student? What research was done?
- Include background information needed to understand or explain the problem

#### 2b. Problem

• Use question format. Example: "Which materials conduct electricity?

#### 3. Hypothesis

- It is a prediction about the possible outcome, written before doing the experiment.
- If...then statements can be a helpful way to phrase a hypothesis.

#### Examples:

a) "I think plants need sunlight because I noticed that plants on the sunny side of my house are larger than the plants on the shady side. <u>If</u> this is true, <u>then</u> if I place one plant in the sun and one plant in the dark closet, I predict the one in the dark will not grow." (primary grades)

*b) "While experimenting with electromagnets, I discovered that more wire coils around the nail made the magnet stronger. I wonder if there were other ways to increase the strength of an electromagnet. An electromagnet has wire coils and an iron core. I think that <u>if</u> I wrap coils around a larger nail, <u>then</u> it will attract more paperclips than on a smaller nail." (upper grades)* 

Notice that these hypotheses have the variable and the background, and the idea for the experimental design already built into them. Remember: the point is NOT to prove you are right; the results of the experiment may not support the prediction. Many important science discoveries and advances have been made because scientists were forced to rethink their predictions when things did not turn out as expected. Scientific inquiry is a process.

#### 4. Materials

• List of all materials needed (including items such as scissors, containers, tape, etc.) and include the quantity of each item.

#### 5. Procedures

- Should be written as detailed step-by-step instructions, and include repeated trials.
- Should include a control test when applicable. This shows that the outcome was a result of changing the variable—not a result of random chance.

**Example**: If you are trying to prove chemical reactions happen faster at higher temperatures, you need to experiment at room temperature as well, and test each temperature multiple times.

#### 6. Results

• Graphs, charts, tables. Diagrams and/or photographs.

#### 7. Conclusion

- Refer to the original question and examine the outcome compared to the hypothesis.
- Discuss any problems encountered during the procedure.
- Offer an explanation or further research or investigations.
- Suggest possible real world applications for expansion of the project.

### What will judges look for?

Below is a checklist to provide an idea of things judges will look for as they evaluate projects.

# **Project Checklist**

#### SCIENTIFIC METHOD

[NOTE: K – 3 projects may be demonstrations, 4-6 must involve problem solving.]

- **É** Is the **PROBLEM** clearly stated in the form of a question? Is it a testable problem?
- **•** Is a <u>HYPOTHESIS</u> offered? Is their reasoning explained? (I think... because...)
- ▲ Is the <u>PROCEDURE</u> explained in terms the student and you can understand? Are the methods described step by step? Are the <u>MATERIALS</u> listed? Is the procedure appropriate for the question and hypothesis given?
- Are the <u>RESULTS</u> easy to understand? If appropriate, are the graphs and charts clearly labeled? For measurements, are the appropriate units given? If there is no way to represent the results in chart or graph format, is there some kind of graphic display?
- Is the <u>conclusion</u> supported by the results? Does the conclusion relate back to the hypothesis? If the hypothesis is not proven correct by the results, is there an attempt to explain this, or a suggestion of further research that would be needed?
- Was more than one trial done to verify results?

#### SCIENTIFIC ACCURACY and KNOWLEDGE

Did the student give credit to sources of any information used? Is the factual information correct? Are any calculations done correctly? Is the spelling correct?

#### NEATNESS, TIME, EFFORT, and CREATIVITY

- ▲ Are the labels and title neat? Is the handwriting as neat and legible as you could expect for grade level? Is the board layout and design as attractive as might be expected for grade level? Are there props, pictures or sketches included?
- Is it apparent that the student use creativity and put effort into the project?

### SOME SUGGESTIONS FOR SCIENCE FAIR INVESTIGATIONS:

Use these if you need ideas, but it's best to think of your own!

- 1. How can you stop cut apples from going brown?
- 2. How does the color of light affect plant growth?
- How does temperature influence yeast cell reproduction? 3.
- Which surfaces provide the least amount of friction? 4.
- Which materials insulate best against the cold? 5.
- 6. How high do you have to raise a smooth board to get a block to slide down it? How does covering the block with felt or sandpaper or other materials affect that height? How does changing the weight of the block affect height?
- 7. What affects how fast an ice cube melts in air? How can you get it to melt faster than in air?
- 8. What is the biggest shadow you can make with a piece of paper 8 ½ inches by 11 inches? What is the smallest shadow you can make with the same piece of paper?
- 9. How can you get seeds to germinate fastest?
- 10. Which seeds germinate fastest? Do little seeds germinate faster than big seeds?
- 11. What is the fastest way to cool a cup of hot water?
- 12. Do people who play sports regularly have the same heart rate as people who don't? Do sports people recover from exercise more quickly than less active people?
- 13. How can you make suds last longest? Compare shampoos to dishwashing detergents. Compare different brands of shampoo or different brands of dishwashing detergent to each other.
- 14. Does toilet paper stop bacteria getting through? Try touching agar with a naked finger and then with a finger wrapped in one layer of toilet paper.
- 15. Which materials conduct electricity? Try different kinds of liquids too.
- 16. Which design of paper plane will fly the furthest?
- 17. Who can react faster to a bell children or adults?
- 18. Can people identify different kinds of Kool-Aid by taste alone?
- 19. What age group is best at estimating the passage of time?
- 20. Does the type of liquid affect how fast an ice cube melts?
- 21. Does changing the temperature of water affect the buoyancy of an egg?
- 22. Does the type of wood affect how long it burns?
- 23. Does the flavor of ice cream affect how fast the ice cream melts?
- 24. Does changing the wingtip direction affect an airplane's flight? What design flies the farthest?
- 25. Does changing the height of a ramp affect how far a car will travel?
- 26. Does the type of shoe worn during a 20-yard dash affect the speed in which you can run?
- 27. How does changing the amount of baking soda and vinegar affect the height of an explosion? (careful to change only one: baking soda or vinegar) **Educational Services** 7

- 28. How does the type of light affect how quickly a plant will grow?
- 29. Do artificial sugars attract ants?
- 30. Does the type of insulation on the wire affect the strength of an electromagnet?
- 31. What effect does temperature have on the strength of different types of magnets?
- 32. On which surface can a snail move the fastest-dirt, cement, or grass?
- 33. How can you make a parachute fall more slowly?
- 34. Does the direction seeds are planted affect plant growth?
- 35. Is there an effect on evaporation rates when forming crystals from sugar and sugar substitutes?
- 36. Does the length of the wire affect the power of the circuit?
- 37. What materials provide the best insulation?
- 38. Will more air inside a basketball make it bounce higher?
- 39. Do heavier toy cars roll faster than lighter toy cars?
- 40. Does surrounding color affect an insect's eating habits?
- 41. What is the effect of different amounts of chlorine on plant growth- a lot, a little, or none?
- 42. What is the effect of different amounts of air movement on plant growth?
- 43. Do ants prefer artificial sweeteners, natural sugar, or hard candy?
- 44. Can mealworms or other invertebrates be taught to go through a maze?
- 45. Which increases your heart rate more: walking up and down real stairs or using a stair-master?
- 46. How does the temperature of water affect the time its takes to freeze into ice cubes?
- 47. Given the same amount of water, how does pot size affect the amount of time it takes to boil?
- 48. How does a light bulb's wattage affect the amount of heat detected above a light?
- 49. Does the color of a shirt affect the amount of heat it absorbs?
- 50. Can people use their sense of hearing alone to tell apart a penny, nickel, dime, and quarter?
- 51. How does increasing the height of a ramp affect how far a ball rolls down the ramp?
- 52. How does caffeine affect people's heart rate?
- 53. How does talking on a cell phone or listening to music affect reaction time?
- 54. How does temperature affect a magnet?
- 55. What type of travel mug keeps hot drinks hot for the longest time?
- 56. Does the direction of a multiplication problem affect how fast you solve it?
- 57. How does temperature affect the stretchiness of a gummy worm?
- 58. Does positive encouragement or negative trash-talking affect free throw accuracy?
- 59. Which eggs can support the most weight?
- 60. Does mint-flavored gum affect the temperature of your mouth?

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