Durham's SCIENCE FAIR
Planning Guide

Do an experiment with your family, a friend, a small group, your whole class, or by yourself!

Questions? Contact Nikole Emerson at nemerson@ttsd.k12.or.us.

Step One: Come Up With A Good Question

Ask a question that can be answered using the scientific method.

The Effect Question:

What is the effect of _____ *on* _____*?*

sunlight	*plant growth*
price	*paper towel absorbency*
brands of cookies	*soaking up milk*

The How Does…Effect Question:

How does the _____ *affect* _____*?*

amount of water	*growth of plants*
ramp angle	*distance a toy car travels*

The Which/What and Verb Question:

Which/What _____ *(verb)* _____*?*

	paper towel	*is*	*most absorbent*
foods		*do*	*butterflies prefer*
	popcorn brand	*pops*	*the most kernels*

Helpful Resources:

- Libraries (Durham Elementary, Tigard, or Tualatin) have science experiment books
- www.sciencebuddies.org ("Project Ideas" tab at the top of the page)
- www.education.com/science-fair/elementary-school/ (search page by topic and/or grade)

Step Two: Figure Out Your Variables

The variables are things that can change in an experiment. When scientists do experiments with the scientific method, they try to keep everything the same (controlled variables) except the one part they are testing (independent variable). Scientists take measurements that result from the experiment (dependent variable).

Which paper towel brand absorbs more water?

Controlled Variables = size of paper towel, time in water
Independent Variable = brand of paper towel
Dependent Variable = amount of water absorbed

What is the effect of sunlight on plant growth?

Controlled Variables = type of plant, age of plant, location of plants, soil, amount of water
Independent Variable = sunlight or no sunlight
Dependent Variable = height of plant, number of leaves

Step Three: Background Information

Do a bit of research about your topic. Talk to experts about your topic, check out books from the library, or Google information with a grown-up. Write 1-2 paragraphs about what you find out. This may help you design your experiment. It will also allow you to make an *educated* guess about possible answers to your experimental question.

Step Four: Make Your Prediction/Hypothesis

What do you think the answer to your question is? A prediction is an educated guess (appropriate for K-3rd grade). A hypothesis establishes a relationship that helps to explain what happens between the variables in the experiment (appropriate for some 3rd graders and all 4th-5th graders). If you are doing a family project, be sure to have the students make their predictions before the adults!

Prediction

I think [independent variable)] _____ will [dependent variable] _____ because [give a reason] _____.

I think the plant grown in the sunlight will grow taller and have more leaves than a plant grown in the dark because plants need light to grow properly.

Hypothesis

If I [do this] _____, then [this] _____ will happen.

If there is less oxygen in the water, then rainbow trout suffer more lice parasites.

If aphid-infected plants are exposed to ladybugs, then they will have fewer aphids after 10 days than aphid-infected plants that are not exposed to ladybugs.

Step Five: Materials

Make a detailed list of the things you will need to do your experiment. Include amounts and brands. It is basically a shopping list in case another scientist wants to do your experiment.

Materials (too vague)	Materials (detailed)
Potting soil	*60 grams Percy's Perfect Potting Soil*
Sand	*60 grams Toys R Us Play Sand*
Rice	*60 grams Fred Meyer Instant Rice*

Step Six: Procedure

The procedure is the step-by-step directions for your science experiment. It should be detailed enough that another scientist could follow your steps to do the same experiment. The steps should be numbered. It is important to repeat your experiment at least three times to make sure your results are consistent and not just an accident.

Procedure

1. *I gathered my materials.*
2. *I labeled three cups "potting soil," three cups "sand," and three cups "rice."*
3. *I put 20 grams of the potting soil, sand, or rice in each labeled cup.*
4. *I buried three sunflower seeds ½ inch in the cups.*
5. *I watered each cup with 15ml of cold water every evening.*
6. *I set all of the cups on a windowsill.*
7. *I recorded the growth of the sunflower seeds once a day for one month.*

Step Seven: Doing Your Experiment

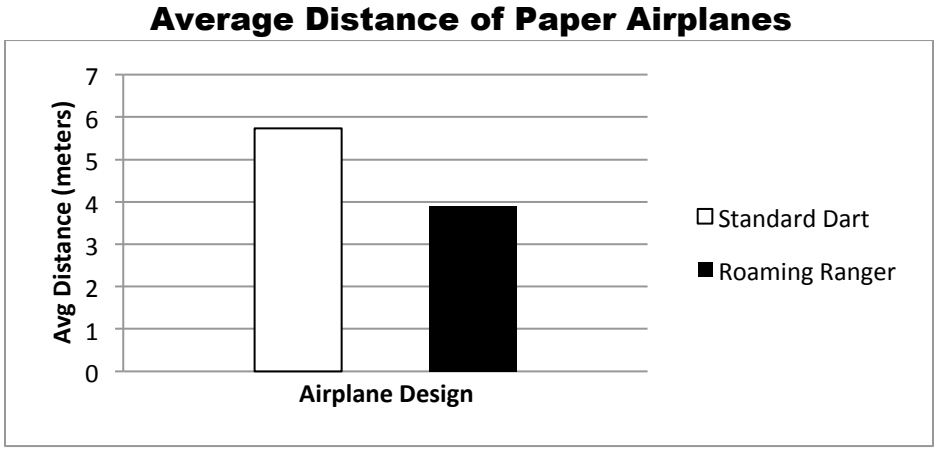
Before starting your experiment, make a data table so that you can record what happens during your experiment. Be very careful when taking your measurements. Don't forget to write down any observations you notice. This is a great time to take photos of the experiment – you can include them on your project display board.

Distances of Paper Airplanes

Paper Airplane Design	*Distance #1*	*Distance #2*	*Distance #3*	*Average Distance*
Standard Dart	*5.0 meters*	*6.0 meters*	*6.2 meters*	*5.7 meters*
Roaming Ranger	*4.0 meters*	*3.5 meters*	*4.2 meters*	*3.9 meters*

Step Eight: Analyze Your Results

Organize your data and observations. Make a complete record. Note any unusual results, mistakes, or unexpected results. Use graphs and charts if possible. Most science fair projects have at least one graph (the independent variable is on the horizontal x-axis and the dependent variable is on the vertical y-axis). Clearly label all tables and graphs and include units of measurement.



Step Nine: Conclusions

Using data from your results, answer the question that you asked at the beginning. Was your hypothesis supported by your results or not? Scientists often find that the experiment results don't support their hypothesis – this leads them to ask more questions that lead to new experiments! What did you learn by doing this experiment? What would you do differently next time?

Conclusions

According to my experiment, [summarize the results] _____

_____. *My hypothesis was [restate your hypothesis]* _____. *My results [do/do not] support my hypothesis. I learned* _____. *One thing I would change about my experiment* _____. *An interesting future experiment might involve* _____.

Step Ten: Make Your Display Board

You have worked so hard! Now it is time to show off your work and what you have learned. You can find a trifold, self-standing, foam or cardboard display board at office supply or craft stores for under $5 (contact Nikole Emerson at nikoleemerson@yahoo.com 503-670-8238 if you need financial assistance). Your display board should be neat, organized, and colorful – this is your chance to be creative and artistic. Organize your information like a newspaper so that readers read from top to

bottom, left to right. Have your text on white or one color of paper and then mount this on construction paper to create a border. Use a font size of at least 16 or your best handwriting.

My Display Board Checklist

_____ Title (large, easy to read from across room)

_____ Name (and family members if they were involved) and grade

_____ Question (use this word as a label)

_____ Variables (use this word as a label)

_____ Prediction or Hypothesis (use one word as a label)

_____ Background Research (use this as a label)

_____ Materials (use this word as a label)

_____ Procedure (use this word as a label)

_____ Results (use this word as a label) = charts, tables, graphs, photos, illustrations, etc.

_____ Conclusions (use this word as a label)

_____ My display board is tri-fold, self-standing, and made of foam or cardboard.

_____ My sections are organized top to bottom, left to right so they are easy to follow.

_____ My font size is 16+ OR my handwriting is my best and easy to read.