Miami Arts Studio
6-12

SCIENCE FAIR PROJECT

2016-2017

SCIENTIFIC INQUIRY

Name:_____ Period:_____ Turned in on :_____

Parents: Introducing Science Projects

Dear Parents:

Your child will have the chance to solve his or her own science mystery by doing a science project, a mandatory assignment for your child's class.

Since your child has the chance to pick his or her own science project question, from the physics of making music to the biology of tide pool animals, he or she will have the chance to experience the joy of discovery.

When starting a science project, a student chooses a question he or she would like to answer. Then, he or she does targeted library and Web research to gain the background information needed to formulate a hypothesis and design an experimental procedure. After writing a report to summarize this background research, the student performs the experiment, draws conclusions, and communicates the results to teachers and classmates.

Through time management and project planning, your child will take on the responsibility of completing a project over a four-week period. Your child will discover his or her creativity by brainstorming science project questions and figuring out how to display the process and results. A science project, through its challenge to ask questions and discover, is truly a real-world experience in innovation, similar to what scientists do in their careers.

We will provide your child with sufficient support to succeed, so that he or she develops enthusiasm for scientific discovery. We will review the progress of the project at key checkpoints along the way, so that you won't face helping your child do a project the last night before the fair. We have included a basic guide (enclosed) of how to help without getting over-involved.

To get started, read the **parent's guide to science projects** on the next page.

Once your child's teacher approves the problem statement, you can begin to work on the project.

By signing this form, parent and student, agree to submit a science fair project by the due date: _____.

_____ _____

Student Name Parent Name

_____ _____

Student signature Parent Signature

Parent's Guide to Science Projects

Information on the Scientific Method

Science projects should follow the six-step scientific method. These steps are shown on the chart below. A comprehensive Science Buddies Project Guide (www.sciencebuddies.org) provides direction on all of the steps.

Time Management

See your child's Student Science Project Schedule for all of the key due dates. Help your child meet these dates by getting out your family calendar and marking the interim due dates. Block out times for trips to the library and other work time. Look for any scheduling conflicts, such as vacations, and discuss issues with the teacher.

How to Help

As your child works on his or her project, he or she will likely face stumbling blocks. To help, ask questions to help your child figure things out; don't just provide the answers. Open-ended questions, such as, "What else could you try to solve this?" or "What is stopping you from going on to the next step?" are best (Fredericks & Asimov, 2001, p.xiii). Sometimes just talking it out can help children get unstuck. If not, ask the teacher for help. Respect your child's independence in learning by helping at the right level.

Helping at the Right Level at Every Step

Project Step	Helping at the right level:	Going too far:
Ask a question.	• Discussing with your child whether a project idea seems practical	• Picking an idea and project for your child: A topic not of interest will turn into a boring project.
Do background research.	• Taking your child to the library • Helping your child think of keywords for Internet searches	• Doing an Internet search and printing out articles
Construct a hypothesis.	• Asking how the hypothesis relates to an experiment the child can do	• Writing the hypothesis yourself
Test the hypothesis by doing an experiment.	• Assisting in finding materials • Monitoring safety (you should always observe any steps involving heat or electricity)	• Writing the experimental procedure • Doing the experiment, except for potentially unsafe steps • Telling your child step-by-step what to do
Analyze data and draw a conclusion.	• Asking how your child will record the data in a data table • Reminding your child to tie the data back to the hypothesis and draw a conclusion	• Creating a spreadsheet and making the graphs yourself, even if your child helps type in values • Announcing the conclusion yourself
Communicate your results.	• If a presentation is assigned, acting as the audience • If a display board is assigned, helping to bring it to school	• Writing any of the text on the display board • Determining the color scheme and other graphic elements

Student Workbook

1. **Start** by visiting: www.sciencebuddies.org
2. Choose a topic that you find truly interesting.
3. Develop a testable problem statement.

Problem Statement: A **question** that clearly states a *cause* and *effect* relationship.

Here are some things to keep in mind before you write your problem statement in the box below:

- A well-worded problem statement clearly identifies your *test* and *outcome* variables.
- In the question you are trying to answer, can you *measure* changes using a number that represents a quantity such as a count, percentage, length, width, weight, voltage, velocity, energy, time, etc.?

Examples:

Does the amount of fertilizer added to a plant affect the height of plant growth?

This is the test variable, the item you are manipulating as a scientist. This is the "cause" that will give you an effect.

This is the outcome variable, the part that you will measure in your experiment. This is the "effect" that happens because of what you manipulated in your test variable.

Which soda will create the greatest Mentos geyser?

This is the test variable, the item you are manipulating as a scientist. This is the "cause" that will give you an effect.

This is the outcome variable, the part that you will measure in your experiment. This is the "effect" that happens because of what you manipulated in your test variable.

Write your problem statement in this box:

Problem statement approved on _____ (Date) by _____ (Teacher's Name)

Identifying Your Variables

Variables *(Fill in the table with the appropriate information from your own experiment)*		
Independent (Test) Variable **(***What will you be changing in the experiment? Note: There should only be one item listed here***)** **Hint: This is the "cause" in your experiment that leads to the effect.**	**Dependent (Outcome) Variables** (*What will you be measuring or observing?*) **Hint: This is the "effect" that happens because of what you are testing.**	**Controlled Variables** (*What will you be keeping the same during the experiment?*)

Formulate Your Hypothesis

Your hypothesis must be written as an "If-Then" statement. Use the blanks below to help you develop your hypothesis.

Your Hypothesis

(Fill in the blanks with the appropriate information from your own experiment.)

If [*I do this*] _____

_____,

then [*this*]_____

will happen.

EXAMPLE:

If I add 5g, 10g, and 15g of fertilizer to plants, ***then*** the gardenia plant with 15g of fertilizer **will grow to be the tallest**.

Your Science Fair Display Board

- This year, your science fair board will be presented digitally through the Discovery Education website, which can be accessed through your student portal.
- To access your Discovery Education account, follow these directions:

1. Go to dadeschools.net and login to your student portal.

2. Go to the Apps/Services/Sites link.

3. Click on Discovery Education.

4. Look for the "Board Builder" link.

5. You will find that there are pre-made boards that you can edit, or you can start from scratch and make the board to your liking.

6. Each digital display board must contain all of the components that a traditional board should have.

7. See "Checklist for all Science Fair Board components" on the following page to help guide you.

Checklist for all Science Fair Board components:

- ☐ **TITLE**
  - o Not the same as your problem statement-something catchy
- ☐ **PROBLEM STATEMENT**
  - o A question that clearly states a cause and effect relationship
- ☐ **HYPOTHESIS**
  - o An IF-THEN statement that states how the test variable will affect the outcome variable "If (I do this), then (this will happen)."
- ☐ **MATERIALS**
  - o Did you make a BULLETED list?
- ☐ **PROCEDURES**
  - o Are they in number order?
  - o Do they explain everything perfectly, so ANYONE can replicate your experiment?
- ☐ **TEST (INDEPENDENT) AND OUTCOME (DEPENDENT) VARIABLES**
  - o Correctly identify the one factor you changed (manipulated) and the one factor you measured.
- ☐ **CONTROLLED (CONSTANT) VARIABLE**
  - o Correctly identified all factors that were kept the SAME
- ☐ **TABLE**
  - o Your table is organized and understandable – see rubric
- ☐ **GRAPH**
  - o Your graph is the proper graph and it has a title and labels – see rubric
- ☐ **RESULTS**
  - o Retell what your data says in sentence form.

  For example: "After three trials, my data shows that Diet Coke had the greatest geyser height with an average of 51 cm. Sprite had an average of 22 cm after three trials, while water averaged nothing, with 0 cm.
- ☐ **CONCLUSION**
  - o Did you reference your hypothesis to show if it was supported or not supported by your data?
- ☐ **APPLICATION**
  - o How can your findings be useful in today's society? Could your findings help any particular field or employee/employer?
  - o Could you find any ways to improve your experiment to make it more VALID and RELIABLE?
- ☐ **ABSTRACT**
  - o A BRIEF 250 word summary of your project – see the following page for tips on how to write the perfect abstract.

How to write a good abstract

An abstract is an abbreviated version of your science fair project final report. It is limited to a maximum of 250 words. The abstract should have the following five pieces:

- **Introduction**. This is where you describe the purpose for doing your science fair project or invention. Why should anyone care about the work you did?
- **Problem Statement**. Identify the problem you solved or the hypothesis you investigated.
- **Procedures.** What was your approach for investigating the problem? Don't go into detail about materials unless they were critical to your success. Do describe the most important variables if you have room.
- **Results.** What answer did you obtain? Be specific and use numbers to describe your results. Do not use vague terms like "most" or "some."
- **Conclusions.** State what your science fair project or invention contributes to the area you worked in. Did you meet your objectives? For an engineering project state whether you met your design criteria.

Example of an abstract

Advertisers are always touting more powerful and longer lasting batteries, but which batteries really do last longer, and is battery life impacted by the speed of the current drain?

This project looks at which AA battery maintains its voltage for the longest period of time in low, medium, and high current drain devices.

The batteries were tested in a CD player (low drain device), a flashlight (medium drain device), and a camera flash (high drain device) by measuring the battery voltage (dependent variable) at different time intervals (independent variable) for each of the battery types in each of the devices.

My hypothesis was that Energizer would last the longest in all of the devices tested.

The experimental results supported my hypothesis by showing that the Energizer performs with increasing superiority, the higher the current drain of the device. The experiment also showed that the heavy-duty non-alkaline batteries do not maintain their voltage as long as either alkaline battery at any level of current drain.