2012-13

Mulberry Middle School’s

# SCIENCE FAIR PROJECT

(Adapted from Jewett Middle Academy and McKeel Academy)

Dear Students and Parents,

It’s time for Mulberry Middle School’s science fair project. While this can instill “fear” in some and a “challenge” in others, we hope to make the guidelines simple to follow in this hand-out. Having a science and technology emphasis at our school, the administration of Mulberry Middle feels the completion of an independent science project will enrich the student’s knowledge of the scientific inquiry process. It is believed that the skills learned in completing a science fair project are skills that can be used in all aspects of a student’s education and growth. Some of the skills included areobservation, communication, researching, measuring, comparing, inferring, record keeping and analyzing.

**Important Information**

• Students participating in the Mulberry Middle Science and Engineering Fair, Polk Regional Science and Engineering Fair and Florida State Science and Engineering Fair are required to adhere to ALL forms requirements set forth by the International Science and Engineering Fair Rules.

• CERTIFICATION FORMS MUST BE COMPLETED AND APPROVED BEFORE EXPERIMENTATION BEGINS.

• Students will be completing the “Rule’s Wizard” provided by the ISEF site to determine which forms their projects must have before experimentation begins.

* All necessary forms are found at the Florida State Science and Engineering Fair website: http://www.floridassef.net/student/student-forms/

This handout is a detailed guide for completing their project. It provides specific instructions.

**A Science Fair Information Night will be Tuesday September 18 at 6:30 pm in the cafeteria.**

**The final project will be turned in by Tuesday November 5.**  (See time line page).

We encourage everyone to keep the time line handy so that their project is turned in on time.

Thank you for your assistance in this project.

Sincerely,

Mulberry Middle School

Science Teachers

**Notes to Parents**

During the next few weeks your child will begin developing a science project that uses the scientific method to solve a problem.

* A project is simply a long-term science investigations in which students answer a narrowly defined question by gathering, recording, and analyzing data.
* **A project in this sense is not simply a book report, topic paper, demonstration, or model.**
* Instead, all projects must demonstrate understanding of cause & effect, variables, key science concepts, data collection, & data analysis.
* Help your child “brainstorm” for possible project topics
* Do you know someone that can share some information about their chosen topic?
* Help your child develop a personal Science Fair schedule or agenda
* “Let’s look at the Science Fair Handbook together.”
* “Need more background information?

“How about if I take you to the Public Library?”

* Florida State Science and Engineering Fair website is <http://www.floridassef.net/student/student-forms/>
* International Science and Engineering Fair web site is <http://www.societyforscience.org/isef/rulesandguidelines>

The Mulberry Middle School Fair is affiliated with the Polk Regional Science and Engineering Fair, Florida State Science and Engineering Fair and the Intel International Science and Engineering Fair (ISEF). We use the ISEF guidelines, then, as the standard for our school fair.

Please visit <http://www.polk-fl.net/staff/teachers/science.htm> for additional resources and help with project planning and investigation.

**Please contact your child’s teacher for help. Students can stay after school for help almost anytime. Check with your teacher to be sure that they will be there when you need help.**

**Guidelines for Your Project**

|  |
| --- |
| **Step 1: Researching Project Ideas** |
| • Set up log book. (see pages 5-7)  • Write three possible project ideas and choose one.  • Complete the “Rule’s Wizard “at <http://www.societyforscience.org/isef/rulesandguidelines> on the ISEF site to determine which forms your project must have before experimentation begins. |
| **Step 2: Gather Background Information (Observations and Research)** |
| • Begin library/internet research and bibliography. (See pages 7 and 14-15 for more information)  • In the "Background Information and Research" section of your log book, write a minimum of 15 facts from five different resources. See instructions. |
| **Step 3: Form a Hypothesis (see page 7 for more information)** |
| • Write a hypothesis in the "if-then. |
| **Step 4: Design an Experiment (see page 7-9 for more information)** |
| • Prepare a detailed list of needed materials and write it in the log book.  • List the variables, constants and control (if applicable) in the log book.  • Prepare a detailed list of steps for your safety, experimental and data collection procedures and write it in your log book.   * **Topic Approval form and adult sponsor form turned in for approval**   **Step 5: Write the research plan**   * Question or problem being addressed * Goals/ expected outcomes/hypothesis * Description in detail of the procedures and experimental design * How the data will be collected * How the data will be analyzed * Bibliography of at least 5 sources. |
| **Step 6: Test the Hypothesis** |
| • Gather needed materials for experimentation.  • Conduction practice trials (if desired or needed).  • Begin experimentation. |
| **Step 7: Collect and Record Data (see page 9 for more information)** |
| • Collect qualitative data and observations. Record in the "Daily Journal" of the log book.  • Collect measurements (quantitative data) and record on hand written data tables in the "Data" section of the log book.   * Create at least one data table and one graph for your project board.   **Step 8 Analyze Data (see page 9 for more information)**   * Using your data tables and graphs analyze your data to draw your conclusion. |
|  |
| **Step 9: Draw Conclusions (see page 9 -10 for more information)** |
| * Write your conclusion in the proper three paragraph format. |
| * Hand-write in the log book and type for your project board. |
| **Step 10: Communicate with Others (see page 11-13 for more information)** |
| • Complete log books.  • Complete project abstracts. Using the abstract form from <http://www.floridassef.net/student> .Print  • Create project boards with format done according to instructions.  • Turn in research plan, project boards and log book. |

**Items to Be Turned in to your teacher (See checklist form for due dates)**

1. **Required Certification Forms**

* **Topic Approval form**
* **Adult Sponsor Form**
* Upon completing the ISEF Rules Wizard at <http://www.societyforscience.org/isef/rulesandguidelines>
* you may be required to submit additional certification forms. This depends on your use of chemicals and other things. This may include Material Safety Data Sheets (MSDS). Your teacher will help you to determine if you need other certification forms.

• Each student must have certification forms submitted and reviewed prior to beginning of experiment

• Forms may be found online at <http://www.floridassef.net/student>

* **Experimentation may not begin until project is approved**

1. **Log Book (see page 5-7 for more detailed instructions)**

**3. The research plan (see page 8 for more detailed instructions)**

**4. Display Board (see pages 12-13 for more detailed instructions)**

**Do’s and Don’ts**

• Your project must be a scientific investigation (uses the Scientific Method) with a measurable outcome.

• Remember we are not building kits, models (ex. model of a volcano), simply giving a report or creating product comparisons (ex. Which battery lasts the longest?)

• No food will be given to humans as part of experimentation.

• Projects that involve decaying food in ANY fashion are not acceptable.

• Always have safety and other types of procedures documented in your logbook and cite the resources where you found and/or studied them.

• Experimentation is NOT permitted to begin until ALL required student forms are submitted and approved.

**ANY STUDENT USING HUMAN SUBJECTS for a survey**

* (Minimum number of participants must be 75)
* You must have Form 4 completed to be approved by the review committee. After your project has been approved by, you will take this form and have it copied a number of times.
* Then you will have EACH SUBJECT sign a copy of the form AND date it before they participate in your experiment. If your subject is younger than 18 you must also have their parents sign the form. **So this means you must provide 75 copies of each form. The school will not provide copies.**
* You must know your participants.

**SCIENCE PROJECT Handbook**

**Choosing Your TOPIC**

The topic is the subject of your experiment.

* Start by choosing several *large* subject areas that you may be *interested* in.
* Decide which of the topic areas can be TESTED. For example it would be difficult to design an experiment to test research done on hurricanes or planets.
* Narrow down the topic by listing relationships that are found within the topic area.
* Choose one of these topics to research.
* When choosing a specific topic ask yourself the following:
  + 1. Can I design an experiment that measures the results in **numerical terms**?

2. Can I design an experiment that has a **cause/effect** relationship in the problem?

1. Is there something that can be **compared** (usually to a control)?
2. Is the topic **cost effective** and are the **materials readily available**?

**LOG BOOK**

**A project logbook is your most treasured piece of work. Accurate and detailed notes make an excellent logical project. Good notes show consistency.**

The log book is a daily or weekly documentation (daily blog) of the progress made on the experiment.

1. Write your name and class on the front of your composition notebook.
2. Write your name, class and title of your experiment on the first page.
3. Number each page in the upper outer corner.
4. Record everything that you do or need. Use BLACK INK only. Not pencil or any other color of ink.
5. All pages should be numbered in the lower outer corner.
6. No pages are to be torn out.
7. No liquid paper or white out.
8. If you need to change something, cross it out neatly, and write in the change. Crossed out values should still be visible.
9. Keep notes of interviews or phone calls, phone numbers and e-mail addresses if you are corresponding to or interviewing a professional in your field of study. Note e-mail replies or paste in printed copies if necessary

**Setup for Background Information in the Log Book**

1. Record bibliography information (see pages 14-15 for formats) at top of the page for the source that you will be using.
2. Record the day’s date in margin at top of page.
3. Place number of page that you are referencing from in the margin.
4. Record EACH page used from text.
5. Write brief, bulleted notes NOT WHOLE PARAGRAPHS.
6. If notes continue onto the next page of log book, record date and page of text in margin.
7. When using Internet sources, record notes in log book just like other references using page 14-15 of handout.
8. Use NEW log page for EACH change of reference.
9. **Don't worry about neatness**. It's a personal record of your work. Do not re-do your logbook because it looks sloppy.
10. Think of the logbook as your "Dear Diary" for science fair. It's not just for recording data during the experimental phase of your project and it's not just for your teacher.
11. **It should be used during all phases of your project**, jotting down ideas or thoughts for a project, phone numbers, contacts or sources and prices of supplies, book references, diagrams, and graphs.

**Note: It is the logbook which is a record of your actual experimentation and the only official documentation that you have of completing your experiment. This is required at school, regional, state, and international science fairs.**

**Example of logbook**



**Example of a data table for your log book**



**RESEARCH- BACKGROUND INFORMATION**

At this point, you DO NOT KNOW THE ANSWER TO YOUR EXPERIMENT and the research paper is a document written *before experimentation* that helps organize background information *in order to help form a hypothesis.*

* Write the scientific question that will be answered with your experiment
* Identify The Variables
  1. Independent Variable – the factor that the scientist changes
  2. Dependent Variable – the factor being measured or observed during the experiment (this information goes in the data table)
  3. Control Variable – the factors that stay the same
  4. If doing a biological experiment, such as with plants, a Control group would be needed. (a control group would not receive the experiment treatment)
* Research The Variables and write your information in your log book.
* Bibliography – keep track all of the necessary information needed to write a proper bibliography. Five sources are required.

**HYPOTHESIS**

The hypothesis is an *explanation* as to the expected outcome of the experiment based on research completed by the student.

* Write the hypothesis in the form of an If/Then statement with the independent variable and the dependent variable included in the wording. The independent variable should be in the “If” part and the dependent variable should the in the “then” part.
* Hypothesis must be testable with the planned experiment.

**MATERIALS**

Materials are a list of all items used to CONDUCT the experiment.

* Include *amounts (quantities)* and *measurements (sizes).*
* Make sure to include enough materials to complete the total number of trials.
* Use metric units.
* Include ALL equipment used – do not list pen and paper unless it is part of the experiment.
* **Examples of Materials Lists:**
* Measuring Cup 250 ml graduated beaker
* Water 750 ml distilled water
* Container 20 cm X 20 cm aluminum cake pan
* Thermometer Celsius thermometer

**PROCEDURE**

* The procedure is a specific set of steps taken in order to do the experiment.
* Someone who does not know anything about the project should be able to read the procedure and duplicate the experiment without any questions.
* Use metric measurements.
* Instead of retyping steps for another trial use the term “repeat”.
* Number your **PROCEDURES** in order of their occurrence.
* Be sure to list ALL of the steps of your experiment.
* **IT IS IMPORTANT TO INCLUDE ALL SAFETY PRECAUTIONS NECESSARY**.
* Include amounts and times if they were used.
* Recording results is part of the procedure.
* Also, include in your bibliography the source of safety procedures that you may use.
* **A Materials Safety Data Sheet (MSDS) for each chemical used in a project must accompany the topic approval forms**
* Copies of surveys given to subjects must accompany each Human Behavioral Project Research Plan.
* Each Behavioral Project must have a “script” accompanying the Research Plan to assure consistency in subject testing.
* **Consider This... As You Develop Your Experimental Plan:**
* If possible, run the experiment several times to refine your technique and determine its validity. Once you start recording consistent results, begin the actual collection of data to be used as experimental data.

• Be sure to use a control, when appropriate and to quantify all observations possible.

• Use your senses: tell what happened, what was seen, heard, smelled. Explain the changes that occurred and how those changes were determined.

• Measure carefully.

• Run the experiment as many times as possible. The larger the number in your sample and the amount of data collected (more trials) determines the validity of your project.

**Science Fair rules require that only metric units be used for measurement in science fair projects**

* Symbols for metric abbreviations are NOT capitalized (with the exception of the “L” for liter, which can be capitalized but does not “have to be”)
* Do not place a period after a metric abbreviation
* Conversion websites can be helpful. http://www.worldwidemetric.com/metcal.htm 

**Research plan for ALL projects is to include the following:**

A. Question or Problem being addressed

B. Variables and Hypotheses

C. Description in detail of method or procedures (The following are important and key items that should be included when formulating ANY AND ALL research plans.)

• Procedures: Detail all procedures and experimental design to be used for data collection

• Data Analysis: Describe the procedures you will use to analyze the data that answer hypothesis.

D. Bibliography: List at least five (5) major references (e.g. science journal articles, books, internet sites) from your literature review.

**If your project includes Hazardous Chemicals, Activities & Devices the following items must be included:**

* Describe Risk Assessment process and results
* Detail chemical concentrations and drug dosages
* Describe safety precautions and procedures to minimize risk
* Discuss methods of disposal.

**If your project includes Human participants**

* Describe who will participate in your study (age range, gender, racial/ethnic composition). Identify any vulnerable populations (minors, pregnant women, prisoners, mentally disabled or economically disadvantaged).
* Recruitment. Where will you find your participants? How will they be invited to participate?
* Methods. What will participants be asked to do? Will you use any surveys, questionnaires or tests? What is the frequency and length of time involved for each subject?
* Risk Assessment
* Risks. What are the risks or potential discomforts (physical, psychological, time involved, social, legal etc.) to participants? How will you minimize the risks?
* Benefits. List any benefits to society or each participant.
* Protection of Privacy. Will any identifiable information (e.g., names, telephone numbers, birth dates, email addresses) be collected? Will data be confidential or anonymous? If anonymous, describe how the data will be collected anonymously. If not anonymous, what procedures are in place for safeguarding confidentiality? Where will the data be stored? Who will have access to the data? What will you do with the data at the end of the study?
* Informed Consent Process. Describe how you will inform participants about the purpose of the study, what they will be asked to do, that their participation is voluntary and they have the right to stop at any time.

**Organizing Your Data**

Each experiment must have its data organized in a table and represented on a graph. A data table is a convenient way to store information as needed and organize information. A graph gives a quick visual display of results and projects and also serves as an organizational tool for data. It aids in comparisons so that conclusions may be drawn more readily.

**Data Tables**

* Create a data table in your logbook to organize data collected during experimentation.
* Each project must have a data table in the log book and on the backboard.
* Title every data table.
* Design a data table appropriate for your project. Take care that each column and row has the proper heading.
* Include units of measurements in the headings NOT in each individual cell.
* Use a ruler to draw the data table in your log book.
* You can use Microsoft Word or Excel or other software to create your data table for your display board.
* For more detailed instructions on how to prepare a data table, see the handout in your science folder.

**Graphs**

* Determine which type of graph; bar, line or circle, would best illustrate your results.
* Title the graph
* For bar and line graph label the horizontal axis (x-axis) with the name of the manipulated (independent variable). Label the vertical axis (y-axis) with the name of the responding (dependent) variable. Use an appropriate scale on each axis.
* You can use Microsoft Word or Excel or other software to create your graph for your display board.
* For more detailed instructions on how to prepare graph, consult the handout on tables and graphs in your science folder.

**Analysis and Conclusion**

**LOOK FOR PATTERNS.** Closely look at your data tables to see if a trend clearly emerges.

1. Did the data support your hypothesis or not? (Be honest – it’s ok if things didn’t turn out as expected)

2. What were the unexpected problems that might have affected the results of your experiment?

3. Did you make any mistakes and have to start over? If so, how would they have affected the outcome?

4. Did you gather enough data?

5. Did you do at least 5 or more trials?

6. How would you do your experiment differently the next time?

7. Is there some way you could expand your experiment in the future?

8. Who can use this information?

9. Why is this information important?

**Writing the Conclusion**

* When you write your conclusion:
* Write in the **third person**
* Write in the **past tense** with the exception of the first sentence.

**FIRST PARAGRAPH**

* The first sentence should state whether or not your test results supported the hypothesis.

**Example**: It is concluded that the data collected supported the hypothesis.

It is concluded that the data collected did not support the hypothesis or

the results of this project were inconclusive.

* The second sentence restates the hypothesis in a way that indicates whether it was supported or not.

**Example***:* The data collected showed that the water in the black can got hotter faster than the water in the unpainted can.

* Add 2 or 3 sentences to the first paragraph stating what trends the results and data showed and how those results supported or did not support the hypothesis.

**Example***:* The results also showed that the temperature of the black can remained an average of 2.5 degrees Celsius higher than the unpainted can. The data indicated that in this experiment the black can absorbed more of the sun’s rays than the unpainted can.

**SECOND PARAGRAPH**

* In the second paragraph explain any problems or errors that may have affected the results of the experiment.

**Example***:* This experiment was done during the latter part of December when the sun’s rays are slanted the most since the sun is over the Tropic of Capricorn.

Some days during the experiment were cloudier than others and this affected the results. The thickness of the paint could have affected the results, also.

* Tell of additional experiments that can continue from your present one. Write at least 3 sentences in this paragraph.

**Example:**The next time the unpainted can should be painted with paint as close in color as possible to the original can color. This would eliminate a variable that was overlooked and test only the effects of the color of the cans. Also, it would be interesting to do this experiment during the summer solstice when the sun’s rays are shining more directly on this part of the earth.

**THIRD PARAGRAPH**

* Write a third paragraph telling who could use this information.

**Example***:* The information learned from this experiment would be helpful to home or commercial canners who want their products to remain as cool as possible after the canning process is completed. Roofing manufacturers could also use this information.

**Abstract**

The abstract is a summary of your project. It will include the following information in this order:

**The Abstract should include the following:**

**a) Purpose of the experiment**

**b) Procedure**

**c) Data**

**d) Conclusions**

• The abstract is extremely important to your project, so type it in a word processing program, save it and then copy and paste to the required form.

• It is part of the entry form for the Mulberry Middle School fair, the Regional fair and the State Fair.

• It must be prepared on the official Florida State Science and Engineering Fair form that can be found on the <http://www.floridassef.net> website.

**This form needs to be completed according to the instructions below:**

1. Give your project title. Capitalize the first letter of each word that is greater than two letters.

2. The title given must be the title on your display board.

3. The entire abstract must fit within the box on the form.

4. Type your abstract in a Word Processing program and then copy and paste it into the abstract form.

5. Type single-spaced using Times New Roman font and a 10 or 12 pt. font size.

6. The abstract is approximately 200-250 words.

7. Complete the questions at the bottom of the abstract.

8. Sign and date the completed form.

• Please have your abstract edited by a responsible adult or classmate to insure that it makes sense and is free of spelling and grammatical errors.

• Save your abstract on your hard drive or other form of storage on your computer.

• Your abstract will be placed in the lower left corner of your display board.

* If you go to the Polk County Regional Fair you will have to have additional copies

**Display Board**

The purpose of your display is to present your project.

Content, or the information on the board, is important.

Science Fair display boards have a 3-panel configuration and the traditional way to setup this type of board is:

**Your display represents you. Give it your best effort!**

• Label each part of your display as shown. Type large enough for the viewer to read easily.

• **SPELLING MUST BE CORRECT**

• Back your information with construction paper.

• It is good to use complementary colors in your display.

• ***Use rubber cement, glue stick or double-faced tape to mount your paper to the backboard.***

* ***No tacks or staples!***

• Use a paper cutter rather than scissors for a neat display.

• Photographs make an excellent display.

• All photographs, graphs and tables must be labeled. Photos must include a caption explaining the images and credit must be given to the person who took the picture. Graphs and tables must include a proper heading and if the data was taken from a source other than your logbook, credit must be given to the originator of that data.

• No embellishments may be added to the board (nothing may be attached) for simply decoration purposes. See your teacher if there is a question.

**Sample Board**

Title

Problem Illustrations variables

Hypothesis Data table/charts Materials

Procedures

Abstract Graphs

Conclusion

**Exhibit Requirements**

• A freestanding, durable backboard must be used for the display.

• **Maximum size** for an exhibit is:

76 cm (30 in.) deep, front to back

122 cm (48 in.) wide, side to side **(outside to outside)**

274 cm (108 in.) high, **floor** to top of exhibit

***A standard table is about 30 in. high***

• **A copy of the abstract MUST be displayed with the project, in the lower left corner. The abstract must be in the format presented in class.**

**Bibliographie Formats:**

**Articles from Magazines, Newspapers & Journals**

**Article from a Database: Your citation for an article from an electronic source should include these important elements:**Author. (If given) "Article title" *Periodical title*  
Date of publication. *Database Name* Date of access

Example:  Elson, John. "The great migration." *Time* Fall 93 Special Issue. *EBSCOhost.* April 15, 2002.  
  
**Article from a Printed Periodical:** **Your citation for an article from a printed source should include these important elements:**   
Author. (if given)  "Article title." *Periodical title*  
Date of publication. Page numbers of the article (if given)

Example: Wenger, Ty. "Wired hoops: How basketball has become the most wired game in sports? And what does that mean for hoops lovers? An obsessive-compulsive guide to b-ball." *Yahoo!* March 2002: 56-59.

## Books: Your citation for a book with one or more authors should include these important elements: Author(s) or editor(s). Title of the book. Place of publication: Publisher, Date of publication.

Example: Voelkel, James R. *Johannes Kepler and the New Astronomy.* New York: Oxford University Press, 1999.

Example:Yolen, Jane, and Bruce Coville. *Armageddon Summer.* New York: Harcourt Brace & Company, 1998.

**Electronic Book: Your citation for an electronic book should include these important elements:**   
Author or editor. *Title of the book.* Place of publication:   
Publisher, Date of publication. <Address of the site>.  
Date you accessed it.

Example: Adams, Douglas. *The Hitchhiker's Guide to the Galaxy.*  New York: Oxford University Press, 1998. <http://www.netlibrary.com>. January 1, 2002.

**Short Story: Your citation for a short story should include these important elements:** Author   
"Title" of the short story *Title of the anthology* Editor of the anthology  
Publisher and city Page on which the story begins

Example: Connell, Richard. "The Most Dangerous Game." *Short Stories: Characters In Conflict*. Ed. John E. Warriner. Harcourt Brace Jovanovich. Orlando. 1981. 1.

**Encyclopedias and other multi-volume works: Your citation for an article from an encyclopedia should include these important elements:**Author (if given) "Title of article" *Title of the encyclopedia*  
Volume number, Page number. Date of publication.

Example: Lehman, Jeffrey. "French Americans: Bad advice given in good French." *Gale Encyclopedia of Multicultural America: Primary Documents.* 2nd. ed. Vol.2, p 591.1999.

**Interview: Your citation for an interview should include these important elements:**   
Interviewee's name Interviewer's name Date conducted

Example: Pumpkin, Great. Interview with Charlie Brown. Rec. October 31, 1990

**On-Line Listserv, BB, or Discussion Group Posting: Your citation for an on-line source should include these important elements:**Author. "Title of posting." Name of site host,   
Date of posting. URL of message site or archives.  
Date of access.

Example: Cheshire\_Cow. Re: "Joey Pigza Swallowed the Key." Online posting. Saturday, March 09, 2002. Mustangs On Books. April 20, 2002.  
<<http://www.harmani.com/discus/index.html>>.

##### Videos: Your citation for a web page should include these important elements:

##### Title of Video Director Production Company Year released

##### Example: Finding Nemo.  Dir.  John Lasseter.  Walt Disney Pictures, 2003.

## Web Pages

**A Document on the World Wide Web: Your citation for a web page should include these important elements:**Author, if given *Title of work* Group responsible for the site, if given.  
Date site was last updated URL of the site                        Date of access.

Example: *Writer's Handbook: MLA Documentation.* University of Wisconsin-Madison. February 29, 2000. <http://www.wisc.edu/writing/Handbook/DocMLAWorksCited.html#book> April 1, 2002.

Note: The above information was taken from the following web page:

“Works Sited” (note the information of author, group responsible and update was not given) \_

<http://www.asij.ac.jp/middle/lib/BibliographyFormat/Bibliography%20Format.htm> June 5,