



**Elementary School
SCIENCE FAIR MANUAL
2011-2012**

The School Board of Hernando County, Florida

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Explore, Create, Discover

This booklet describes the requirements and procedures for completing a Science Fair project.

- **The Scientific Method Project:** Scientists use an orderly approach to learn new information and to solve problems. This is called the scientific method and includes making observations to form a hypothesis, designing an experiment to test a hypothesis, separating and controlling variables, and interpreting data. This method can be used to develop a science fair project. All individual students and classes may complete this type of project. Students in grades 3-5 may do only scientific method projects. Only scientific method projects will be eligible to participate in the district competition.

Please take the time to read this booklet carefully. An attempt has been made to fully explain all criteria and judging procedures. It is recommended that you take time to review the judging sheets. If you have questions that are not answered in this booklet, or if you need assistance, please contact your site based Science Fair Coordinator.

Selecting a Topic

Thoughtful consideration of several factors will help you choose a good topic for your science project. Consider topics related to your hobbies, sports activities or life experiences. This will help you find a topic that is age-appropriate and highly motivating. You may wish to probe for ideas within areas of study that are suggested by the Big Ideas in Florida's Next Generation Sunshine State Standards.

Next, choose a topic for your project that can be thoroughly studied and displayed within a time frame that is reasonable and productive. Finally, if you have identified several topics to choose from, pick the one with the best competitive edge. Novel projects with *unknown* results are better than over used, cook-book type projects. Projects that require actual measurements yield more points than opinion polls or counted responses. **All topics must be approved by the School Science Fair Director prior to starting the project. Topics must comply with School Board Policy and FLDOE safety guidelines.**

Project selection is often frustrating because there are so many things to think about. Yet, it should be noted that doing a science experiment is an ultimate exercise in thinking skills, strategizing, and problem solving. Seeing a project through from deciding on a good topic to completion, and even competition, is a highly rewarding and profoundly important learning endeavor.

Scientific Method Competition Guidelines

- A science fair project has two main parts. They are the project board and the notebook.
- Participation will be judged according to grade level in both school-based and District Science Fairs.
- Each project will be evaluated prior to interviews. Students must earn a designated number of points for the project board and the project notebook in order to be eligible to be interviewed. Students must earn a minimum of 42 points on the Scientific Method Project Notebook to be interviewed. Students must earn a minimum of 72 points on the Scientific Method Project Board to be interviewed.

- Two judges will interview students eligible to be interviewed. Ties will be broken by a third interview and/or a consultation of two or more objective observers in the school based science fair.
- Winning projects will be determined by totaling the points earned on the project board, the notebook and the interviews.
- Any project that has been copied from another source or does not reflect the student's original work will be disqualified.
- Awards for students participating in the science fair will include:
 - pins for all individual participants
 - ribbons for all students participating in class projects.
- Awards for individual winners of the science fair will include:
 - Trophies, medals and ribbons for each participant.
 - Top 1/3rd top award
 - Middle 1/3rd second place
 - Bottom 1/3rd third place
 - Top score in each grade level will be awarded a first place trophy

Awards will be given to class winners.

 - ribbons for all class projects
 - awards to one class project per grade level

Criteria for Participation in the Scientific Method Competition

1. All projects must be represented through photos or drawings. (No three-dimensional items may be attached to the project boards.) Glue or tape should be used to attach materials to the project board.
DO NOT USE STAPLES
2. No projects using allergens (i.e. mold), human or animal tissue or fluid or alcohol will be accepted.
3. No project which involves the injury or death of vertebrate animals will be accepted.
4. The student should be able to set up the project backboard. The backboard must be free standing.
5. Project boards must be no larger than 4 feet wide and 3 feet high.
6. Project notebooks must accompany project boards.
7. The student should be able to describe orally the details of the project.
8. The student should use the judging sheet to make sure that all components of the scientific method are included in the project.

Directions for Completing a Scientific Method Project

A scientific method project is an investigation to discover the answer to a scientific problem. The scientific method is the “tool” that scientists use to find the answers to questions. It is the process of thinking through the possible solutions to problems and testing each possibility to find the best solution.

The scientific method involves the following steps: identifying the problem or purpose of the project, stating a hypothesis, conducting project experimentation, reading information about the topic, and reaching a conclusion.

Scientific Method Project Notebook

Students should begin their project by using their notebook to record all of the information concerning their project. Students should use the information from the notebook to put together the project board.

All items described below must be included in the project notebook. Each item must be clearly labeled.

1. Written report

Read at least two books or articles related to the project.

- Take notes while reading. Include notes in the notebook.
- Summarize what has been learned through reading about the project.
- Relate the reading materials to the project.
- Include a bibliography with at least two sources in the report.
- Credit should be given to any individual that assisted with the project.

2. Description of data collection and procedures followed in the experiment

Part of doing an experiment is observing and recording information about what is happening when one part of the experiment is changed. This is called data collection. Details about the data collection should include measurements and descriptions that can be written down in a journal or log. All of the following must be included in the data collection log.

- A journal of dates and activities.
- Identify the Constant Variables. Parts of the experiment that stay the same.
- Identify the Independent Variable. Part of the experiment that are intentionally changed.
- Identify the Dependent Variable. Parts of the experiment that change as a result of the response to the independent variable.
- Include dates, times and conditions of each trial in the journal.
- Identify at least three different trials.
- Give details about the measurements taken.

3. Title

The title must appear on the cover of the project notebook, and it must be the same as the title of the project board.

Bibliography

- Books – Author’s last name, Author’s first name. Title of the book. City of publisher: name of publisher, date published.
- Magazines/Periodicals – Author’s last name, Author’s first name. “Article Title.” Magazine Title Date: page numbers.
- Professional assistance – Last name of person assisting, first name of person assisting. Title or occupation. Assistance date and time of meeting. Subject of interview.
- Internet sites – Author(s). Title of Article. Internet address: date of publication. Access date.

Scientific Method Project Board

The science fair project board must include a purpose, hypothesis, procedure, materials, data display, title and conclusion. Each part must appear on the project board and be clearly labeled. All of this information should have been previously recorded in the notebook.

Purpose

The purpose of the project is a scientific question that can be solved by careful testing. It should be expressed as an “open-ended” question. An open – ended question is a question that is answered with a statement, not just a yes or no. For example, “How will the mass of a ball affect its speed when rolled down a ramp?” Try to limit the scope of the question to be answered and choose a problem that can be solved experimentally. The question should appear on the project board under the label “purpose”.

Hypothesis

A hypothesis is an idea about the solution to the question or purpose of the project. It is an educated guess about what will happen when the experiment is completed. All of your project experimenting will be performed to test the hypothesis (i.e., More light on a plant will cause the plant to grow faster.)

- State facts from past experiences or observations on which you base your hypothesis.
- Write down your hypothesis before beginning the project experimentation.
- The hypothesis should never be changed even if experimentation does not support it.

Procedure

The procedure section of a science fair project is a detailed description of how the project is done. **First**, step-by-step directions describing how the experimentation will be done should be written clearly and specifically. This procedural plan should address the safety concerns related to how the materials and equipment must be handled. The directions should explain how the measurements will be made. The use of metric measurement is encouraged. If your experiment has no metric measurement, (for example you are counting specific items) please state that in your procedure.

The **second** part of the procedure section must be a detailed explanation of the variables in the experiment. There are three kinds of variables that must be identified in the experiment. The **independent variable**, sometimes called the manipulated variable, is the one thing that has been intentionally changed in the experiment. The **dependent variable**, sometimes called the responding variable, is the variable that is being observed and changes in response to the manipulated variable. The **constant variables** are the parts of the experiment that are not changed but remain the same throughout all experimentation. **Variables should be titled on the board so the judges can identify this part.**

The **third** part of the procedure is a detailed description of a minimum of three trials. This description of the procedure must include an explanation of what has been observed and the measurements that have been made. The dates, times and conditions of each trial must be recorded.

- Have only one independent variable (one thing you change intentionally)
- Repeat the experiment for a minimum of three trials to verify your results
- Identify one or more constant variables.

Materials

All materials used in the experiment should be clearly identified. The materials list must include specific information about the amount of the materials and equipment being used in the experiment. Identify all measurement tools used.

Safety

All safety concerns should be identified in a separate section on the board. If there are no safety concerns, please state that.

Note: No projects dealing with micro-organisms, guns, or alcohol are allowed.

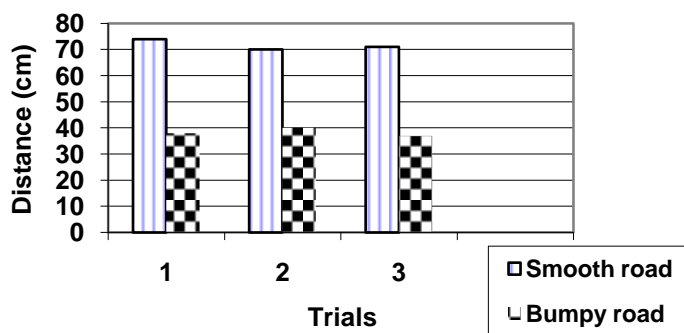
Data Display

The data display is the place to organize the results of your experimentation. The results of the three trials should be organized into a chart or graph. Careful considerations should be given to selection the type of graph or chart that will illustrate what happened in your experiment. There are 2 main types of graphs. A bar graph- is used to display data that does not occur in a continuous manner.

Purpose:

Do cars travel further on a smooth road?

Distance Cars Traveled



A bar graph must include the following:

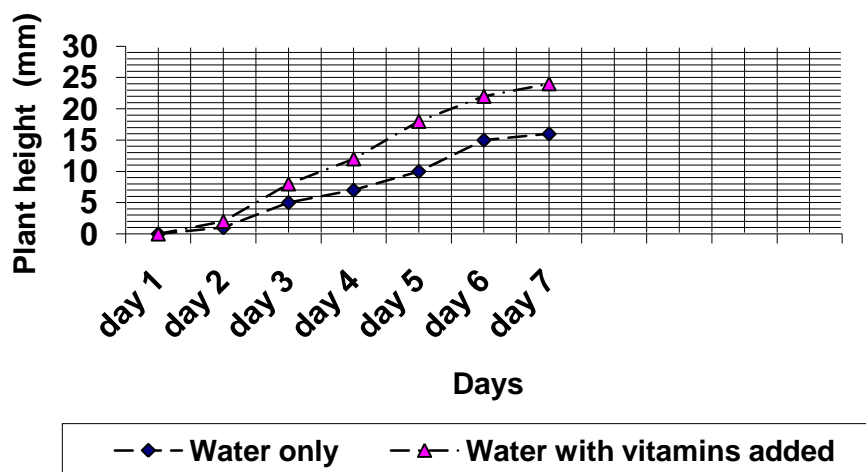
- Title: The Title is a short description of the data being displayed.
- A comparison of your results.
- Key or legend.

Plan your graph so that your data will be evenly distributed across the horizontal and vertical axes.

A line graph is used to show a relationship between the results. It is the appropriate tool to use when the responding variable occurs over a specified period of time.

Purpose: Will plants grow taller if vitamins are added to their water?

Plant Growth Trial 1



A graph must include the following:

- Title: The title is a short description of the data being displayed.
- Label the horizontal and vertical axis.
- Key or legend.

Plan your graph so that your data will be evenly distributed across the horizontal and vertical axes.

Conclusion

The project conclusion is a summary of the results of the project experimentation and a statement of how the results relate to the hypothesis. The conclusion should explain if the hypothesis was correct or incorrect. The student must offer an explanation for the results of the experiment using data to support their explanation. Inferences should be drawn from the data that has been collected as well as material that has been read. Reasons for experimental results that are contrary to the hypothesis should be included. If your results do not support your hypothesis:

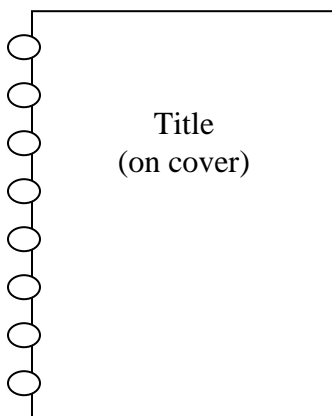
- The hypothesis should not be changed.
- Include experimental results that support your hypothesis and results that do not support your hypothesis. Include data in your conclusion.
- Give possible reasons for the difference between your hypothesis and the experimental results.
- Give ways that you can experiment further to find a solution.
- Explain how this information can be used in real life.

If your results support your hypothesis, compose a brief conclusion explaining the results of the three trials using the data and research collected. Also include ways that you could expand on this particular project as well as how this information could be used in real life.

Title

When the project board has been completed, the student must develop a title for the project that reflects the theme of the project. The title must appear on the project board and the cover of the notebook.

Project Notebook



Label the following in the Project Notebook:

- Title (on the cover)
- Written Report with a bibliography
- Description of data collection and procedures
- Student's name should be on the inside of the back page

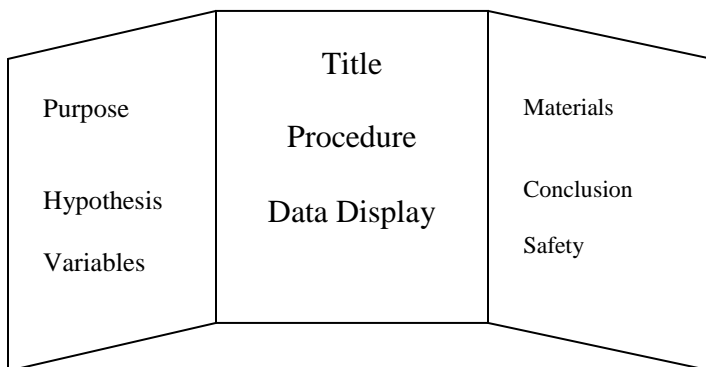
Appearance:

1. Each part of the project must be clearly labeled.
2. Student work should be evident.
3. Writing should be easily read.

Sample for Scientific Method Project Board

All of the following items must be a part of the display and labeled properly. The following diagram is the suggested order of placement of items on the board.

The following labels must be on the Project Board



- Title
- Purpose
- Hypothesis
- Procedure
- Materials
- Data Visual Display
- Conclusions

- Project Boards must be **no** longer than 4 ft. wide and 3 ft. high.
- Project Boards must fold flat.
- Student name must be on the back and bottom of the center panel with the school name.

Score Sheet for Scientific Method Project Notebook **Grades Pre K-5**

Project number _____

Maximum points 60

| | | |
|-------------------------|---------------------------|-------------|
| 0= Does not appear | 1=Attempt made to include | |
| 2= Adequately addressed | 3= Addressed completely | 4= Superior |

TITLE:

| | |
|---------------------------|-----------|
| Reflects theme of project | 0 1 2 3 4 |
|---------------------------|-----------|

WRITTEN REPORT:

| | |
|---|-----------|
| Student summarizes information read in essay form | 0 1 2 3 4 |
|---|-----------|

| | |
|--|-----------|
| Experiment is mentioned in essay and connected to research | 0 1 2 3 4 |
|--|-----------|

| | |
|---|-----------|
| Bibliography complete – includes at least two sources | 0 1 2 3 4 |
|---|-----------|

DATA COLLECTION:

| | |
|--|-----------|
| Includes dates, times, measurements, conditions of experiments | 0 1 2 3 4 |
|--|-----------|

| | |
|--|-----------|
| Describes observations based on appropriate senses | 0 1 2 3 4 |
|--|-----------|

| | |
|-------------------------------|-----------|
| Identifies Constant variables | 0 1 2 3 4 |
|-------------------------------|-----------|

| | |
|---------------------------------|-----------|
| Identifies Independent variable | 0 1 2 3 4 |
|---------------------------------|-----------|

| | |
|-------------------------------|-----------|
| Identifies Dependent variable | 0 1 2 3 4 |
|-------------------------------|-----------|

| | |
|----------------------|-----------|
| Identifies trial one | 0 1 2 3 4 |
|----------------------|-----------|

| | |
|----------------------|-----------|
| Identifies trial two | 0 1 2 3 4 |
|----------------------|-----------|

| | |
|------------------------|-----------|
| Identifies trial three | 0 1 2 3 4 |
|------------------------|-----------|

FORMAT:

| | |
|----------------------------------|-----------|
| Student participation is evident | 0 2 4 6 8 |
|----------------------------------|-----------|

| | |
|---|-----------|
| Notebook is organized with sections clearly labeled | 0 1 2 3 4 |
|---|-----------|

Judge number _____

Points earned _____

Students must earn 42 points on the *notebook* and 72 points on the *project board* to be interviewed.

Score Sheet for Scientific Method Project Board **Grades Pre K-5**

Project Number _____

Maximum Points 100

0 = Does not appear
3=Addresses completely

1 = Attempt made to include
4= Superior

2 = Adequately addressed

TITLE: Reflects the theme of the project 0 1 2 3 4

PURPOSE: Stated in a question form 0 1 2 3 4

HYPOTHESIS: Uses previous knowledge to predict the outcome of the experiment 0 1 2 3 4

PROCEDURE:

Safety issues recognized 0 1 2 3 4

Lists all steps taken 0 1 2 3 4

Identifies constant variables 0 1 2 3 4

Identifies independent variable 0 1 2 3 4

Identifies dependent variable 0 1 2 3 4

Employs scientific method 0 1 2 3 4

Describes a minimum of three trials 0 1 2 3 4

Uses metric measurement 0 1 2 3 4

Gives specific measurements taken 0 1 2 3 4

Design of experiment is valid and sound 0 1 2 3 4

MATERIALS:

Lists all materials used 0 1 2 3 4

Lists specific measurement tools used 0 1 2 3 4

DATA DISPLAY:

Complete and appropriate chart/graph is present 0 1 2 3 4

Identifies three separate trials and includes an average of three trials 0 1 2 3 4

Labels graph/chart correctly (includes key or legend) 0 1 2 3 4

CONCLUSION:

Explains results based on hypothesis 0 1 2 3 4

Includes data in explanation 0 1 2 3 4

Uses information from written report 0 1 2 3 4

Includes information about further experimentation 0 1 2 3 4

FORMAT:

Neat and attractive appearance 0 1 2 3 4

Grammar and spelling correct 0 1 2 3 4

Reflects student's participation 0 1 2 3 4

Judge number _____

Points earned _____

Students must earn 42 points on the notebook and 72 points on the project board to be interviewed.

Score Sheet for Scientific Method Interviews **Grades Pre K-5**

Students must earn 42 points on the Notebook and 72 points on the Project Board to participate in the interviews.

Project Number _____

Maximum points 40

| | | |
|-------------------------|---------------------|-------------------------|
| 0= No response | 1= Limited response | 2= Adequately addresses |
| 3= Addressed completely | 4= Superior | |

- | | |
|---|-----------|
| 1. What is the purpose of this project? | 0 1 2 3 4 |
| 2. What was your hypothesis and why did you choose it? | 0 1 2 3 4 |
| 3. What are the steps to run your experiment? | 0 1 2 3 4 |
| 4. What parts of the experiment stayed the same? (Constant variables) | 0 1 2 3 4 |
| 5. What part of the experiment was changed on purpose? (Independent variable) | 0 1 2 3 4 |
| 6. What happened as a result of the change that was made? (Dependent variables) | 0 1 2 3 4 |
| 7. What was observed during the three trials? | 0 1 2 3 4 |
| 8. What were the results of the experiment? (Use the information on the board to explain.) | 0 1 2 3 4 |
| 9. How did the result of your experiment support or not support your hypothesis? | 0 1 2 3 4 |
| 10. How could this information be used in life? | 0 1 2 3 4 |

Judge number _____

Points earned _____