Practical Research Investigating the Scientific Method

PRISM

A Celebration of Science & Learning for Elementary Students

LINDBERGH SCHOOLS

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GENERAL INFORMATION

PRISM (**P**ractical **R**esearch **I**nvestigating the **S**cientific **M**ethod) is an exciting program that has been developed by the Lindbergh Schools community to enhance science education in the district.

This **PRISM** booklet contains general information on the types of projects students may choose to complete for the **PRISM** celebration at each elementary school as well as the criteria for each type of project.

Please pay special attention to any information your school provides about **PRISM** through announcements or other forms of communication as each school may decide on their own specific guidelines.

For any questions, please contact your building directly.

We hope that you will encourage your child to participate in **PRISM** and explore the wonderful world of science.

Nancy Rathjen, Ed.D.
Assistant Superintendent for Curriculum and Instruction

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What is PRISM?

PRISM (Practical Research Investigating the Scientific Method) is a child-centered, noncompetitive science celebration for students in Lindbergh Schools. Students in kindergarten through grade five are encouraged to investigate a **scientific topic** and display the results of their study at a school-wide celebration.

Students choose a scientific topic to explore and decide the best way to present their findings. The types of projects are:

- **Collection**
- **Invention**
- **Investigation**
- **Portfolio**

Each of the above projects has specific criteria that must be followed. These criteria are listed in the PRISM booklet. Students are encouraged to choose a type of project to complete that best fits their learning style. Students should also be actively engaged in development of their exhibit, researching their scientific topic, and applying the scientific process.

What is Next?

- ✓ Choose a **scientific topic** of interest. Think of something that interests you. Decide on the best way to display the information that you gather.
    - If you are thinking of creating something you would consider building an **invention**
    - If you have a question you would like answered you would consider exploring through an **investigation**
    - If you would like to collect something or have a collection and you would like to classify and group them in a particular order you would consider constructing a **collection**
    - If you want to complete an in-depth study of a scientific topic you would consider creating a **portfolio**

- ✓ Complete your project. Check to see the date that projects are due at school. These dates will be decided by each school. Make sure that the project has met all the criteria.
- ✓ Allow your project to be assessed by a team of adults at your building. If needed, make the necessary adjustments so your project fully meets criteria.

Types of Exhibits

There are 4 types of PRISM exhibits. Choose the one that interests you.

Invention—developing an original idea or improving an existing idea

Investigation—an experiment involving the scientific method

Collection—a gathering of scientific objects all of a central theme

Portfolio—a collection of many types of pieces of work focused on the same theme

Deciding a Topic for Your Project

Investigation:

Sometimes thinking of an idea can be the most difficult part of completing a PRISM project. After you come up with an idea, turning that idea into a testable question can be hard.

A good website to use if you are stuck trying to think of ideas or coming up with a question if you are completing an investigation is:

http://www.sciencebuddies.org

Always remember that an investigation must show scientific worth. A good example of this is: *Why is it difficult to observe the nighttime sky in the city?* **Or** *What affects the rate of a pendulum?*

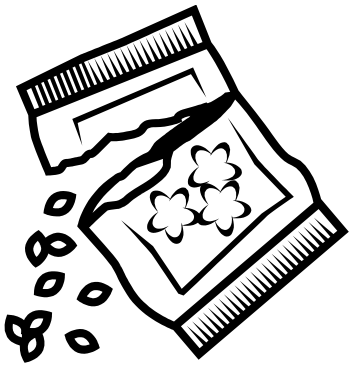
An example of a question that does not have scientific worth might be: *What kind of dog is my class's favorite?*

Portfolio:

Constructing a portfolio can be a great way to become an expert on a scientific topic. Choosing the topic is tricky. When you select your topic to research be sure it has scientific worth.

Good projects: Albert Einstein, puffins, oil, mollusks, mites, Europa

Not acceptable: football, Spain, dolls, The Titanic, trains, automobiles



Criteria for an Invention

_____ Original or an improvement on a pre-existing invention

_____ Shown as a three dimensional model with moving parts

_____ Includes title with name of invention

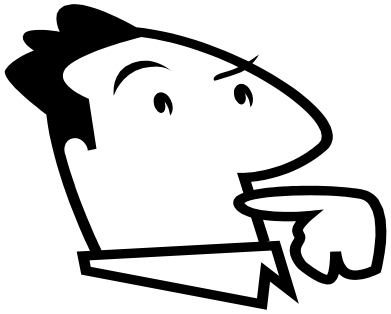
_____ Includes report with:

- _____ Reason for invention
- _____ Description of invention
- _____ Diagram of invention
- _____ Explanation of parts
- _____ Description of how invention works
- _____ State what's learned from completing invention

_____ Includes bibliography citing sources

_____ The computer is only used as a tool. All work is original and not downloaded from the computer

_____ The PRISM card is attached to the bottom right hand corner



Criteria for an Investigation

_____ Testable Question: The problem of the investigation is stated as a question. The question must be one that is testable. This can also function as the title of the exhibit.

_____ Research: Background information is researched about the testable question.
- ↱ Grades Kindergarten – 2: One paragraph of information
- ↱ Grades 3 – 5: Two to four paragraphs of information.

_____ Bibliography: All references must be acknowledged.
- ↱ Grades Kindergarten – 2: One to two sources of information
- ↱ Grades 3 – 5: Two to four sources of information.

_____ Hypothesis: After completing your research make a hypothesis of what you think is going to happen while performing the investigation.
It is recommended that this be stated in an "if-then" statement. *(See experiment explanation page)*

_____ Variables: Students shall include variables in which are being tested. *(See experiment explanation page)*

_____ Safety: Any safety precautions for completing the investigation shall be listed.

_____ Experiment: A list of all materials needed to complete the Investigation will be listed, as well as a step by step procedure of how to perform the experiment. This is the ingredients and recipe of the investigation. While performing the experiment one should perform repeated trials. This assures that enough data is gathered to gain accurate data. *(See experiment explanation page)*

_____ Data: The collected data will be presented in table or chart form. This table will then be converted into an appropriate graph (bar, line, or pie). The display must contain a chart and a graph.

_____ Conclusion: An answer is given to the original testable question. Students analyze the data and explain why they think their results occurred.

_____ Scientific Worth: The effects of the investigation on the student's lives are addressed. What did the student learn? Why was the investigation done? How does this information relate to their life? What additional labs could be performed as a result of the original investigation?

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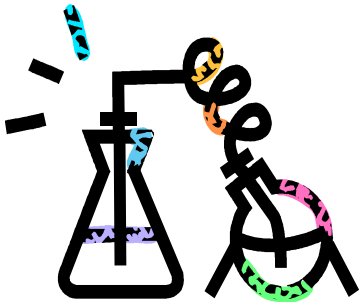

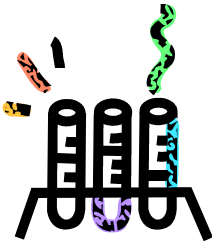

Experiment Explanation Page

Hypothesis – A hypothesis is much more than an educated guess. It is a statement that can be tested. It also states a relationship between variables.

A good hypothesis is often stated in a cause and effect relationship. In doing this it is recommended that it is written in an "if – then" statement; "*If* I do this, *then* I believe this will happen." An example of this is, "*If* a magnet is dropped, *then* it will get weaker."

Variables – Variables are a very important part of performing an investigation in science. The three kinds of variables that you project should include are:

- **Independent Variable** (also called a manipulated variable) is a variable that the experiment deliberately changes or manipulates in an investigation *(this is the "I" change it)*
- **Dependent Variable** (also called a responding variable) is a variable that changes in an investigation in response to changes in the independent variable
- The **Constant** are the components that are deliberately kept unchanged in an investigation in order not to skew the results

Experimenting and Collecting Data - By following the experimental design process, it will ensure that fair testing measures are being met. Fair testing is important because it demonstrates that the findings are accurate.

While performing an investigation, students must show that they have used repeated trials. By repeating the investigation several times, outliers will be identifiable and there will be more data to draw conclusions about the test.

It is critical that you have a testable question. Collecting data and completing a <u>survey</u> is <u>not</u> an <u>investigation</u>.

Criteria for a Collection

_____ Science oriented

_____ Contains no live specimens

_____ Contains no non-living vertebrates

_____ Contains no nests, feathers, or animal homes

_____ Clear title indication items gathered

_____ Items clearly identified and labeled

_____ Arranged to show some kind of relationship (type, size, characteristic or other)

_____ Contains paragraph explaining scientific relevance

_____ Includes bibliography citing sources

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Criteria for a Portfolio of Science

_____ Select a topic that is of scientific relevance. The project will be an in-depth study of a scientific topic.

_____ Construct a piece from each of the four categories.

_____ Construct one – three additional pieces.

_____ Label each piece as to what it is and from what category it belongs.

_____ Include a report about what was learned about the topic and how this knowledge can be used in other scientific learning situations.

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Choosing a Topic of Study

Think of something that is of interest to you that is related to science. The topic should be something in which you want to become an expert. The topic should not be something that has nothing to do with science. The relevance should be obvious.

Think of a noun; person, place or thing. Be creative! Select a topic that is not common. Try not to do a pet.

Some good choices are: invertebrates, planets, famous people who made contributions to science

Some choices that are not acceptable: social studies topics, sports, cities, states, countries, wars and conflicts, ships

Portfolio Categories

Art

Cartoon
Collage
Diorama
Drawing
Flip Book
Mobile
Origami
Painting
Pointillism
Puppet

Language – Literature

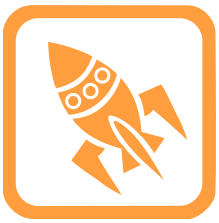
Brochure
Crossword Puzzle
Fact Sheet
Journal or Diary
Letter of Persuasion
Newsletter
Poem
Story
Song

Reference – Research

Diagram
Essay
Graphic Organizer
Interview
Map
Outline
Survey
Time Line

Technology

Audio Tape
Circuit Board or Board Game
Graph
Model
Photographs (original)
Power Point
Puzzle
Spread Sheet
Video



Displaying Projects

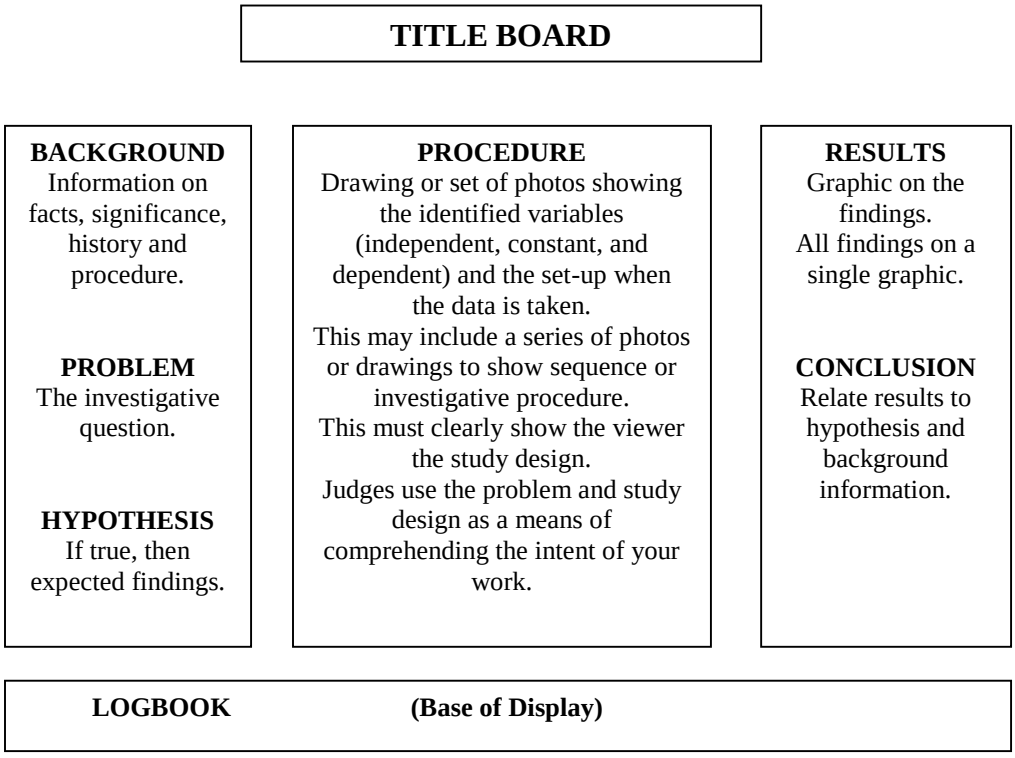
All exhibit materials must be arranged and attached to a display.

The display:

- ☑ Can be no larger than 120 centimeters high, 40 centimeters deep, and 60 centimeters wide. (47 ¼ inches X 15 ¾ inches 23 5/8 inches) Displays may be smaller.
- ☑ Must have a self supporting back and an attached base. Sides are optional.
- ☑ Cannot use electrical outlets.
- ☑ Can have nothing breakable.
- ☑ Cannot have chemicals.
- ☑ Cannot have liquids.
- ☑ Cannot have powders.
- ☑ Cannot have life specimens.
- ☑ Should not have valuables attached.
- ☑ Should not show pictures of students (faces).
- ☑ Must have an identification card attached in the bottom right hand corner of the display box. Please use the colored card that is given to you at school.
- ☑ Must not have staples that are open or exposed backs. Please attach pieces with tape or glue.
- ☑ Must have a bibliography that states resources.
- ☑ Must pass the "Shake" test. Pick up the project with one hand and give it three shake. All pieces must stay on.

Suggested Exhibit Layout

The assessment criteria indicate which sections are most valued by the points given for each of them. The arrangement suggested below takes those values into consideration.



Display boards may be purchased at your school. Check with your teacher for details.

Locating and Using Resources

When you decide upon a project type and a topic the first thing you should do is gather information. Consider possible places to gather the information, what kind of information to gather, and if the sources are reliable.

Some of the possible places you can find information are your school library or librarian, the public library, the Lindbergh Schools web resource page, encyclopedias, atlases, almanacs, magazines, interviewing an expert, the internet, newspapers, video or television.

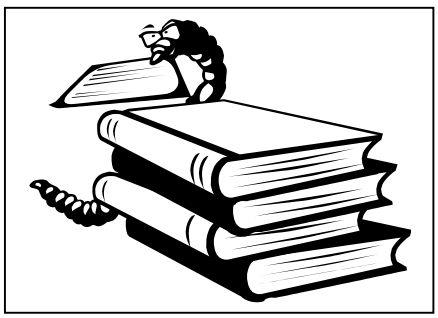
Because you have gathered good information, it is important that you give credit to your sources. This is the key to good research. By doing this, you will create a bibliography.

What is a bibliography?

A bibliography is an alphabetical list of all materials consulted in the preparation of your project.

Why must you do a bibliography?

- Acknowledge and give credit to sources of words, ideas, diagrams, illustrations, quotations borrowed, or any materials summarized or paraphrased
- Show that you are respectfully borrowing other people's ideas, acknowledging that these are not your original ideas
- Offer additional information to your readers who may wish to further pursue your topic
- Give readers an opportunity to check out your sources for accuracy. An honest bibliography inspires readers' confidence in your writing.



How Do I Create a Bibliography?

For students in kindergarten through grades 2, list the source type and the title.
Example:

Book – The Discovery Channel: Wicked Weather

For students in grades 3 through 5, use the MLA format.

Example:

Shulman, Mark. Discovery Channel: Wicked Weather.
Des Moines: Meredith, 2006.

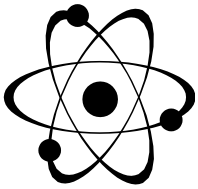
A good resource to help you complete this bibliography is to go on the internet and type the url: www.noodletools.com

Upon entering this site, use the "NoodleBib" MLA starter. You can create an ID and use this tool to create many different bibliographies. Adding bibliographies to work anytime you use resources is a good habit to establish.

How Much Help?

- Be a **questioner** to help achieve focus and clarity. Guide the students rather than lead. Encourage students to make their own decisions and use the inquiry approach.
- Be a **helper** by answering questions on the "how to" parts of the entry. A learner might require help remembering how to set up a graph or chart. Show them how but don't do it for them.
- Be an **assistant** when children need extra hands. Some tasks are just too difficult to do alone. Help reach hard to get items or help them organize time and information.
- Be a **coach** for students who need help. Show or remind how to use information of assist in finding appropriate search tools.
- Be a **runner** for various materials that the child might need. A child might need materials for the project or they could need to visit a site to enhance their study. Help join in on learning by engaging in appropriate trips to places such as The Saint Louis Science Center, Missouri Botanical Gardens, The Saint Louis Zoo, The Magic House, Powder Valley, The Butterfly House or the City Museum.
- Be a **wise listener** when children want to share ideas. Allow the child to discuss progress and show interest in the student's project.
- Most of all, be an **encourager!** Allow children to do their own quality work. Children will perform best if they know they have support from teachers and parents. Let them know how well they are doing and how proud you are of their accomplishments.

Completing a PRISM project is about learning a process. The project will be exemplary if the process of inquiry is followed.



Works Cited

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PRISM NOTES

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