IMPERIAL ESTATES
SCIENCE DIVISION STEP BY STEP PROCESS
2020-2021

Students this guide is designed to help you while working on your Science Division project at home. This guide along with your teacher's guidance and instruction and your hard work will help you successfully complete a science project. Remember this is for SCIECCE DIVISION Projects.

Please take note of the following rules and restrictions:

1. **Your log, and any other research/data for your project must be in a logbook. This year it can be digital (see teacher for template or on loose leaf notebook paper in a folder or binder.**

2. **ALL measurements need to be in METRIC UNITS!**

3. **NO projects allowed that grows MOLD**

Have fun with your project!
Please contact your teacher if you have any questions throughout this process.

QUESTION & TITLE

The purpose of this Science Fair Experiment is to try and find the answer to a question you have. For example: "Do plants grow better in the light or the dark?" You are telling what it is that you are trying to find out. This is NOT a research project ("Hearts: how do they work?) and this is NOT a time to make a model (This is how a volcano erupts)… think of it as solving a problem.

My Experiment Question:

_____

_____

_____

_____

The title of your project may be the same as your experiment question above. However, to have a more "catchy" title will grab the judges' attention to your display board and might keep their interest on your project longer.

My Catchy Science Fair Title:

_____

_____

_____

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DAILY LOG & OBSERVATIONS

Your Daily Log will be kept in a logbook and each part of your project will be recorded as though it were a "science fair diary".
Your daily log should begin from the very 1st day of your project. It will include all of the information (question, title, materials, procedures, data tables, graphs, results, conclusion, and any pictures you want to include) from the beginning to the end of your project. Remember to date each entry. This part of the project should be several pages and include many details.

Example:

10/20/20 Today I thought of my Science Fair question. It is……. My title is…….

10/21/20 I went to the library and found some books on my topic. I've been thinking about my project and I learned a couple of interesting things…….

10/26/20 I came up with my hypothesis for my experiment. It is……

10/28/20 My materials I need to begin my project include three Marigolds plants, 1000mL of soil, and 1000mL of tap water,……

11/2/20 My procedures are as follows:

Step 1: Gather materials – 3 Marigold plants, 1000mL soil, …….

Step 2: Measure each plant in mm and record in log.

11/5/20 Today I measured both the 3 plants growing on the window sill and the 3 plants growing in my closet. I noticed some interesting things….

** YOU ARE RESPONSIBLE FOR DAILY ENTRIES**

NOTE: SOME PROJECTS CAN BE TESTED AND RETESTED SEVERAL TIMES IN ONE OR TWO DAYS. THE TERM "DAILY" LOG MAY NOT APPLY. HOWEVER, YOUR LOG SHOULD INCLUDE ALL PARTS OF YOUR PROJECT IN DETAIL.

HYPOTHESIS

Your hypothesis is an educated guess as to what will happen by the end of your investigation. This guess should be based on research and you should have background information to support your predicted answer. Your hypothesis should be written in an "If…..then…." statement.

Example: "If I do……(tell what are going to do or test in your project) then I think (what you think will happen) because…..(tell a reason you think this will happen based on your research)."

If I plant three Marigold plants and water one with tap water, one with distilled water, and one with well water, **then** I think the one with well water will grow the tallest **because** of all the minerals in well water.

You would not just say, "I think that plants grow better in the light." You would need to explain why you think so. Did you read a book about plants? Search the internet for some background information on plants? You need to give a reason for how you came up with that hypothesis.

Example: If I measure the bouncing height of a new basketball with three different pressures, then the ball with the highest pressure will bounce 10% higher

**Remember: your hypothesis does not change once it is made!

LIST OF NEEDED MATERIALS

A detailed list of ALL materials that you will need or use during this project must be given. Be very specific about what you used in your investigation! ALL supplies and measuring tools MUST be listed in METRIC UNITS!

A good list ☺	A poor list ☹
500 mL of potting soil	Dirt
.5 liters of water	Water
6 4 cm clay pots	Pots
a ruler (in mm)	

PROCEDURE/ STEPS FOLLOWED

This experiment is like a recipe. How did you do your investigation? What did you do first, next, after that? Make it clear enough so that the judges will know exactly what you did. List everything you did in steps. Put down the amounts, time involved, and measurements (IN METRIC UNITS!) you used… include even the smallest details. Procedure should be written in numbered steps. For example:

1. *Gather all materials*
2. *Measure 500 milliliters of soil and pour it into the pot. Continue for each of the 5 pots being tested.*
3. *Pat the soil down and dig small holes (10 centimeters in the middle of each pot filled with soil.*
4. *Place a lima bean seed in each of the hole and cover the hole with dirt.*
5. *Water each plant with 20 milliliters of water once every two days.*
6. *Record observations in daily log.*

SCIENCE VARIABLES

It is important that you complete your experiment with only one variable (same seeds, water, and soil… just changed the type of light/dark) and with repeated trials (grow 3 cotton seeds in the light and 3 in the dark) to make sure your results are valid and accurate and for back up in case one try doesn't work.

- **Independent Variable** The variable you are "messing with".

- **Dependent Variable** The variable that you will record and measure. The changes "depend" on the independent variable.

- **Control Variable** All aspects of this variable must remain constant.

"How Does ***Aspirin*** Affect the ***Growth Rate*** of ***Roses***?"
Independent Dependent Control

"What is the Effect of ***Coke*** on the ***Decay*** of ***Teeth***?"
Independent Dependent Control

CONTROL GROUP

- **Control group:** The group that receives no treatment or test.

  (what would you normally do)

- Used to compare with experimental groups

"How does aspirin affect the growth of roses?"

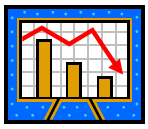
- **The control group would be roses in water without aspirin so we can compare if aspirin has an effect on growth**

"What is the Effect of Coke on the Decay of Teeth?"

- **The control group would be teeth not treated with coke so we can compare the decay of teeth treated with coke to those not treated.**

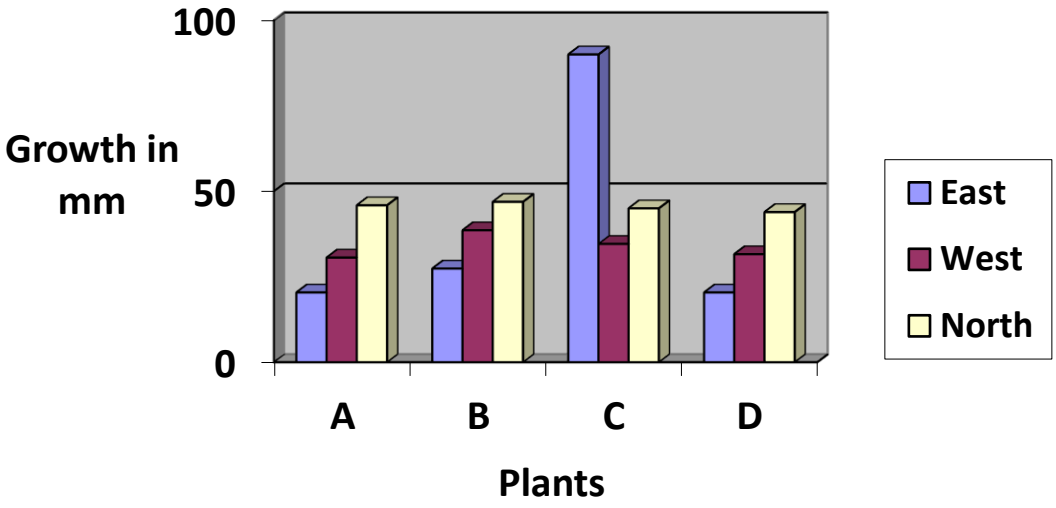
TESTING AND ANALYZING THE RESULTS

- Your data that you collected has been put into a format that is easily understood. Use specific terms and details in a paragraph to explain what your graph means. Are there patterns? Trends over time? One group stronger? Faster? More? Results include both **data** and **observations**.
  - Record measurements and observations in the Daily Log.
  - Think about the data and observations and decide what those results mean.
  - Try to use mathematical calculations such as mean, median, mode, and range (6^{th} grade)
  - Construct graphs or tables digitally that will show results clearly; Create-A-Graph, Google Sheets, or Excel



DATA INTERPRETATION

Directional Plants



In your Daily Log, you have collected information that was measurable with rulers, stop watches, counted totals, or some other means. This information now must be put into a form which others can easily understand it. You need to create a line, circle, or bar graph and/or tables. Remember to give it labels and make it clear and neat and place it in your logbook

WRITING THE CONCLUSION

The conclusion can be written in one or two paragraphs.

- Did the data support the hypothesis? If not, why do you think it did not? What would be done differently the next time? How would people apply your findings to everyday life?

- Do **NOT** say your hypothesis was right or wrong…It is either the data supports or does not support your hypothesis.

- Do not worry about **negative results**, or results that come out differently than expected. Just explain why you think you got those results. If the results turned out as expected, **explain why** your hypothesis SUPPORTS your data. This is where you apply and explain your scientific thinking

BIBLIOGRAPHY FOR 4-6 GRADES ALL PROJECTS

- ***This is an alphabetical listing of all books, articles, people, interviews, websites, etc. used as resources during the investigation. Take note of the formats for each specific source below (ALL punctuation is an important part of the bibliography!)***
- ***Students are REQUIRED to have a minimum of 3 sources.***

Book by single author
Day, R. A. (1994). How to write and publish a scientific paper. (Fourth Edition).
Phoenix, AZ: The Oryx Press.

Book by more than one author
Cothron, J. H., Giese, R. N., & Rezba, R. J. (1993). Students and research.
(Second Edition). Dubuque, IA: Kendall/Hunt Publishing.

Computer Program
Dombeck, R. A. (1991). Theoretical prediction of interference loading on aircraft stores.
(Computer program).
Ponoma, CA: General Dynamics, Electro Dynamics Division.

Encyclopedia
Photosynthesis and plants. (1987). Encyclopedia Americana (Volume 22).
New York: Americana Corporation.

Interview
Borski, S. A. M. (1985, October, 23). Arlington Heights, IL: Northwest Community Hospital.
(Interview).

Journal/Magazine/Newspaper
Bonkalski, J. (1991, February). My view of the land fill. Better Homes and Gardens. pp. 52-53.
Journal/Magazine/Newspaper - no author
Study finds free care used more. (1989, May). APA Monitor. p. 14.

For an Internet Source with an author:
Author's last name, first name. "Title of Work". address (day month year).
Ogawa, Roann. "Great Lakes Science
Center". http://www.glsc.nbs.gov/science/communication/index.htm
(25 Sept. 1997)

For an Internet Source without an author:
"Electricity and Magnetism". http://www.essex1.com/people/speer/elect.html
(11 July 1996)