Lincoln County R - 3
Troy Middle School
Troy South Middle School
2019 - 2020

Updated: 8/2019

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Overview

The purpose of this handbook is to provide students, parents, and teachers of both Troy Middle School and Troy South Middle School information on our Science

and Engineering Fair along with the **Missouri Tri-County Regional Science and Engineering Fair (MTRSEF)** and to provide guidance on how to put together a quality project.

Lincoln R-3 Middle School Science Fair Project Timeline 2019-2020

Due Dates	Teacher Initials	Date finished	Task /assignment
9/23			Hand out materials for Science Fair or Engineering Fair project
9/27			Teachers must review the Experimental Design (include independent/dependent variable/hypothesis)
10/4			Students should write a testable question and submit it for teacher approval.
10/11			Remind parents of their child's science fair project and answer any questions they may have.
10/25			Students must have a hypothesis (variables) and rationale (purpose/problem with research) complete
11/15			Student must have a materials list and procedure completed.
1/6			Student must have conducted their experiment.
1/10			Students must have results and conclusion completed from their experiment Student must have a completed logbook and graph for their project. (graph can be a line, bar, pie)
1/21			Science fair project must be completed and entered in the fair to be judged
1/21			Science Board Deadline - by 2:30 pm @ school
1/23			Science Fair Judging 7:30 am - 2:30 pm

Getting Started - **Take your passion and make a change!**
What do you love? What are you good at? How can you use those to ideas to make a positive change in the world around you?

A successful science fair project does not have to be expensive or even terribly time-consuming. However, it does require some planning and careful thought. Projects become frustrating to students, parents and teachers when they are left to the last minute and thus do not have the chance to be as good as they possibly can. You cannot rush good science!

The most difficult part of a science fair project is coming up with a good topic to research. Whatever the topic, it is probably best that it be something that interests the student and that they can come up with a question about the topic to test and design an experiment to test that question. Whatever the project idea, it must have a testable outcome. Keep in mind what equipment will you need to conduct the experiment. Equipment can be as simple as a ruler and stopwatch or become nearly impossible due to cost and access without the help of a research scientist at a local corporation or university.

Below are some helpful links to help you get started:

https://www.googlesciencefair.com/en/
- Use the "Make Better" generator to help identify an idea based on your interests

Discovery Education
- Leveled project ideas elementary to middle school ideas

Science Buddies - science fair projects
- Take the interest inventory to narrow down topics or your interest/level

The Experiment – A guide to putting it together

1. Title – The title should reflect the relationship between the independent variable and the dependent variable.

2. Rationale- The rationale (purpose/problem) states the reason for doing the experiment. It includes statistics or a real world example. The rationale should also define any scientific vocabulary necessary to understanding the project.

3. Variables – This is what you want to investigate. It is stated as a question that identifies the independent variable and the dependent variable. It should directly relate to your hypothesis.

Your variables should be clearly defined. The independent variable is the one thing that is changed in the experiment. The dependent is what you can measure as the result of the independent variable.

For example:

Variables: How does the amount of water given affect the height of a plant?
Independent variable: amount of water (milliliters)
Dependent variable: height of plant (centimeters)
(In this example, both variables are measured in metric units)
Constant variables: three required

4. Hypothesis- A hypothesis is an "if – then" statement written in the third person. The hypothesis is an educated guess (based on research) that will answer your problem. It must be related to the experiment. It should include the independent variable and the dependent variable.

For example – If clear packing tape is placed in the freezer (0° C) and in the sun (35° C), then the tape in the freezer will be less adhesive when brought back to room temperature (21° C).

5. Materials List- The materials list should include all items used. All measurements need to be in metric units. Go to website listed below to convert Standard English units of measurements to metric units of measurements.

http://www.sciencemadesimple.net/conversions.html

6. Procedure (experiment) - The procedures should be in logical steps that are numbered in a list, not in paragraph form. Remember that you can only test one independent variable at a time. All other possible variables in the experiment must be kept constant for each group tested. The group(s) that receives the independent (manipulated) variable may be referred to as the experimental group(s). If you use a control group for comparison, ensure that it does not receive the manipulated variable.

A procedure should be a step-by-step description of how you did the experiment. The experiment should be easily understandable and repeatable using your steps.

The steps of the experiment should be written in the third person. All procedural steps begin with command verbs, such as mix, pour, cut, measure, mass.
It should be written without pronouns using command words (cut, pour, measure, add, etc.).

Take pictures of your experiment and your results. Remember, you cannot have any **faces** in your photos.

Use the organizing and planning project sheets to set up your experiment. This should make it easier for you to write a step-by-step description of your procedure. Remember to be creative in your experimental design. Good experiments have at least three trials.

7. Accuracy of Data – Your experiment should have an appropriate sample size and should have been repeated at least 3 times and the results averaged. You should have at least 10 in each group tested. If you are comparing acidic content of oranges, lemons, and limes, you need to have 10 of each fruit, and you would take 3 samples from each of the fruits (total of 30 samples). This gives you 3 trials and uses an adequate sample size.

8. Data/Statistics – Keep a logbook with dates, notes, observations and measured data. Check your math for any errors. You must have your data in tables. All labels should be in metric when appropriates **(NO ENGLISH UNITS OF MEASUREMENT) Helpful** website for converting English units to metric units: http://www.sciencemadesimple.net/conversions.html

You should construct a data table before you experiment so that you have a place to record your observations neatly.

Guidelines For Constructing a Data Table

1. Label each table with a number and title.
2. Include a column for each experimental and control group.
3. Each column should have a heading with metric units if appropriate.
4. All trials in each group should be shown.
5. The average of the trials in each group should be calculated.

Guidelines for Graphing

When choosing a graph, you must pick a graph appropriate for your data.

1. When comparing two sets of numeric data (2 sets of numbers), you should use a line graph to show the continuous change.
2. When comparing a set of numbers and a category, you should use a bar graph.
3. If you have two sets of non-numeric data, you should use a pictograph.
4. All labels on your graph should be metric when appropriate – distance, temperature, mass/weight, volume, etc.
5. All graphs should have a title that includes the independent and dependent variables used in the project.
6. The x-axis is the independent variable and the y-axis is the dependent variable.

9. Conclusion- Your conclusion should restate your hypothesis and then tell if the data collected in the experiment supports or rejects your hypothesis. A hypothesis will not be

proven, true, right or wrong. You need to use the terms supports or rejects. You should then explain your results including what you have learned and what scientific concepts can be applied your data. You should also discuss any new ideas you have to improve your project. Further, include any mistakes or mishaps during the experiment, errors in data collection, etc.

10. Presentation Characteristics- A good project will have a creative approach to the experiment. It will be attractive and neat. It should include photographs, diagrams, and/or drawings to explain procedures and data. It should also include a logbook. Double-check your project for correct spelling and grammar.

11. The Logbook- This is like a scrapbook of your entire project. Documents to include, but would not be limited to, the following: All of your original notes, rationale on your topic, pictures not included on the display showing the progress of the experiment, etc. Listed below is a suggested list of items that you might want to include. Ensure the logbook is titled the same as your display.

a. Cover – with project title
b. Table of contents listing each item and lettered tab.
c. Background report or research paper on the topic
d. Experiment – List procedures, safety precautions taken and materials. Pictures taken during the experiment that are not on the display board can be included here.
e. Data – Include your results from your observation and notes
f. Charts and Graphs of your data
g. Report – Addressing the problem statement and the conclusion
h. Required Forms for the fair
i. Miscellaneous – Receipts, etc.

Rationale
(Purpose/Problem)

Introduction

Hypothesis

Independent Variable

Dependent Variable

Constants

Control

Materials

TITLE

Photos

Data Table(s)

Graph(s)

Log Book
(clipped to board)

Procedure

Conclusion

Bibliography

Is My Project an Award Winning Science Fair Project?

Title:

1. Does the title include the independent and dependent variables?

Rationale (purpose/ problem):

1. Does it state the reason for doing the project?
2. Does it use statistics or real world examples?
3. Are the independent and dependent variables included?

Hypothesis:

1. Is the hypothesis written in an "If (IV)…., then (DV)…" format?
2. Does the hypothesis relate to the experiment?

Variables:

1. Are the variables clearly defined?
2. Are the constant variable identified?

Materials list

1. Materials used listed?
2. Did you use metric measurements for all values?

Procedure:

1. Are all steps of the experiment numbered sequentially?
2. Are the steps of the experiment logical and repeatable?

Accuracy of Data:

1. Did the experiment have an appropriate sample size?
2. Are there at least three trials of the experiment?

Data:

1. Was the appropriate type of graph used?
2. Were all graphs and charts labeled appropriately with metric units?
3. Is the graph and data table titled correctly? (The effect of the IV on the DV)
4. Is the X and Y axis labeled correctly. X= IV Y=DV
5. Do the measured values relate to the experiment?
6. Are all mathematical computations correct?

Conclusion:

1. Does the conclusion restate the hypothesis?
2. Did you use the terms “supports” or “rejects”?
3. Does the conclusion explain the results of the experiment in terms of scientific concepts?
4. Does the conclusion describe any errors in the experimental design or in the collection of data?

Presentation Characteristics:

1. Was the design of the experimental procedure creative?
2. Is the display neat and attractive?
3. Are there photographs, and diagrams?
4. Is the log book present and complete?
5. Are the spelling and grammar correct?

Use the links below for help with your bibliography

***TMS /TSM Library page - remember your citations must be APA format

R-3 Library website

Use the link below for your Science Fair Planner

***Remember to save as a copy and title it with your name

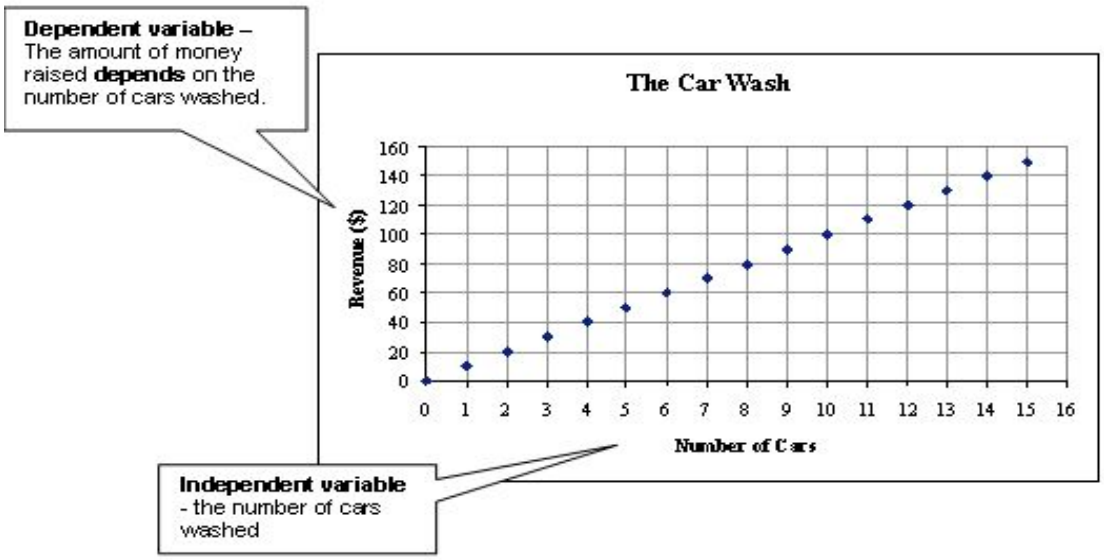
Middle School Science Fair Planner

Data Tables & Graph Examples

Titles: must be in the following format: The effect of (IV) on the (DV)

DATA CHART

What you will change **X** (Independent Variable)	What you watch change (Dependent Variable) Trial #1	Trial #2	Trial #3	What you graph **Y** Average
1.				
2.				
3.				
4.				
5.				



Bibliography Help

Your bibliography must be complete in the ***APA format.***

R - 3 Library Website

Internet Remember that every piece of information will not appear on every site every time. Do your best to locate the information, but if it is not there, you cannot cite it. Put as much information as you can. The most important information is the URL address and the date you were there!

Lincoln Co. R - 3 Middle School Science Fair Scoring Guide

Student Number: _____ **Total:** _____ / **115 Pts.**

Circle Category: Biology Consumer Science Earth and Environmental Physical Science

Points Awarded	Possible Points	Category	Descriptors
	5 4 3 2 1	Title	Contains independent and dependent variables
	5 4 3 2 1	Rationale (Board)	Purpose for doing project/what you hope to learn (Concise and reasonable with research)
	5 4 3 2 1	Hypothesis (Board)	Clear and correct/ MUST BE IN THIS FORMAT If (IV)Then (DV) statement
	3 2 1 2 1 2 1 3 2 1	Variables (Board) 10 pts	Independent variable listed and labeled correctly (3 pts) IV levels are indicated (time=every 30s for 5 min.) (2 pts) Dependent variable listed and labeled (2 pts) Constants described (3 required) (3 pts)
	5 4 3 2 1 5 4 3 2 1 5 4 3 2 1	Procedure (Board) 15 pts	Logical procedure for hypothesis (5 pts) Possible to follow (no ambiguity) (5 pts) Multiple trials – 3 minimum (5 pts)
	2 1 4 3 2 1 6 5 4 3 2 1 3 2 1	Data Table (Board) 15 pts	Title includes IV and DV (2 pts) IV and DV labeled with units (4 pts) Trials are labeled (6 pts) Mathematical computations are accurate /Logically arranged/easy to understand - Neat (3 pts)
	2 1 5 4 3 2 1 5 4 3 2 1 3 2 1	Graph (Board) 15 pts	Title includes IV and DV (2pts) Label for X axis is IV with units (5 pts) Label for Y axis is DV with units (5 pts) Appropriate type of graph -Reasonable scale - Size large enough to read - Accurate - Neat (3 pts)
	5 4 3 2 1 5 4 3 2 1 5 4 3 2 1	Log Book 15 pts	All parts of the experiment including detailed information on: Materials & Procedures - (5 pts) Data Tables & Graph (5 pts) Results (5 pts)
	2 1 3 2 1 5 4 3 2 1 5 4 3 2 1 5 4 3 2 1	Conclusion 20 pts	Restates purpose of hypothesis (2 pts) Includes major findings (3 pts) Using data to support or reject hypothesis (5 pts) Possible explanation of data (5 pts) Ideas for further improvements /study and is accurate (5 pts)
	5 4 3 2 1	Reference/ Bibliography	Present and appropriate
	5 4 3 2 1	Overall Proj.	Neat -Typed - Third Person -Few grammar or spelling errors

Missouri Tri-County Regional Science and Engineering Fair

Regional info for 6-8 grade Rules and Forms

This information will be shared as we receive notification from the Missouri Tri-County Regional Science and Engineering Fair (MTRSEF).
Eligibility
Schools in the counties of St. Charles, Lincoln and Warren

All students should participate in a local (school) qualifying fair prior to attending the MTRSEF regional fair.

Any student in grades K-8 is invited to have their project judged at the Missouri Tri-County Regional Science and Engineering Fair (MTRSEF) in one of four categories: Biology, Physical Science, Earth/Environmental or Applied Consumer Science. Students will be judged on creativity and scientific thought. Students in grades K-8th Grade will not be allowed to do vertebrate projects of any kind.
Due to the intense level of pre-approval required, students in grades K-8 are prohibited from performing research involving any vertebrates, including humans. This includes:

- Taking a person's fingerprints
- Conducting surveys
- Sports activities/exercise
- Video gaming
- Medical procedures
- Culturing bacteria from human/animal subjects
- Pets (including aquarium fish)

Awards
K-8 First through third place awards will be given in each grade level per category. (Applied Consumer Science, Biology, Physical Science, Earth and Environmental are the K-8 categories)

Display and Safety

Maximum Size of Project

Grades 5-12	60cm deep front to back
	56 cm side to side
	96cm table top to project top

Required to be displayed

- Photograph credits
- Log book
- Problem/Hypothesis
- Method
- Data
- Conclusion
- Bibliography

Not Allowed at Project

- Living organisms including plants
- Taxidermy specimens or parts
- Preserved vertebrate or invertebrate animals
- Human or animal food
- Human/ animal parts or body fluids
- Plant materials: living, dead or preserved **EXCEPTION**: wood as a construction material in project or display
- All chemicals including water
- All weapons- including lasers
- Dry ice
- Sharp items (needles, nails, syringes, pipettes, knives)
- Flames or highly flammable items
- Batteries with open top cells
- Awards from other competitions
- School name or identification
- Photographs with faces or showing organisms in unnatural states (necropsy, dissection)
- Glass or glass objects
- Any other apparatus that is deemed unsafe by the Science Fair Directors. **There will be no electricity provided at the fair.**

Judging Process

5th-12th grade students will have their projects evaluated using the scoring guide in this handbook. Students in grades 5th-12th **will not** get a feedback sheet because they are at a level in which they should already be able to apply the scientific method.

Judge Entry Review and Discussion/Interview

- Entries that require judge's interview will be notified at least 2 weeks before the competition.
- The judging review/interview time is scheduled for a minimum of 5 minutes and is typically about 10 minutes in duration.
- The interview gives the judges the opportunity to consider the depth of understanding by the entrant and clarify any information that is in question.
- After the interview period is complete, at any time prior to the awards ceremony, judges may revisit entries.

Photographs of method and data and charts and graphs are very valuable on the display!