

2019-2020 Science and Engineering Fair

Student Handouts

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WORK IN PROGRESS CHECKPOINTS

Student Name: _____

Please check off what you have completed so far for your science fair project.

1. Work In Progress Check #1 (pg. 5): **Due October 11, 2019**

MJHS only – due October 4, 2019

PROPOSAL:

_____ TOPIC*

_____ QUESTION

Teacher Signature: _____

_____ FOCUS OF RESEARCH

*The following projects need district preapproval before the student(s) begin their experiment: people as participants, including surveys and observations, microbiology (bacteria, etc.). Animal studies are not allowed.

2. Work In Progress Check #2 (pp. 6-9): **Due October 23, 2019**

RESEARCH SUMMARIES

_____ SOURCE 1

_____ SOURCE 2

Teacher Signature: _____

_____ SOURCE 3

_____ SYNTHESIS OF RESEARCH

3. Work In Progress Check #3 (pg. 10): **Due November 15, 2019**

_____ VARIABLES

_____ HYPOTHESIS

_____ MATERIAL LIST

Teacher Signature: _____

_____ PROCEDURES

4. Work In Progress Check #4 (pp. 11-12): **Due December 13, 2019**

_____ LOG BOOK/PROJECT CHECK Teacher Signature: _____

5. Work In Progress Check #5 (pg. 13): **Due January 10, 2020**

_____ DATA

_____ RESULTS

Teacher Signature: _____

_____ CONCLUSION

6. Science Fair Board (pp. 14-15): **Due January 24, 2020**

_____ BOARD

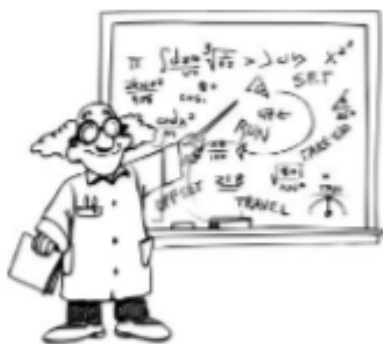
Teacher Signature: _____

_____ SCIENCE FAIR DISPLAY CHECKLIST

7. Abstract (pg. 17): **Due January 24, 2020**

_____ ABSTRACT

Teacher Signature: _____



Websites to Help With Science Fair Projects

Brainstorming a Topic

Science and Kids have topic ideas in biology, Earth science, physics, chemistry and much more.

<http://www.sciencekids.co.nz/projects.html>

Science Buddies allows you to browse over 1,000 ideas or allows you to take a survey to narrow down topics based on your interests. There are also tabs that give an explanation of the scientific process with detailed explanations of each step. There is even a tab for parents.

<http://www.sciencebuddies.org>

Science Made Simple.com is a website that takes you through the whole process of the science fair project from choosing the topic to making the board.

http://www.sciencemadesimple.com/science_fair_project.html

Science Fair Project Ideas

Education.com has pages and pages of possible experiment ideas for middle school students.

<http://www.education.com/science-fair/sixth-grade+seventh-grade+eighth-grade/>

Science Fair Projects World has topics categorized by subject i.e. biology, chemistry, physics, math, human body and technology.

<http://www.sciencefair-projects.org>

Science Fair Bob has ideas, experiments and research help.

<http://www.sciencebob.com/index.php>

Scientific Method

Science and Kids has an explanation of the scientific method.

<http://www.sciencekids.co.nz/projects/thescientificmethod.html>

Fact Monster has a detailed explanation of the scientific method as it relates to a science fair project.

<http://www.factmonster.com/cig/science-fair-projects/understanding-using-scientific-method.html>

ELEMENTARY SCHOOL IDEAS

- Does a person's heart rate change when listening to different types of music?
- Can girls or boys hear sound from the farthest away?
- Does sound travel better through solids, liquids, or gases?
- How much does the pitch of a vibrating rubber band change as it is stretched longer?
- How much sugar and salt can dissolve in water before it becomes supersaturated?
- How soluble are flour and baking soda compared to sugar and salt?
- Do materials mix more easily in tap water or bottled water?
- Do items float better on tap water or salt water?
- Are there any oils that allow color to be permanently mixed into them?
- Which type of paper is best to use when conducting a chromatography test?
- How does the amount of sugar in ice cream affect the formation of ice crystals?
- Which type of cat litter absorbs the most liquid?
- Does hot water freeze faster than cold water?
- Will salt, tap, or bottled water freeze faster?
- Do different liquids become the same size when they freeze?
- Do different colors of crayons melt at different temperatures?
- Do different liquids evaporate at the same rate?
- Does the thickness of a liquid affect its evaporation rate?
- Does the size and shape of a container affect evaporation rate?
- Do different liquids take different amounts of time to boil?
- How long does it take for a bathroom mirror to fog up using different temperatures of water?
- Does a balloon stay inflated longer in warm or cold air?
- Do soap bubbles last longer on warm or cold days?
- How much salt does it take to make an egg float?

SECONDARY SCHOOL IDEAS

- What household waste materials might be used to filter water? Examples of materials you might try would include banana peels and coffee grounds.
- Will the changing the temperature of onions, before cutting them, affect the amount of tears someone has when cutting the onion?
- What ratio of vinegar to baking soda produces the best chemical volcano eruption?
- What type of plastic wrap prevents evaporation the best?
- Does the presence of laundry detergent in water affect plant growth?
- How accurately do egg producers measure eggs?
- How do differences in surfaces affect the adhesion of tape?
- If you shake up different kinds or brands of soft drinks (e.g., carbonated), will they all spew the same amount?
- Does light affect the rate at which foods spoil?
- Do different brands of diapers absorb the same amount of liquid?
- Do different dish soaps produce the same amount of bubbles to clean the same number of dishes?
- How permanent are permanent markers? What solvents (e.g., water, alcohol, vinegar, or detergent solution) will remove the ink the best?
- How does the effectiveness of laundry detergent change if you use different amounts than the recommended amount?
- Do different types of hairsprays hold equally well?
- Do different types of hairspray hold equally as long?
- Does the type of hair affect how well hairspray works?
- How do different factors affect seed germination? Factors that you could test include the intensity, duration, or type of light, the temperature, the amount of water, the presence/absence of certain chemicals, or the presence/absence of soil. You can look at the percentage of seeds that germinate or the rate at which seeds germinate.
- What conditions affect the ripening of fruit (e.g. enclosing a fruit in a sealed bag, temperature, light, or nearness to another piece of fruit)?
- How are different soils affected by erosion? You can make your own wind or water and evaluate the effects on soil.
- How much is the interior of a car cooled if a light-blocking windshield cover is used? Do they work?
- How does temperature affect the rate of chemical changes that occur to open containers of juice over time?

PROPOSAL: TOPIC, RESEARCH QUESTION, AND FOCUS OF RESEARCH

Progress Check #1: Due October 11, 2019

Team members (if applicable):

MJHS only – due October 4, 2019

Circle one: INDIVIDUAL PROJECT TEAM PROJECT (2-3 students)*

*Students participating in a team project will work together during each step of the project; however, each student needs to complete his or her own papers in this science fair packet, including pages 5-13 and page 17. The team will submit one display board for the science fair.

I propose the following investigation or engineering project for my Science Fair Project

1. PROJECT TOPIC⁺

⁺The following projects need district preapproval before the student(s) begin their experiment: people as participants, including surveys and observations, microbiology (bacteria, etc.). Animal studies are not allowed.

2. RESEARCH QUESTION (What I want to find out)

3. FOCUS OF RESEARCH (books, websites, interviews – keep track of where you found info)

PARENT SIGNATURE: _____

STUDENT SIGNATURE: _____

RESEARCH SUMMARY #1

Progress Check #2: Due October 23, 2019

Resource #1

Type of resource: Check which type of resource you are using for resource #1, and fill in the information about the selected resource.

Book or article

- Author: _____
- Title: _____
- Publishing company: _____
- Location of publishing company: _____
- Date of publication: _____
- Pages used in the book: _____

Website

- Website URL (Write down what someone else could type in to find this webpage. Do not write the name of a search engine, such as Google or Wikipedia).

Interview

- Person: _____
- Date: _____
- Job title: _____

Summarize and paraphrase the information, in your own words, that you researched.

RESEARCH SUMMARY #2

Progress Check #2: Due October 23, 2019

Resource #2

Type of resource: Check which type of resource you are using for resource #2, and fill in the information about the selected resource.

Book or article

- Author: _____
- Title: _____
- Publishing company: _____
- Location of publishing company: _____
- Date of publication: _____
- Pages used in the book: _____

Website

- Website URL (Write down what someone else could type in to find this webpage. Do not write the name of a search engine, such as Google or Wikipedia).

Interview

- Person: _____
- Date: _____
- Job title: _____

Summarize and paraphrase the information, in your own words, that you researched.

RESEARCH SUMMARY #3

Progress Check #2: Due October 23, 2019

Resource #3

Type of resource: Check which type of resource you are using for resource #3, and fill in the information about the selected resource.

Book or article

- Author: _____
- Title: _____
- Publishing company: _____
- Location of publishing company: _____
- Date of publication: _____
- Pages used in the book: _____

Website

- Website URL (Write down what someone else could type in to find this webpage. Do not write the name of a search engine, such as Google or Wikipedia).

Interview

- Person: _____
- Date: _____
- Job title: _____

Summarize and paraphrase the information, in your own words, that you researched.

PARENT SIGNATURE: _____

STUDENT SIGNATURE: _____

VARIABLES, HYPOTHESIS, MATERIALS LIST, AND PROCEDURES

Progress Check #3: Due November 15, 2019

Variables

Dependent variable (what you will measure): _____

Independent variable (the ONE thing you will change): _____

Control variables (everything else you keep the same): _____

Hypothesis (what you think is going to happen):

Create a hypothesis statement for your experiment using the if, then format.
If _____ (CAUSE), then _____ (EFFECT)

A hypothesis is an estimate or "educated guess" for solving a problem based on facts, observations, and available data.

- Example Scenario: A student wants to see if the amount of sunlight affects the growth cycle of a pansy. The student places one pansy on a window sill (natural light) and another in the living room (only artificial light).
- Example Hypothesis: If a pansy is placed in natural light, then it will grow two inches higher than a pansy grown in the artificial light.

HYPOTHESIS FOR YOUR SCIENCE FAIR PROJECT:

MATERIALS:

- | | |
|----------|----------|
| 1) _____ | 5) _____ |
| 2) _____ | 6) _____ |
| 3) _____ | 7) _____ |
| 4) _____ | 8) _____ |

PROCEDURES*: (USE BACKSIDE IF NEEDED)

*Repeat the trial/experiment 3 times

- 1) _____
2) _____
3) _____
4) _____

PARENT SIGNATURE: _____

STUDENT SIGNATURE: _____

LOG BOOK/PROJECT CHECK

Progress Check #4: Due December 13, 2019

Your teacher will provide you details of what they want to see for this progress check, such as data you have collected, a written description of progress you have made on your project, or look at your log book.

Log Book

The **logbook** is a *crucial part of any research project*. It is a detailed account of every phase of your project, from the initial brainstorming to the final research report. The logbook is evidence that certain activities occurred at specific times and most importantly student understanding. The log book can be as formal as a composition journal, to bound papers. Following the pointers below will help keep you organized. It's a great opportunity to show off all of your hard work and impress the science fair judges!

- The first page of the log book must be the Title Page. It should contain the title of the project, the name of the student, the name of the teacher, and the name of the school.
- The second page will become the Table of Contents. Once the log book is finished the table of contents will list page numbers and what is found on each.
- Make logbook entries in pen, not in pencil; this is a permanent record of all of your activities associated with your project. When a mistake is made the error is marked out neatly (no whiteout).
- Organize your logbook. Make a table of contents, an index, and create tabs for different sections within your logbook. This helps keep you organized for different activities. For example, have a data collection section, a section with contacts, sources, etc. and a section of schedule deadlines.
- Always date every entry, just like a journal. Entries should be brief and concise. Full sentences are not required.
- Don't worry too much about neatness. Your logbook should be organized, but keep in mind that this is a personal record of your work. Think of the logbook as your "Diary" for the science fair. It's not just for recording data during the experimental phase of your project and it's not just for your teacher.

- The logbook should be used during all phases of your project for jotting down ideas or thoughts for a project, phone numbers, contacts or sources and prices of supplies, book references, diagrams, graphs, figures, charts, sketches, or calculations. Log entries should include your brainstorming, calculations, library/internet searches, phone calls, interviews, meetings with mentors or advisors, notes from tours of laboratories, research facilities and other related activities. Remember that it's documentation of your work.
- Use the logbook regularly and write down everything, even if it seems insignificant; it could later be extremely useful. For example, you may find yourself frantically searching for the title of a crucial reference the night before the fair. Make sure that you describe things completely, so that when you read your notes weeks or months later you will be able to accurately reconstruct your thoughts and your work.
- Glue, staple or tape any loose papers into your logbook, such as photocopies of important items. Loose papers look messy and tend to fall out and go missing. If you have several pages to include you may want to download and print off your own version of the logbook and organize all of these pages into a binder along with your own table of contents.
- Include a reflections section in your logbook. For example, what, if anything would I do differently next time? What part of the experiment could be changed to improve the experimental procedure?
- Always include any changes made to procedures, as well as mishaps, failures, or mistakes. As human beings, all of us make mistakes! (e.g. "1/4/05 my cat, Sheba scratched the pots of soil, and ate 4 of my 12 plants. I will have to replant everything! I need to protect my plants from the silly cat. Maybe I should try putting a screen around the pots or keep the cat outside!")
- Include any and all observations made during your experiment. In other words, record ALL data directly in your logbook. If this is not possible, then staple photocopies of data in the logbook.

DATA, RESULTS, AND CONCLUSIONS

Progress Check #5: Due January 10, 2020

Data (Visual representation about what happened)

Turn in your tables, graphs, and/or charts with this paper. How are you going to organize or represent your data? Check all that apply.

- Data table (organizes data)
- Line graph with one line (shows changes over time)
- Line graph with more than one line (compares change over time for more than one object)
- Bar graph (comparisons)
- Pie chart (good to show percentages)
- Scatter plots aka dot plots
- Other: _____

Results (Written explanation about what happened, and describes the data)

Conclusion (Briefly answer the research question, state if the hypothesis was supported or not supported, why the project turned out the way it did, and make suggestions for further research)

PARENT SIGNATURE: _____

STUDENT SIGNATURE: _____

SCIENCE FAIR DISPLAY BOARD

Due: January 24, 2020

- Title: short, catchy, related to the topic and results of the experiment
- Photographs: pictures from conducting your project to help support the data and results
 - A picture of the student in his or her own project is allowable.
 - If there is a picture of a student in a project that advances to the regional fair in Kilgore, then a photograph release form will need to be signed by the student and his or her parents or guardians.
- Research Question or Problem: this can be asked as a question or a problem statement
- Hypothesis: the predicted answer to the question/problem asked with a reason
- Materials: a list of the supplies, equipment to be used
- Procedure: a list of the steps followed to perform the experiment
- Data: displayed in table and/or graph form to include data analysis (mean, medium, mode, range) and accompanied by a written explanation (results)
- Results: What happened – write about the data
- Conclusion: briefly answers the question asked in the beginning; states the hypothesis that was supported or not supported, why the project turned out the way it did, and makes suggestions for further research
- Application: describe how the results from your project can be applied to daily life, and how these findings are useful

INTRODUCTION 	TITLE (OR RESEARCH QUESTION)	PROCEDURE
PROBLEM 	PHOTOGRAPHS 	
HYPOTHESIS 	DATA 	CONCLUSION
MATERIALS 	RESULTS 	APPLICATION

SCIENCE FAIR DISPLAY CHECKLIST

Due: January 24, 2020

Look at the following checklist before, during, and after creating your display board. Add or revise any areas that you did not check off as being complete. After you have made any changes to your board, have your parent complete the checklist as a final review of your work before turning it in at school.

Review

- Overall appearance is neat and attractive.
- All necessary parts are included and labeled (Question, Prediction, Materials, Procedure, Results, Conclusion, and Application).
- My display board has a short and catchy title.
- All of the words on my display board are spelled correctly.
- There is proper grammar and punctuation.
- My procedures are written in a clear, sequential order.
- My procedure shows that I conducted repeated trials (at least 3).
- I have identified my independent, dependent, and control variables.
- All necessary parts are included on my data tables, graphs, and/or charts (title, labels, and units) and it is neatly drawn and filled in with appropriate data.
- I have the correct type of graph that displays my data from my chart and the graph includes all the necessary parts (title, axes, increments, labels, and scale). A key is present if necessary.
- I included a written explanation of my chart, graph and any other observations I made.
- My conclusion includes the answer to the original question, accuracy of my prediction, what I learned supported with data, any problems, and real world applications.
- My research paper follows the guidelines listed in the journal.

TIPS FOR CREATING OUTSTANDING DISPLAYS

Neatness:

- Avoid frayed or ripped edges of paper, glue globs, lots of cross outs or white outs, etc.
- Writing should be neat and legible.
 - If you choose to use a computer or typewriter, stick to one or two fonts to type your work. Too many fonts can be distracting and difficult to read.
 - If you are handwriting the information, be extra careful to write so it can easily be read by others. Pen is easier to read than pencil. Messy or illegible writing can really lower your score.
- Use colors to attract attention, but do not overdo it!
- Frame or matte your work - Use construction paper or other colored materials to provide a background for your written work and labels (construction paper, wrapping paper, old wall paper, contact paper, etc.).

Title:

- Short and catchy
- Related to the project idea
- Example: Color of Cool Cubes instead of The Melting Rate of the Different Colors of Ice Cubes

Practice the layout:

Before you begin gluing things down, practice moving the parts of the display around until they are evenly spaced and centered. Crowding together or large gaps can take away from your project's appeal. Trying to rip off or move things once they are glued down can be messy and often ruins the paper or display board.

Materials:

Don't glue on materials from your project. For example, don't glue on food items such as M & M's, popcorn, or moldy bread to the board. Food products attract bugs, so do their wrappers. Don't place samples of chemicals or their containers on the board. This includes household items such as vinegar, dish soap, oil, etc.

Photos, drawings, and diagrams:

Take photos or draw pictures and diagrams for the display. This will help you to avoid attaching materials from your experiment to your display. Inappropriate materials will be removed from the board before allowing it to be displayed in the fair.

Research and Abstract:

Research reports and abstracts are placed in front of the display board instead of attaching it to the board.

THE ABSTRACT

Due: January 24, 2020

An abstract is an abbreviated version of your science fair project final report. The science fair project abstract appears at the beginning of the report as well as beside your display board.

Include the following five pieces in 250 words or less:

- **Purpose:** Describe the purpose for doing your science fair project. Why should anyone care about the work you did? You have to tell them why. Did you explain something that should cause people to change the way they go about their daily business?
- **Problem Statement or Research Question:** Identify the problem you solved or the hypothesis you investigated.
- **Procedures:** What was your approach for investigating the problem? Don't go into detail about materials unless they were critical to your success. Do describe the most important variables if you have room.
- **Results:** What answer did you obtain? Be specific and use numbers to describe your results. Do not use vague terms like "most" or "some".
- **Conclusions:** State what your science fair project or invention contributes to the area you worked in. Did you meet your objectives?

MISD Science Fair Judging Rubric

Title of project:
Project number:
Judge:

Circle the number of points for each section of the Likert Scale judging rubric.

	Nonexistent	Vague	Satisfactory	Good	Exceptional
Research Question or Purpose	0	3	6	9	12
★ Focused					
★ Testable					
Hypothesis	0	3	6	9	12
★ Student made a specific prediction					
★ Based on the research question or purpose					
Design and Methodology	0	4	8	12	16
★ List of materials					
★ Step by step procedures					
★ Thorough					
Data	0	4	8	12	16
★ Student collected data					
★ Data displayed in a table and/or graph					
★ Written explanation of data					
Conclusion	0	4	8	12	16
★ Answers research question					
★ States if hypothesis was supported or not					
★ Interprets the results of the experiment					
Creativity	0	4	8	12	16
★ Demonstrates creativity in one or more area above					
Poster	0	3	6	9	12
★ Logical organization of materials					
★ Clarity of images: tables, graphics, pictures					
★ Neatness					

Total points: _____