STEM FAIR 2019

6th Grade

Information Packet for

Ms. Brown's Science Students

Name: _____ **Class:** _____

Project Ideas (Write in Question Form):

1. _____
2. _____
3. _____

Final Project Choice:

Question:

_____

Hypothesis:

_____

_____

_____

_____

_____

Turn in the following on Tuesday, February 12, 2019:

- ☐ Display Board
- ☐ Lab Report (2 copies)
- ☐ Oral Presentation

STEM Fair 2019 Important Dates for 6th Graders

Friday, January 4th

- Science Fair Proposal Form Due to teacher for Review
  - Before this day: Begin brainstorming and researching a topic you are interested in.
  - Speak to your parents/guardians about the materials necessary.
  - If you have MI scores in any standard, talk to your teacher to determine what types of projects you can use to help bring up that grade.

Monday, January 7th

- If you have not done so already, begin gathering materials, test subjects, etc.
  - On this day: Teacher will provide feedback on your proposal. As soon as your idea is approved, begin experimenting, etc.
  - Remember, if you are using human test subjects, get their approval first!

Thursday, January 31st

- Rough draft of lab report due in class
- Continue collecting data if necessary. Start editing your lab report and begin planning your display and presentation.

Tuesday, February 12th

- <u>Final Projects due!</u>
- **What to turn in:**
  - **Final draft of your lab report (2 copies)**
  - **Your completed display board**
  - **Your presentation.**

Note: You will give a presentation in class. The top 6th graders will present to the science fair judges on Feb. 21st Winners will continue to the District STEM Fair at Discovery World on April 4th!

A Beginner's Guide to Creating a Science Fair Project

WHAT IS A SCIENCE FAIR PROJECT?

- A science fair project is a hands-on, research based, scientific inquiry experiment.
- The project must use the scientific method to test a hypothesis using an experiment.
- A science fair project IS NOT only a display of scientific knowledge the student has learned but is instead a demonstration of mastery of scientific skills like designing an experiment and writing a lab report.

HOW DO I DEVELOP IDEAS FOR A PROJECT?

- A student's project should be guided by an original question. The student must be able to answer the question using an experiment.
    - Examples: "How does temperature affect the rate that seeds sprout?" or "What percent of an orange is water?"
- The question can address any scientific topic the student chooses (engineering, biology, physics, chemistry, etc.). Be sure to consider time-constraints and grade level appropriateness when designing an experiment.
- Refrain from pseudo-projects which are simply reports of scientific information or models of scientific phenomena, not experiments.
- There are many resources available that can help you come up with ideas including books and the internet. Some examples are listed below and additional resources can be found through a simple trip to your local library or an online search.

ARE THERE ANY GUIDELINES OR RESTRICTIONS?

- Experiments requiring human test subjects require permission from the test subjects (or their guardians) before testing can begin.
- Testing on animals may not cause physical or psychological damage to the organism. Animals must be treated in a humane matter at all times.
- No hazardous or controlled substances should be used in the experiment. Avoid dangerous materials such as explosives, open flames, and harsh chemicals and addictive substances such as tobacco and alcohol.
- During presentations, the following items may not be brought to school:
    - Heat sources (hot plates, lighters, Bunsen burners, etc.)
    - Dangerous or caustic chemicals
    - Mold, Fungi, and/or Microbial Cultures
    - Live or preserved vertebrate or invertebrate animals

- ❖ If these items are used in an experiment, please take pictures/videos of these items to clearly communicate experimental data and results.

WHERE DO I START?

- If you're having trouble thinking of a topic, browse the internet for science fair ideas:
  - **http://www.all-science-fair-projects.com/**
  - **http://www.sciencebuddies.org/**
  - **http://www.sciencefairadventure.com/**
  - **http://www.education.com/science-fair/**
  - **http://www.sciencebob.com/index.php**

OR

- Check out books from your local library:
  - *100 Amazing Make-It-Yourself Science Fair Projects* / Glen Vecchione.
  - *The Complete Handbook Of Science Fair Projects* / Julianne Blair Bochinski
  - *Quick-But-Great Science Fair Projects* / Shar Levine and Leslie Johnstone
  - *Sure-to-win science fair projects* / Joe Rhatigan with Heather Smith.

WHAT ELSE DO I NEED TO PARTICIPATE IN THE FAIR?

- Write a lab report detailing your experiment.
- Create a Display Board to show off all of your hard work!
- Be prepared to present.
- Review the judging rubric.
- HAVE FUN!

If you have any questions or concerns regarding the STEM fair process, please feel free to contact me at brownj3@milwaukee.k12.wi.us. Additional resources can also be found on the Science Fair page of my website (www.msbrownteaches6.weebly.com).

Thanks!
Ms. Bolling-Brown

The Scientific Method

Question/ Problem

- Think of a scientific question you would like to answer or problem you would like to solve.

Hypothesis

- What do you think the answer or solution might be?
- Your "guess" should be based on prior knowledge. Research your topic BEFORE you develop a hypothesis.

Plan an Experiment

- How will you find out if your hypothesis is correct?
- Develop procedures and carry out an experiment.
- List the materials you will need.
- Be sure to consider variables and controls.

Data/Results

- Report what happened during your experiment.
- Organize your data in charts, diagrams, and other easy to read formats.
- Account for variances.

Conclusion

- Draw conclusions based on your results.
- Why do you think things turned out the way they did?
- Was your hypothesis correct or incorrect? Why might this be? What scientific phenomena mught be responsible for your results? What about human error?

Extension

- Can the experimented be repeated with similar results?
- What could you change to make your experiment better or the results clearer?
- Think of ways to take your experiment a step further
- What other related questions/problems can you address?

Ms. Brown-February 2013

How to Write a Lab Report

General Guidelines:

- Remember, a lab report is a formal academic document. The font, formatting, and presentation should represent your most professional work.

- Always use a traditional font. Size 12, Times New Roman font is universally accepted for all formal academic documents. Print in black ink and only use color to emphasize important information such as differentiating between variables in a graph.

- Include all steps of the Scientific Method. Be detailed in explaining each part (*How* did you develop your hypothesis? *Why* did you choose the variables you've selected?).

- Be clear and specific in your word choice. Use scientific vocabulary. Avoid the use of pronouns, especially without antecedents.

- Include a coversheet with the following information:

Title of Project:

Research Question

Student Name

Grade/Class

School

City and State

Date(s) of Experiment

- Add additional information as an appendix to the report (an attachment at the end of the document).

- Use the attached template as a guide.

Title of Lab

(Title can be creative but should relate directly to the experiment)

Question: *(What scientific question is the experiment attempting to answer?)*

_____

_____

Hypothesis: *(Include and educated guess in "If...Then...Because..." format.)*

_____

_____

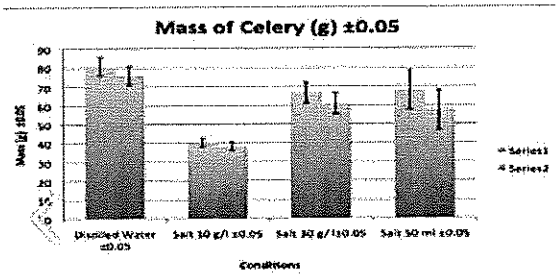
Materials: *(Make a bulleted list of ALL materials used, including quantities. It is a good idea to list materials in the order they are used during the experiment.)*

- Be sure to include quantities.
- For example, don't write, "Water"
- Write "1 cup of water" instead.
- If your list is long, use the *column* feature.
- This will help your list fit neatly on the page.

Procedure: *(Create a numbered list of all steps taken during the experiment.)*

1. "Gather Materials," is an excellent first step.
2. Be sure your list is detailed and all steps are in the correct order.
3. A reader should be able to re-create your experiment exactly following the steps you have written.
4. Try to avoid personal pronouns (Ex. "I poured 1 cup of water into a large bowl" becomes "Pour 1 cup of water into a large bowl).
5. "Clean up" is a good last step.

Data and Results: *(Record all observations and data collected in easy to read formats such as tables, charts, and graphs)*



Conclusion: (*Use paragraphs to analyze data and apply results to the real world.)*

_____

_____

Ms. Brown's Tips for Writing a Great Lab Report!

Be sure the **QUESTION**:

- ☐ Cannot be answered with a "yes" or "no."
- ☐ Does not use personal pronouns.
- ☐ Can be researched through experimentation.

Check that the **HYPOTHESIS:**

- ☐ Answers the question with a researched-based educated guess.
- ☐ Explains *why* you're making this prediction.
- ☐ Uses *"If...Then...Because..."* format.

Make sure the list of **MATERIALS:**

- ☐ Includes quantities.
- ☐ Is written as a bulleted list.
- ☐ Fits neatly on the page (write the list in multiple columns if there are more than 6 items).

Ensure the **PROCEDURE:**

- ☐ Is detailed enough for your experiment to be duplicated.
- ☐ Includes all steps in the correct order.
- ☐ Is written as a numbered list.

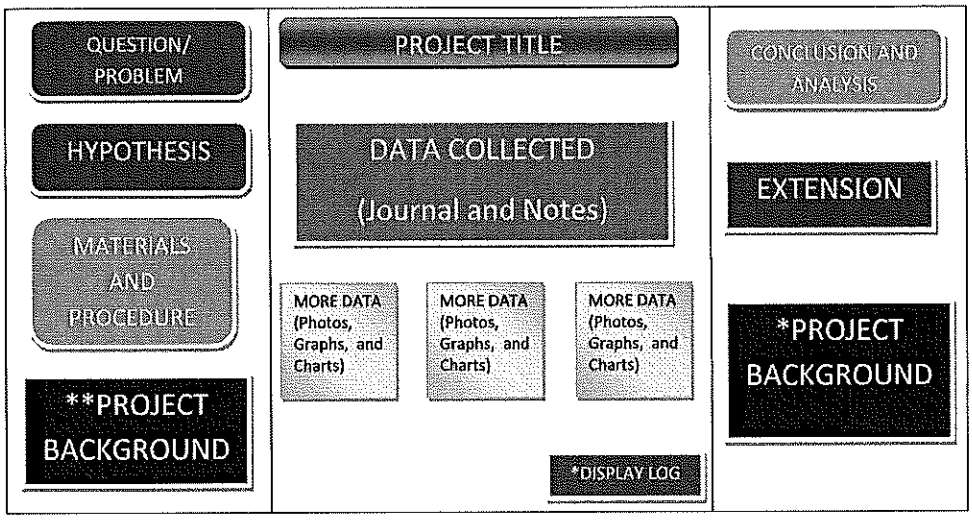
The **DATA AND RESULTS** should:

- ☐ Include all pertinent observations.
- ☐ Be written in easy to read formats such as tables, graphs, and charts.
  - All tables, graphs, and charts should have:
    - A title
    - Labels for columns, rows, axis, etc.
    - Even intervals on graphs
    - Units of measure (seconds, cm, etc.)
- ☐ Include pictures with captions, especially if your materials cannot be brought to class.

A good **CONCLUSION**:

- ☐ Uses the BAM to recap the question and hypothesis.
- ☐ Tells if the data supported or disproved the hypothesis.
- ☐ Refers to specific observations/data to support claims
- ☐ Explains how the experiment may have produced data that was incorrect (sources of error).
- ☐ Describes how information learned during the experiment can be applied to the real world.
- ☐ Lists lingering questions about the topic OR information you would like to learn more about and why.

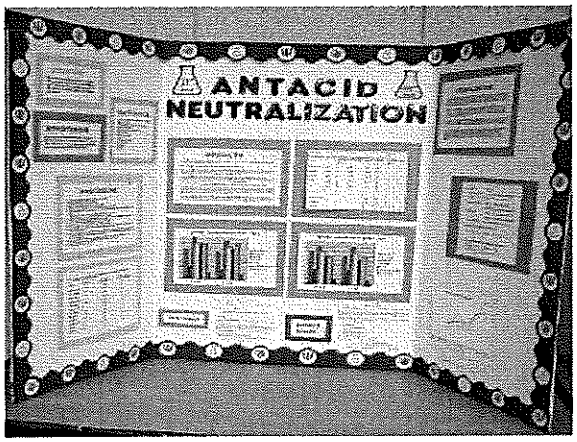
SAMPLE SCIENCE FAIR DISPLAY BOARD



**Project background includes reasons why you selected this project, research, and bibliography.

*Leave a small amount of space for the display log (about the size of an index card)

OTHER STUDENT'S WORK



Above: image courtesy of http://www.biologyjunction.com/diplay_board.htm

Remember, any images or diagrams on our display should be directly related to your project.

Try to use eye-catching colors and create visual interest BUT, remember to include all the necessary scientific information as well.

Check out http://www.biologyjunction.com/diplay_board.htm for more great info about science fair displays!

Lab Report Scoring Rubric

Component	Exceptional Quality(4)	Acceptable (3)	Progressing (2)	Unacceptable (1) Missing (0)
Identifying Info				
Title	Title is descriptive and representative of the purpose, clearly incorporates the experiments variables.	Title gives a general description of the purpose of the experiment. The topic is clear from the title	The title is creative but gives little to no insight into the purpose of the experiment	The title is either erroneous, irrelevant, or missing.
Question	The question is clearly identified and stated using appropriate academic vocabulary. The question is open – ended and requires an experiment.	The question partially identifies the purpose of the experiment. It may lack appropriate vocabulary or be vague in its description.	The question is not open-ended and can be answered with a yes or no. It does not require experimentation to find an answer.	The question does not apply to the lab. It is either erroneous, irrelevant, or missing.
Hypothesis	The hypothesis shows a clear relationship between the variables and the predicted results. The hypothesis is thoroughly explained using research or background knowledge.	The prediction is clear and reasonable based on the background knowledge the student has acquired through class but gives little to no explanation.	The stated hypothesis indicates flawed logic about the relationship between the variables and predicted results.	The hypothesis stated is either erroneous, irrelevant, or missing.
Materials	All materials and quantities are clearly and accurately listed.	All materials are listed but the list lacks quantities and attention to detail.	Most materials are listed. Some are missing	Materials list includes items that are either erroneous or irrelevant. OR list is missing.
Procedure	Procedures are listed in clear steps; each step is numbered and in a complete sentence; the experiment could be easily replicated based on the procedures provided	Procedures are listed, but seem to be missing some information that would allow one to successfully replicate the experiment.	Procedures do not accurately list the steps of the experiment. some steps are not numbered and/or are in incomplete sentences	Procedure is either erroneous, irrelevant, or missing.
Data	Professional looking and accurate representation of the data in tables, graphs, and written form; graphs and tables are appropriately labeled and titled	Accurate representation of the data in two of the three possible forms (written, graphs, tables); graphs or tables are not appropriately labeled and titled; "something is missing"	Data are inaccurate and/or represented in only one of the three possible forms (written, graph, tables); "a lot is missing"	Data included is either erroneous, irrelevant, or missing.
Conclusion	Conclusion includes ALL necessary components: summary of the experiment claims with supporting evidence, whether the findings support or refute the hypothesis, sources or error, and what was leaned from the experiment. Conclusion includes proper use of academic vocabulary and student attempts to extend their thinking including questions they still have.	Conclusion includes a general overview of the experiment and what was learned from the experiment; 1 -2 components are missing	Conclusion shows little effort and reflection. 3 or more components are missing.	Conclusion has info that is either erroneous, irrelevant, or missing over half of the necessary components/

Point Totals:

AD—24-28 pts

PR—18-23 pts

BA—10-17 pts

MI— 1-9 pts

These rubrics will be used to assess STEM Fair projects. Full sized copies of these rubrics can be found on the science fair page of msbrownteaches6.weebly.com.

Science Fair Project Score Sheet – Scientific Practices

Student: _____ Project: _____ Grade: ____ Class: ____

Scientific Practice	Advanced	Proficient	Basic	Minimal	N/A
Asking Questions/ Defining Problems	Question arises from examining models or a theory and aims to clarify and/or seek additional information about phenomena	Question Seeks to determine relationships between independent and dependent variables	Question can be investigated and used to predict reasonable outcomes based on patterns such as cause and effect relationships.	Question builds on prior experiences and progresses to a descriptive idea that can be tested.	N/A
Developing and Using Models	Develop and/or use multiple types of models to provide mechanistic accounts and/or predict phenomena, and move flexibly between model types based on merits and limitations.	Develop and/or use a model to predict and/or describe phenomena. Develop and/or use a model to generate data to test ideas about phenomena in natural or designed systems.	Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.	Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).	N/A
Planning and Carrying Out Investigations	Plan an investigation or test a design individually to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled.	Plan an investigation individually and, in the design, identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.	Plan and conduct an investigation to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered	Plan and conduct an investigation (independently or with assistance) to produce data to serve as the basis for evidence to answer a question.	N/A
Analyzing and Interpreting Data	Consider limitations of data analysis (e.g., measurement error, sample selection) when analyzing and interpreting data. ☒ Compare and contrast various types of data sets (e.g., self-generated, archival) to examine consistency of measurements and observations	Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships. Distinguish between causal and correlational relationships in data. Analyze and interpret data to provide evidence for phenomena.	Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.	Compare predictions (based on prior experiences) to what occurred (observable events).	N/A
Using Mathematical and	Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to	Use mathematical representations to describe and/or support scientific conclusions and design	Decide if qualitative or quantitative data are best to determine whether a	Decide when to use qualitative vs. quantitative data. Use counting and	N/A
Computational Thinking	describe and/or support claims and/or explanations. Apply techniques of algebra and functions to represent and solve scientific and engineering problems.	solutions. Apply mathematical concepts and/or processes (e.g., ratio, rate, percent, basic operations, simple algebra) to scientific and engineering questions and problems	proposed object or tool meets criteria for success. Describe, measure, estimate, and/or graph quantities (e.g., area, volume, weight, time) to address scientific and engineering questions and problems.	numbers to identify and describe patterns in the natural and designed world(s).	
Constructing Explanations and Designing Solutions	Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.	Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.	Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.	Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.	N/A
Engaging in Argument from Evidence	Respectfully provide and/or receive critiques on scientific arguments by probing reasoning and evidence, challenging ideas and conclusions, responding thoughtfully to diverse perspectives, and determining additional information required to resolve contradictions. ☒ Construct, use, and/or present an oral and written argument or counter-arguments based on data and evidence.	Respectfully provide and receive critiques about one's explanations, procedures, models, and questions by citing relevant evidence and posing and responding to questions that elicit pertinent elaboration and detail. ☒ Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	Construct and/or support an argument with evidence, data, and/or a model. ☒ Use data to evaluate claims about cause and effect.	Construct an argument with evidence to support a claim. ☒ Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.	N/A
Obtaining, Evaluating, and Communicating Information	Communicate scientific and/or technical information or ideas (e.g. about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically).	Evaluate data, hypotheses, and/or conclusions in scientific and technical texts in light of competing information or accounts. ☒ Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.	Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.	Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.	N/A

Science Fair Score Sheet

Oral Presentation/Display Board

Name: _____ Class: ____

Title of Project: _____

Category	Rating	Comments/Suggestions
Title and subtitles are prominently displayed and clearly convey the thesis/hypothesis and subject of the experiment.	4 3 2 1	
The display is organized into subtopics and the starting and stopping points are easy to identify. It is neat, creative and visually appealing.	4 3 2 1	
Clear, concise captions and/or other text are used to explain pictures, charts, graphs, or other visuals.	4 3 2 1	
Presentation is well planned, organized, and coherent.	4 3 2 1	
The significance of the topic is clearly explained and conclusion gives scientific reasons for results.	4 3 2 1	
Provided in depth coverage of the topic but stayed within the allotted 6 minute time frame.	4 3 2 1	

AD: 21+ PR: 15-20 BA: 10-14 MI: ≤13

STEM FAIR

Science Fair Project

Judge No. _____
Project No. _____
Grade _____

Display/Creativity (20 points)	5	4	3	2	1	0
The problem is original or is a unique approach to an old problem (considering student's grade level)						
Scientific criteria displayed (problem, hypothesis, experiment, data collection, results, conclusion, new problem)						
Visual representation of data (model, graph, colors, designs, etc.)						
Student communicates knowledge of topic and understands that unanswered questions remain						
Scientific Thought (30 points)	**5**	**4**	**3**	**2**	**1**	**0**
Hypothesis is clearly stated						
Project shows depth of study and effort						
Project exhibits orderly recording and analysis of data and the inclusion of a log book						
Sampling techniques and data collection are appropriate for the problem						
Scientific procedures are logical, complete and organized						
Conclusions formulated are logical, supported by the data collected and refer to the hypothesis and its relationship to the conclusion. Questions arising from the analysis of the investigation as well as errors made and suggestions for improvement of the project are included.						
Total number of points per column						

Grand Total: _____

A total of 50 points are possible.

Comments: _____

Science Fair Proposal Form

1st Choice

Proposed Project Title:

_____

_____

Research Question:

_____

_____

_____

List ALL materials required for this experiment:

Do you have access to all of these supplies? _____

Possible Variables			
Independent Variable:	**Dependent Variable(s)**	**Constants:**	**Controls:**

Length of Experiment (How long will it take you to complete this experiment?)

_____

Parent/Guardian Approval:
I have discussed this idea with my 6th grader and approve of the experiment they have selected. I also agree to provide all needed supplies for this project.

Parent/Guardian Signature: _____ **Date:** _____

Science Fair Proposal Form

2nd Choice:

Proposed Project Title:

_____

_____

Research Question:

_____

_____

_____

List ALL materials required for this experiment:

Do you have access to all of these supplies? _____

Possible Variables			
Independent Variable:	**Dependent Variable(s)**	**Constants:**	**Controls:**

Length of Experiment (How long will it take you to complete this experiment?)

_____

Parent/Guardian Approval:
I have discussed this idea with my 6th grader and approve of the experiment they have selected. I also agree to provide all needed supplies for this project.

Parent/Guardian Signature: _____ **Date:** _____