

6th Grade Science Fair Project Guide



Name: _____

Class: _____

Mission Statement:

“The Georgia Science and Engineering Fair (GSEF) is dedicated to encouraging all Georgia's teachers and school districts to incorporate active science and engineering research into their classrooms in order to help students 1) develop a love for science, 2) learn to isolate important problems and to attack and solve these problems within the framework of organized, logical thought, careful research, and a detailed analysis of facts, and 3) showcase and celebrate their achievements.”



6th GRADE SCIENCE FAIR GUIDE

Dear Parents and Students,

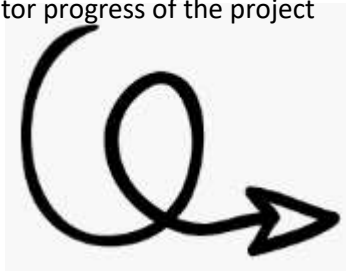
6th grade MERIT science is taught as an inquiry based hands-on approach to learning that aims to tie the classroom to real world problems. This is accomplished by participation in Science Fair, which is a requirement for ALL 6th grade MERIT students per a district directive. We encourage students to explore an area of science of their interest and we expect them to become an EXPERT in that topic of their choice.

There are multiple components completed during Science Fair through the months of August and concluding mid-November. Each student will document these components in a composition notebook called their log book, along with online documents created within their school created google drive. Throughout each component students are instructed by Mrs. Sturrup in class, while at-home participation occurs as well.

All project topics must reflect rigor and approval by Mrs. Sturrup. If a project has been carried out dozens of times before, it is not going to meet the rigor requirement. Topics from the Science Buddies website are generally frowned upon for this reason. If you find a project with step by step procedures already written out for you, the project will not meet the rigor requirement. With that said, students are encouraged to choose a topic that they are actually interested in. This helps make the experience more enjoyable for the student and facilitates in the learning process.

What is the role of the parent?

- Provide support, time and motivation for your child
- Insure your child understands the time involved and materials needed to complete the project
- Encourage your child to communicate difficulties with Mrs. Sturrup
- Help monitor progress of the project



What is the role of the teacher?

- Help students select a project that includes rigor
- Monitor the completion of appropriate assignments & forms
- In class instruction to complete science fair assignments
- Provide feedback during the project

What 'am I turning in?

- Completed handwritten logbook
- Topic form
- Typed background research report
- Hypothesis form
- Typed materials list & procedure
- Digital graphs/tables
- Typed conclusion
- Typed research plan
- Backboard display

Important Info

Daily, summative and formative grades are collected for most assignments related to science fair.

Students may not change topics during the middle of a project, doing so may negatively impact their grade!

This is a culminating project, so try your best to meet each due date. No procrastination.

Have fun! Do your best & always remember Mrs. Sturrup is here to help!

Science Fair Timeline

Assignment	Due Date	Grading Policy
Topic Forms	August 20th	Daily
Logbook Check 1 & Purpose Statement	August 29th	Daily
Begin Research		
Background Research & Hypothesis	Sept. 13th	Formative
Materials & Procedure	Sept. 19th	Daily
Begin Experiments	Sept. 19th - Fall Break	
Research Plan	Oct. 3rd	Summative
Science Fair Forms	Oct. 17th	n/a
Logbook Check 2	Oct. 31st	Daily
Graphs/Tables/Conclusions	Nov. 7th	Formative
Science Fair Completed	Nov. 14th	
Research Report, Logbook & Backboard Due	Nov. 14th	Summative
School-wide competition in library	Dec. 5th	n/a

*Dates are subject to change.

Frequently Asked Questions

Where do I keep my work? Students will set up a google drive folder labeled - 2019 Science Fair. This folder will hold all documents for their individual science fair project. It is accessible through their school google account/email.

How do I know what to do? Mrs. Sturup will walk-through and hold instructional time in class in order to explain each assignment. The timeline with due dates along with examples, rubrics, and forms are all given to students and available electronically through google classroom or on her teacher webpage as well.

Do I actually conduct an experiment? Yes! When choosing a topic make sure it's achievable as far as time, materials and accessibility for you and your family life. You'll be conducting a test at home, so if you don't have access to the materials needed to test, then this experience will not work out. Plan time wisely!

How do I turn in assignments? Most assignments related to science fair, like the background research report, are submitted online through google classroom. Others are found in this packet, which will be turned in to Mrs. Sturup.

When do I work on science fair? Class time is given to students, but home time will be needed as well.

How long does science fair last? We kick-off August 12th and the final assignments are due November 14th.

Where do I buy a backboard display? A tri-fold backboard will be given to all students at a future date. This trifold display board is **NOT** the project. The display board is a summary of the project. A list of requirements and layout is given within this guide. Examples are also displayed within the classroom. Tri-fold displays are mostly completed at home with your personal supplies.

Will this project count towards the academic competition requirement of MERIT? Yes! This project counts **only** if the student in question passes with a 70% or above.

How can I get in touch with Mrs. Sturup? Email, google classroom, and remind are key communication practices.

Be creative and have fun! This experience is to create life-long scientists! **Enjoy! Explore! Engage!**

Contact Info



Mrs. Samantha Sturup
sslurup@tcjackets.net



229.225.4394

Notice! Science fair projects coincide with our required state science standards. We will complete the fair in addition to studying Earth & Space science curriculum.

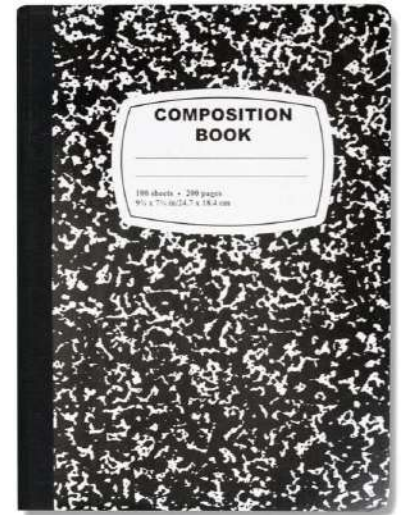
Science Fair *quick* Outline

This page provides a very brief overview of the process that is followed to complete our 6th grade science fair. It also describes some main assignments and tasks.

- **Choose a general topic and/or problem.**
- **Brainstorm within your logbooks about said topic.**
- **Narrow topic down to a specific research question about your broad topic.**
- **Investigate this question in order to create a background research report.**
- **Research, research and research that topic! This will turn into a formal background research report.**
- **Become an expert on this question/specific topic.**
- **Based on your research develop a hypothesis. This is an educated answer to your research question.**
- **Create a test for your hypothesis.**
- **List materials and step-by-step instructions to conduct an experiment.**
- **Now it's time to test! Gather data and make observations while the hypothesis is tested.**
- **Develop a conclusion. Based on your test; evaluate whether or not data collected supports or rejects the stated hypothesis.**
- **Share each step within our tri-fold display and present to class.**
- **During this entire processes students will record information into their logbook and typed google documents.**

Logbook Information

Each student needs a composition notebook. This serves as your scientific journal to record each step of the scientific method as you complete your project.



- Black or blue ink only
- Never tear out pages
- Science isn't neat nor perfect, your logbook may get messy!
- Simply mark through mistakes or "typos".

Table of Contents

1. Title Page – name, school and teacher's name
2. Table of Contents – listed sections with page numbers
3. Brainstorming
4. Question
5. Purpose Statement
6. Research with sources
7. Hypothesis
8. Variables
9. Materials list
10. Procedure
11. Procedure
12. Tables
13. Observations
14. Pictures
15. Graphs
16. Conclusions
17. Reflections

2020 Project Categories

<p>LIFE SCIENCES CATEGORIES:</p> <p>ANIMAL SCIENCES Animal Behavior Cellular Studies Development Ecology Genetics Nutrition & Growth Physiology Systematics & Evolution</p> <p>BIOCHEMISTRY Analytical Biochemistry General Biochemistry Medical Biochemistry Structural Biochemistry</p> <p>CELLULAR & MOLECULAR BIOLOGY Cell Physiology Cellular Immunology Genetics Molecular Biology Neurobiology</p> <p>MICROBIOLOGY Antimicrobials & Antibiotics Applied Microbiology Bacteriology Environmental Microbiology Microbial Genetics Virology</p> <p>PLANT SCIENCES Agriculture & Agronomy Ecology Genetics/Breeding Growth & Development Pathology Plant Physiology Systematics & Evolution</p>	<p>Cell & Tissue Engineering Synthetic Biology</p> <p>COMPUTATIONAL BIOLOGY & BIOINFORMATICS Computational Biomodeling Computational Epidemiology Computational Evolutionary Biology Computational Neuroscience Computational Pharmacology Genomics</p> <p>TRANSLATIONAL MEDICAL SCIENCE Disease Detection & Diagnosis Disease Prevention Disease Treatment & Therapies Drug Identification & Testing Pre-Clinical Studies</p>	<p>ENGINEERING MECHANICS Aerospace & Aeronautical Engineering Civil Engineering Computational Mechanics Control Theory Ground Vehicle Systems Industrial Engineering-Processing Mechanical Engineering Naval Systems</p> <p>MATHEMATICS Analysis Combinatorics, Graph Theory, Game Theory Geometry & Topology Number Theory Probability & Statistics</p> <p>ROBOTICS & INTELLIGENT MACHINES Biomechanics Cognitive Systems Control Theory Machine Learning Robot Kinematics</p> <p>SYSTEMS SOFTWARE Algorithms Cybersecurity Databases Human/Machine Interface Languages & Operating Systems Mobile Apps Online Learning</p>
<p>MEDICINE & HEALTH CATEGORIES:</p> <p>BEHAVIORAL & SOCIAL SCIENCES Clinical & Developmental Psychology Cognitive Psychology Neuroscience Physiological Psychology Sociology & Social Psychology</p> <p>BIOMEDICAL & HEALTH SCIENCES Cell, Organ, & Systems Physiology Genetics & Molecular Biology of Disease Immunology Nutrition & Natural Products Pathophysiology</p> <p>BIOMEDICAL ENGINEERING Biomaterials & Regenerative Medicine Biomechanics Biomedical Devices Biomedical Imaging</p>	<p>EARTH, ENERGY & ENVIRONMENT CATEGORIES:</p> <p>EARTH & ENVIRONMENTAL SCIENCE Atmospheric Science Climate Science Environmental Effects on Ecosystems Geosciences Water Science</p> <p>ENVIRONMENTAL ENGINEERING Bioremediation Land Reclamation Pollution Control Recycling & Waste Management Water Resources Management</p> <p>ENERGY: CHEMICAL Alternative Fuels Computational Energy Science Fossil Fuel Energy Fuel Cells & Battery Development Microbial Fuel Cells Solar Materials</p> <p>ENERGY: PHYSICAL Hydro Power Nuclear Power Solar Sustainable Design Thermal Power Wind</p>	<p>PHYSICAL SCIENCES CATEGORIES:</p> <p>CHEMISTRY Analytical Chemistry Computational Chemistry Environmental Chemistry Inorganic Chemistry Materials Chemistry Organic Chemistry Physical Chemistry</p> <p>MATERIALS SCIENCE Biomaterials Ceramic & Glasses Composite Materials Computation & Theory Electronic, Optical & Magnetic Materials Nanomaterials Polymers</p> <p>PHYSICS & ASTRONOMY Atomic, Molecular, & Optical Physics Astronomy & Cosmology Biological Physics Condensed Matter & Materials Mechanics Nuclear & Particle Physics Theoretical, Computational, Quantum Physics</p>
	<p>MATH, COMPUTING & ENGINEERING CATEGORIES:</p> <p>EMBEDDED SYSTEMS Circuits Internet of Things Microcontrollers Networking & Data Communications Optics Sensors Signal Processing</p>	

2 types of projects: Traditional vs Research based

There are two ways to approach science fair. The first includes a traditional project where a hypothesis is tested during physical experiments. In this case, students take the hands-on approach and gather supplies and personally conduct an experiment to create the data they need to support or reject the hypothesis. The second is research based, which includes students testing their hypothesis based on information gathered from outside sources. Take a topic like mountain formation or shark migration. You don't really do an experiment with those. You access data sets from somewhere and you interpret that data. An example of this could involve whether or not the color of a team's uniforms had an effect on the number of wins those teams achieved during the season. You wouldn't go recruit a league and supply uniforms. You access teams that already exist and look at win/loss records. You're using data and research but you aren't carrying out an experiment. Both of these project types are acceptable – think about which will work best for your topic and question.

What will judges look for?

Most Projects	Engineering Projects (may be applied to some projects in mathematics and computer science)
I. Research Question (10 pts) <ul style="list-style-type: none"> • clear and focused purpose • identifies contribution to field of study • testable using scientific methods 	I. Research Problem (10 pts) <ul style="list-style-type: none"> • description of a practical need or problem to be solved • definition of criteria for proposed solution • explanation of constraints
II. Design and Methodology (15 pts) <ul style="list-style-type: none"> • well-designed plan and data collection methods • variables and controls defined, appropriate and complete 	II. Design & Methodology (15 pts) <ul style="list-style-type: none"> • exploration of alternatives to answer need or problem • identification of a solution • development of a prototype/model
III. Execution: Data Collection, Analysis & Interpretation (20 pts) <ul style="list-style-type: none"> • systematic data collection and analysis • reproducibility of results • appropriate application of mathematical and statistical methods • sufficient data collected to support interpretation and conclusions 	III. Execution: Construction & Testing (20 pts) <ul style="list-style-type: none"> • prototype demonstrates intended design • prototype has been tested in multiple conditions/trials • prototype demonstrates engineering skill and completeness
IV. Creativity (20 pts) <ul style="list-style-type: none"> • project demonstrates significant creativity/originality/inventiveness in one or more of the above criteria 	
V. Presentation (35 pts) <p><u>Poster</u> (10 pts)</p> <ul style="list-style-type: none"> • logical organization of material • clarity of graphics and legends • supporting documentation well selected and displayed <p><u>Interview</u> (25 pts)</p> <ul style="list-style-type: none"> • clear, concise, thoughtful responses to questions • understanding of basic science relevant to project • understanding of interpretation and limitations of results and conclusions • degree of independence in conducting project • recognition of potential impact in science, society and/or economics • quality of ideas for further research • for team projects, contributions to and understanding of project by all members 	



Let's Begin! Step 1

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Finding a topic and formulating a research question.

Often the most difficult step; keep the following ideas in mind:

- Choose a topic you like and your parents approve of.
- Narrow topic to a single aspect and plan time wisely.
- Projects need to be as original as possible; stay away from science buddies!
- Think about what you want to TEST.
- You must collect quantitative data!
- Stay away from consumer testing.



Brainstorm topics of interest within your logbooks. Let your curious mind think deeply about the world around you. Now, think about a specific question(s) you have about that topic. Hmmmmm.....

When writing a research question, be sure to include the independent and dependent variable.

Ex: How does the temperature (IV) affect the rate of photosynthesis (DV) in algae?



Name: _____ Class: _____

Topic:

Research question(s):

1) _____

2) _____

3) _____

THINK! Is your research question concise? Are you using science vocabulary? Are you testing an independent variable on a dependent variable?

Cut on dotted line above and turn in this small half paper to Mrs. Sturrup for feedback. This counts as a daily grade. *Mrs. Sturrup has extra copies if needed.

Guardian(s) Approval: _____

Mrs. Sturrup's Approval: _____

Step 2: Critically investigate the problem.

Now you will research general information about your topic. For example, if I am trying to find out how temperature affects photosynthesis, then I first need to find out everything I can about how photosynthesis works.

Using this research you will create a background research report. It is a typed document containing the actual research done about the science fair topic. The research is important because this information “educates” the student, so that a formal hypothesis can be formed. This information is also important when writing the experimental procedure.

Using scholarly articles, definitions and books you must first record written research into your logbook. Make sure to write down your sources in the logbook because you will formally cite them later in your bibliography.

In text citations

Follow the author-date method of in-text citations. This means that the author's last name and the year of publication for the source should appear in the text.

Good Example - Water cohesion is the stickiness of water (Jones, 1998).

Bad - I read in <https://courses.lumenlearning.com> water cohesion is the stickiness of water.

Include sources into your writing

- I read in _____ that “...”
- The author stated “...”
- In the website, _____ I found “....”
- According to _____ “...”

Outline of background research report

- A. Introduction paragraph
 - Topic, Question, purpose
- B. Supporting Body Paragraphs
 - Research
 - Definitions etc.
- C. Conclusion Paragraph
 - Restate purpose
 - Overview of main findings
 - State hypothesis
 - Make predictions
- D. Separate Bibliography
 - 5 Sources
 - MLA format
 - 3rd page to report

Background Research Report

Requirements

Check-off List:

- Minimum 2 full pages
- Typed, double spaced 12 point standard font
- 5 references
- 1 reference (of the 5 required) must be a book
- 1st paragraph should discuss topic, purpose and question. (Introduction)
- Body paragraphs include research
- Concluding paragraph summarizes overall findings, students' prediction of the outcome and states hypothesis.
- Citations should be in MLA format
- Do not print. This document should be created in your science fair drive using a google document.
- No plagiarism! This may result in a zero.

Reference Sheet

Metric Unit of Measure	
Measures of Length	
1 meter (m)	= 1000 millimeters (mm)
1 meter (m)	= 100 centimeters (cm)
1 Kilometer (km)	= 1000 meters
1 decimeter (dm)	= 1/10 meter
Measure of Weight	
1 gram (g)	= 1000 milligrams (mg)
1 kilogram (kg)	= 1000 grams
Liquid Measures	
1 liter (L)	= 1000 milliliters (mL)
1 deciliter (dL)	= 1/10 liter

Variable	Definition
Independent	What is being tested; changed by tester
Dependent	Data collected; quantitative observation
Control	Kept the same

$$\text{Average/mean calculation} = \frac{\text{Total Sum of All Numbers}}{\text{Number of Item in the Set}}$$

Helpful websites:

1. sciencefair.math.iit.edu/
2. Easybib.com
3. www.worldsciencefestival.com
4. www.georgiacenter.uga.edu/

Step 3: Hypothesis



Your hypothesis should be a testable answer to your scientific question. So far, you've already narrowed your interests to a specific topic, constructed a question about that broad topic and now you must develop a tentative answer to that scientific question based on your research.

Sometimes people refer to the hypothesis as "an educated guess." Keep in mind, though that the hypothesis also has to be testable since the next step is to do an experiment. Your experiment will determine whether or not the hypothesis is right or inaccurate!

Example:

Research Question	Background Research	Hypothesis
Is a classroom noisier when the teacher leaves the room?	Teachers have rules about when to talk in the classroom. If they leave the classroom, the students feel free to break the rules and talk more, making the room noisier.	If I measure the noise level in a classroom when a teacher is in it and compare that level to when she leaves the room, then I will see that the noise level is higher when my teacher is not in my classroom.



Name: _____ **Class:** _____

Question: _____

Hypothesis: _____

Independent (Manipulated) variable: _____

Dependent (Responding) variable: _____

Control (keep the same) variable: _____

Guardian(s) Approval: _____

Mrs. Sturup's Approval: _____

Finalized Procedure & Materials

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Write the finalized detailed procedure below. Be sure to include specific details. Ex: type of soil used, amount of soil, containers used, type of plants, number of plants, how will you run the experiment, how will you collect data (measuring with a metric ruler in cm, massing in grams, counting, timing in seconds)?

Procedure :

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

14. _____

15. _____

*If more space is needed please continue on a piece of notebook paper.

Step 5: Experiment

Now that you've written out your procedure and gathered up all materials - it's time to test! You'll need your logbook close to you during this process because all data is recorded inside of this. ***Pro-tip: Make a neat and easy-to-read chart inside of your logbook to record your quantitative data.***

Experiment Requirements

Check-off List:

- Data during experiment written in logbook
- Quantitative data recorded
- Pictures taken of students during the experiment
- Metric system used
- At least 4 trials conducted, but more may be appropriate
- If using human participants - Minimum of 12 tested
- Make sure you are recording data during the experiment!
- Have fun!

Step 6: Analyze data

Data from trials will be averaged and graphed. Bar graphs work best for data that has been counted; line graphs compare independent and dependent variables; pie charts compare parts of a whole. Conduct statistical analysis of data: find average, mode, mean, and standard deviation.

How to find an average and/or mean: add up all the measurements, then divide by how many numbers there are.

Independent Variable(s)	Averages from 4 trials (What you measured during experiment)

*This chart may not work with all experimental data types.

Graph these averages!

These averages will now be graphed within a google document. Mrs. Sturup will give further instructions in class to complete the graphing step.

What is your data telling you?

Answer the following questions below. These answers will help you construct your conclusion.

1. Was your hypothesis accepted or rejected from your collected data? Explain why or why not.

2. Did you have any outliers in your data? Explain.

3. Evaluate the process. Did you encounter any problems? If so, explain.

4. Explain if you would go back and change anything during this process.

5. How do these conclusions impacts life, society and/or the environment?

Step 7: Form a Conclusion

Using the questions from the previous page you will need to create a formal conclusion based off your experimental findings. The conclusion is a typed document summarizing your findings and overall experience from this project.

Typed Conclusion Requirements

Check-off List:

- 8 sentence minimum.
- Restate topic, research question and hypothesis.
- Briefly review the experiment.
- Include averages of each trial during the experiment.
- Compare each independent variable's data.
- Explain whether data supported or rejected the hypothesis.
- Finish with reflection of the project and state any surprising information that was obtained.
- Do not print - this document should be created in your science fair drive using a google document.
- Typed, double spaced, 12 point standard font
- Write this typed document into your logbook.

Step 8: Research Plan

You're almost done! Throughout the project you should have typed each component of your logbook into separate google docs. Now, we will combine some of those documents into your science fair research plan.

Step 1 - Create a new google document labeled Research Plan

Step 2 - Copy and paste the first paragraph of your background research report into this document

Step 3 - Copy and paste the last paragraph of your background research report into this document

Step 4 - Copy and paste your procedure into this document as your 3rd paragraph

Step 5 - Copy and paste the bibliography of your background research report into this document

Step 6 - Go back and label these 4 paragraphs as A, B,C, and D

Example:

XXXXXX
9/28/19
TCMS
Research Plan
A. Question My topic is water cohesion. My question over this topic is will a penny hold more drops of water or vinegar? My purpose for researching this is to compare the cohesion of water and vinegar to one another. I want to investigate this topic because I noticed raindrops collecting on my car's window one evening when it was raining. When I watched the water, it looked like each drop moved toward another to form larger drops. I began to wonder if all liquids behave this same way.
B. Hypothesis My hypothesis is water will allow more drops on a penny. Evidence shows water is much more cohesive than vinegar. This means water is more sticky than any other liquid substance. This is due to water's two molecules of hydrogen and oxygen. Hydrogen and oxygen are highly polar, which means they are very attracted to one another. These atoms always move toward each other, which makes water more cohesive than vinegar.
C. Methods and Procedure
1.*Copy and paste in your step by step procedure.
2.

*Above example is missing D paragraph with bibliography

Step 9: Share Results

Now that you have wrapped up your project, it is time to show what you learned! Your project display will be completed on the tri-fold backboard display given to each student from Mrs. Sturrup. This board needs to be done neatly and the font needs to be large enough to easily be read when standing in front of your presentation. All sections need to be labeled. Make it colorful and attractive, so that it will entice the judges' attention. Remember, these will be displayed in the school library. Make sure your work represents your best efforts, and is something we can be proud to display.

Display Requirements

Show off your creativity

Check-off List:

Catchy title at center of the board

All sections labeled

Colorful and attractive

Includes purpose, question, hypothesis, variables, background info, materials/procedure, graphs, conclusion and acknowledgements

Each section 'framed' with construction paper

Graph(s) of your results

Large font ex: Size 80 and up

Pictures of you conducting the experiment

All pictures are labeled with a brief description

Checked spelling, grammar and neatness

