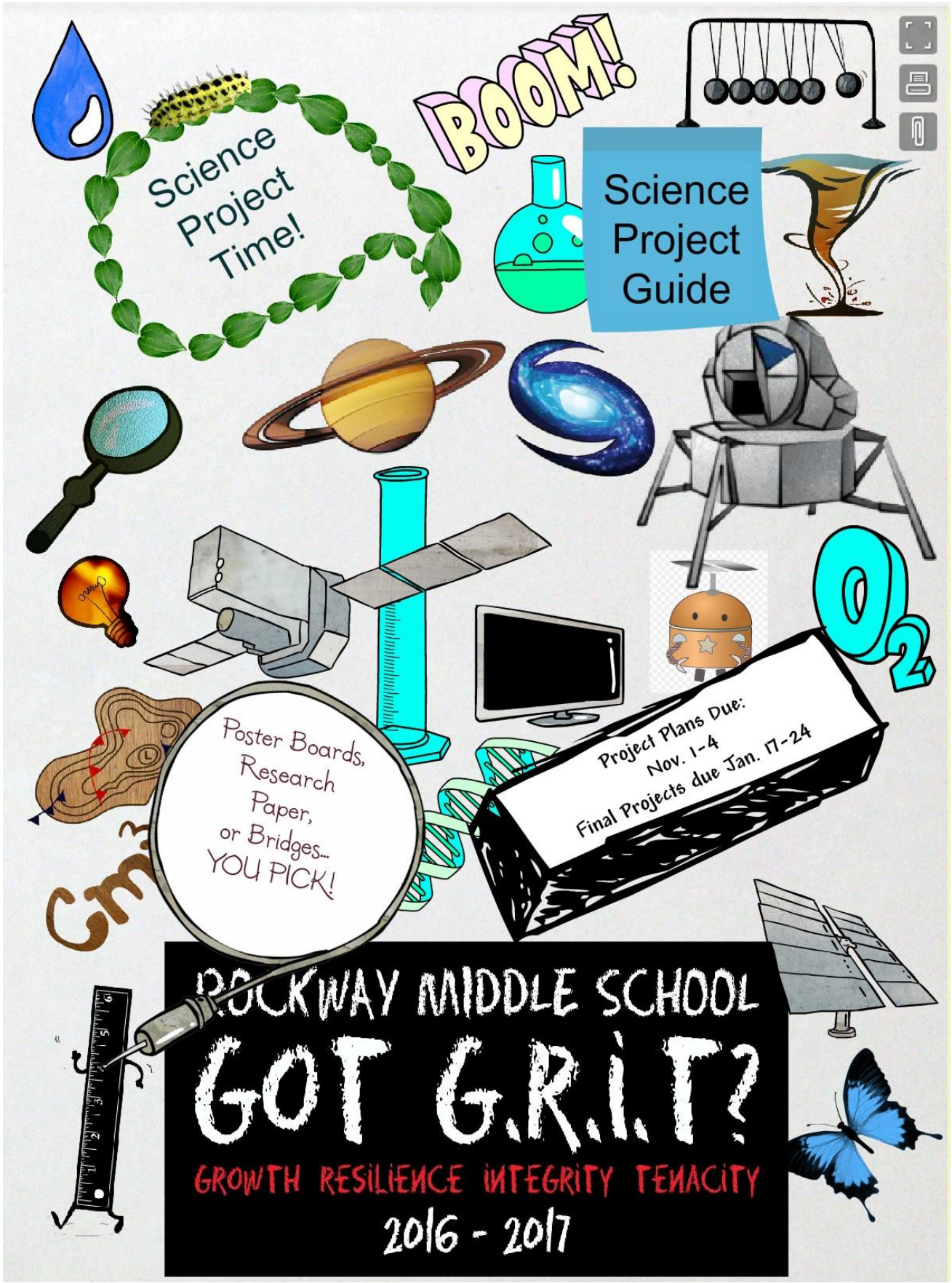
Science Project Time!
BOOM!
Science Project Guide
Poster Boards, Research Paper, or Bridges... YOU PICK!
Project Plans Due:
Nov. 1-4
Final Projects due Jan. 17-24
ROCKWAY MIDDLE SCHOOL
GOT G.R.I.T?
GROWTH RESILIENCE INTEGRITY TENACITY
2016 - 2017

This Guide will help you and your parents/sponsor research, carry out and display a Science Project that can be either one of the following:

A Controlled Experiment: Project Board

Students are encouraged to design 'controlled' experiments, ones that allow them to set up a standard and then change only one variable at a time to see how that variable might affect the original condition tested as the standard. In designing this experiment, it is critical that only one variable – a condition that may affect the results of the experiment – is changed at a time. This makes the experiment a 'controlled' experiment.

Non Inquiry Based Research: Research Paper

Find the rubrics for Research Paper: at:

http://science.dadeschools.net/scienceFair/researchPapers.html

Engineering Projects (Inventions or Improvements on an existing item)

"Scientists try to understand how nature works; engineers create things that never were." An engineering project should state the engineering goals, the development process and the evaluation of improvements. Engineering projects may include the following:

Define a need or "How can I make this better?"

Develop or establish design criteria (could be more than one)

Do background research and search the literature to see what has already been done or what products already exist that fill a similar need? What makes them good and/or weak?

Prepare preliminary designs and a materials list. Consider costs, manufacturing and user requirements.

Build and test a prototype of your best design. Consider reliability, repair and servicing.

Retest and redesign as necessary. Product testing

Present results

Computer Science Projects

These often involve creating and writing new algorithms to solve a problem or improve on an existing algorithm. Simulations, models or 'virtual reality' are other areas on which to conduct research.

Mathematics Projects

These involve proofs, solving equations, etc. Math is the language of science and is used to explain existing phenomena or prove new concepts and ideas.

Bridges

You can build bridges for District and SECME competitions

Bibliography http://www.apastyle.org/

All projects (except for bridges) require a full Bibliography in APA style, citing the source of any information from website, scientific journal, articles, book, magazine or any other resource used in the investigation.

MDCPS Resources for Science Projects:

Parents and Students are encouraged to visit:

http://science.dadeschools.net/scienceFair/generalRulesAndRegulationsRSEF.html

Ideas Online:

http://school.discoveryeducation.com/sciencefaircentral/

http://www.all-science-fair-projects.com/

http://www.ipl.org/div/projectguide/

http://homeworkspot.com/sciencefair/

http://www.chem4kids.com

http://www.sciencepage.org/scifair.htm

http://sciencefairproject.virtualave.net

Choose your Topic Area

ANIMAL SCIENCES Animal Husbandry Development Ecology Pathology Physiology Populations Genetics Systematics Other	**BEHAVIORAL & SOCIAL SCIENCES** Clinical & Developmental Psychology Cognitive Psychology Physiological Psychology Sociology Other	**BIOCHEMISTRY** General Biochemistry Metabolism Structural Biochemistry Other	**CELLULAR & MOLECULAR BIOLOGY** Cellular Biology Cellular and Molecular Genetics Immunology Molecular Biology Other
COMPUTER SCIENCE Algorithms, Data Bases Artificial Intelligence Networking and Communications Computational Science, Computer Graphics Computer System, Operating System Software Engineering. Programming Languages Other	**EARTH & PLANETARY SCIENCE** Climatology, Weather Geochemistry, Mineralogy Paleontology Geophysics Planetary Science Tectonics Other	**ENGINEERING** Electrical & Mechanical Electrical Engineering, Computer Engineering, Controls Mechanical Engineering, Robotics Thermodynamics, Solar Other	**ENGINEERING** Materials & Bioengineering Bioengineering Chemical Engineering Civil Engineering, Construction Eng. Industrial Engineering, Processing Material Science Other
ENVIRONMENTAL MANAGEMENT Bioremediation Ecosystems Management Environmental Engineering Land Resource Management, Forestry Recycling, Waste Management Other	**ENVIRONMENTAL SCIENCES** Air Pollution and Air Quality Soil Contamination and Soil Quality Water Pollution and Water Quality Other	**MATHEMATICAL SCIENCES** Algebra Analysis Applied Mathematics Geometry Probability and Statistics Other	**MEDICINE & HEALTH SCIENCES** Disease Diagnosis and Treatment Epidemiology Genetics Molecular Biology of Diseases Physiology and Pathophysiology Other
PHYSICS & ASTRONOMY Astronomy Atoms, Molecules, Solids Biological Physics Instrumentation and Electronics Magnetics and Electromagnetics Nuclear and Particle Physics Optics, Lasers, Masers Theoretical Physics, Theoretical or Computational Astronomy	**PLANT SCIENCES** Agriculture/Agronomy Development Ecology Genetics Photosynthesis Plant Physiology (Molecular, Cellular, Organismal) Plant Systematics, Evolution Other	**ENERGY & TRANSPORTATION** Aerospace and Aeronautical Engineering, Aerodynamics Alternative Fuels Fossil Fuel Energy Vehicle Development Renewable Energies Other	**CHEMISTRY** Analytical Chemistry General Chemistry Inorganic Chemistry Organic Chemistry Physical Chemistry Other

SP Timetable for Controlled Experiments Project Boards

Assignments	Due Dates
Part I: Project Plan **The Project Plan should be typed, printed and signed by parents or Sponsors. It must contain:**	
1. Title of the Project 2. Problem Statement 3. Hypothesis 4. Independent (Manipulated or Test) Variable 5. Dependent (Responding or Outcome) Variable 6. Constants 7. Control Experiment 8. Materials 9. Procedures 10. Bibliography: with at least five (5) major references in APA style.	***Nov. 1-4*** The research plan should be signed by parents or sponsors and turned in to the teacher before experimentation. Each teacher may assign specific due dates for each part of the project.
Part II: Experiment, Poster Board and Data Book **Information on the Project Board should be typed. Keep a Journal or "Data Book"**	
Run your experiment trials, making sure you have a control. Then display your process on a Poster Board showing the following: 1. Title (that refers to your topic) 2. Problem Statement 3. Hypothesis 4. Independent (Manipulated or Test) Variable 5. Dependent (Responding or Outcome) Variable 6. Constants 7. Control Experiment 8. Materials 9. Procedures 10. Data: Data Tables, Graphs and Pictures 11. Results 12. Conclusion 13. Abstract 14. Data book (optional, but highly recommended) **	**Jan. 17-24** **Teachers may admit other display options*** ***If students are working on PPP or similar, they must set up a Project Board if they are selected to represent school in finals.**

Only Teachers:

Submit Class Project Plans to SP Coordinator.	**Nov. 7-10**
School Judges Meeting	**Nov. 15** **(During Planning)**

Very Important:

- Science Project Plan and Display board sections must be typed.
- An ADULT SPONSOR/PARENT must sign the Project Plan and turn it in to the teacher on Nov. 1-4

Science Project Plan is due Nov. 1-4
Science Project Board w/Data Book due Jan. 17-24**
Research Papers Plan with Thesis Statement and Introduction due Nov. 1-4
Research Papers due Jan. 17 -24

SP Guide for Students and Parents

Part I: Project Plan (Due Nov. 1-4)

The Project Plan should be typed and printed. It must include the following parts:

1. **Title of the Project (Topic):** The topic is perhaps the most difficult part. Get an idea of what you want to study and learn about. Ideas should come from things in your area of interest. A hobby might lead you to a good topic. What is going on in the world that you would like to know more about? Choose a topic that can be done in the amount of time you have. **"Make sure your topic is appropriate to your grade level and oriented to increase your scientific knowledge".** Research your topic. Go to the library or internet to learn more about your topic. Always ask Why? or What if?. Look for unexplained or unexpected results. Also, talk to professionals in the field, organize your information and start writing your Research Plan by giving a "Title" to your project. **Be as creative as you can be! The title must refer to the topic.**
2. **Problem:** Pick a question or problem that is not too broad and that can be answered through **your** scientific investigation. Be very specific!
   The problem must be stated as a question:
   What is the effect of _____ on _____?
   (I.V) Independent variable (D.V) Dependent variable

3. **Hypothesis:** State a hypothesis. You can use the IF and THEN format:
   If… (the cause or Independent Variable), then… (the effect or Dependent Variable) … because… (reason why this would happen)
   "If a tomato plant is placed in natural light, then it will grow five centimeters higher than a tomato plant grown in the artificial light, because …

Identification of Variables: Make sure you identify the following:

4. **The independent variable** (also called manipulated, experimental or test variable). This is the variable, the only one thing that you can freely manipulate or change in your experiment. In a controlled experiment you only change one variable at a time to be certain that the effect that this change produced is the result of the action of this variable. In your project the independent variable will be: _____
5. **The dependent variable** (also called responding or outcome variable). The dependent variable is that factor that is affected in response to the independent variable. In your experiment the dependent variable will be: _____
6. **The constant variables**: These are all the factors and conditions that will be kept identical for all the trials. The constant variables will be: _____(list all possible constants)_____
7. **The control experiment:** A "control" is an additional experiment you run alongside your test experiment. It is identical in every way to your test experiment, except for the one thing you are testing or independent variable. For example: You want to know if salt affects the time it takes for water to boil. You boil water "without" the salt and take the time it takes in regular conditions; this would be your control experiment, because you are not adding the salt. When you boil the water adding the salt, you will compare this results with your control test's results, to see if actually salt affected the time it takes for the water to boil.

8. **Materials:** Use **bullets** to "list" all the materials necessary to complete the experiment. Be specific (include amounts, size, type, etc- remember **everything must be in SI Units/Metric System**.
9. **Procedures:** Number as many steps as necessary to perform the experiment. Use numbers to explain in detail how you will do your experiment and exactly what will be involved. Remember that you have to be very specific for someone would replicate your experiment, should he be able to follow the directions.
10. **Bibliography:** You should include the source about any information that is not your own (i.e. books, journal articles, websites, etc.)
    You can use APA Format to cite:
    1. Journal articles
    2. Reference to an entire book
    3. Reference to a website

Once you have finished with the last step (Bibliography), type your plan, print it and turn it in to your Science Teacher on Nov. 1-4.

If you are selected as a winner for our school, your project should be displayed on a SCIENCE PROJECT BOARD.

Please continue to the next page

Part II: Experimentation, Poster Board and Data Book (Due Jan. 17-24)

Experimentation:

- Now, follow your Research Plan making sure you have made the adjustments suggested by your teacher or sponsor.
- Get a Journal notebook to use as a "DATA BOOK" (optional but highly recommended)
- Get your project materials.
- Perform many trials of your experiment using SI units (metric system)
- Create your Data table to record the results; write notes, drawings and observations on the Journal "Data Book" with the entry dates.
- Don't forget the "control experiment", which should be running at the same time as your experiment.
- Take pictures and record data on your Data Book as frequently as possible.
- On your "Data Book" create Graphs (bar graphs, circle graphs, line graphs) of your results.
- Analyze your data comparing your results with the control.
- Write the results in "words" using SI units/metric system. (See more about how to write results on the next page)
- Draw conclusions. (See more about writing Conclusions on the next page)

Poster Board:

Using your Project Plan and your Data Book, type and print the following to be displayed on your Poster board:

- **Title**
- **Problem**
- **Hypothesis**
- **Independent Variable**
- **Dependent Variable**
- **Constants**
- **Control Experiment**
- **Data Tables**
- **Graphs**
- **Pictures-** (If you are including pictures, make sure not to disclose the identity of the people involved. Otherwise you will need written consent and signature of participants. Take photographs of the most important parts/phases of your experiment to use in the display.
- **Results-** Describe your data table, graphs and pictures in written form or describe your data using words. For example: Based on the data collection, the plant grew 5 cm during the first week, 3cm during the second week, etc. DO NOT WRITE conclusions on this section. Do not write whether your hypothesis was supported or not. Write only what you have as a result of your experimentation.
- **Conclusions-** Before writing the Conclusion Essay read your results; examine your graphs and tables/pictures. This will help you check your testable hypothesis and answer the problem. Identify patterns in the graphs. Did your experiment give you the expected results? Why? Why not? Was your experiment performed with the same exact steps each

trial? Are there any other explanations that you had not considered or observed? Were there experimental errors in your data taking, experimental design or observations? Remember that understanding errors is a key skill scientist must develop.

Write the conclusion in a 3-paragraph Essay that addresses all the following answers to these questions. Don't forget that this is an ESSAY not a question answer paragraph.

First Paragraph

1. What was investigated?
2. Was the hypothesis supported by the data?
3. What were your major findings? Analyze your data using the statistics that you can understand and explain how the variable tested produced a change compared to the control experiment. Never alter the results to "fit" your hypothesis.

Second Paragraph

4. How did your findings compare to those of other researchers that investigated the same topic?

Third Paragraph

5. What possible explanations can you offer for your findings?
6. What recommendations do you have for further study and for improving the experiment?
7. What are possible applications of the experiment?

- **Abstract:** The abstract is the description of the project in a few words. Must be typed on the proper paragraph format and have 250 words or less. At least, the following information should be included:

Title _____
Name of Student _____
School and District _____
The problem was _____
It was hypothesized that if _____ , then_____.
The procedure followed was _____
It was concluded that_____
The results of the experiment _____ did (did not) ___support the hypothesis.

Sample ABSTRACT

Title: Effects of Marine Engine Exhaust Water on Algae
Name of Student: Mary E. Jones
School: Hometown High School, Hometown, PA, United States

This project in its present form is the result of bioassay experimentation of the effects of two-cycle marine engine exhaust water on certain green algae. The initial idea was to determine the toxicity of outboard engine lubricant. Some success with lubricants eventually led to the formulation of "synthetic" exhaust water which, in turn, led to the use of actual two-cycle engine exhaust water as the test substance. Toxicity was determined by means of the standard bottle or "batch" bioassay technique. Scenedesmus quadricauda and Ankistrodesmus sp. were used as the test organisms. Toxicity was measured in terms of a decrease in the maximum standing crop. The effective concentration - 50% (EC50) for Scenedesmus quadricauda was found to be 3.75% exhaust water; for Ankistrodesmus sp. 3.1% exhaust water using the bottle technique. Anomalies in growth curves raised the suspicion that evaporation
was affecting the results; therefore, a fl ow-through system was improvised utilizing the characteristics of a device called a Biomonitor. Use of a Biomonitor lessened the infl uence of evaporation, and the EC 50 was found to be 1.4% exhaust water using Ankistrodesmus sp. As the test organism. Mixed populations of various algae gave an EC 50 of 1.28% exhaust water.
The contributions of this project are twofold. First, the toxicity of two-cycle marine engine exhaust was found to be considerably greater than reported in the literature (1.4% vs. 4.2%). Secondly, the benefits of a flow-through bioassay technique utilizing the Biomonitor was demonstrated.

Sample Project Backboard Set Up

<table>
<tr>
<td rowspan="5">Problem Statement

Hypothesis

Abstract
(This is the required location, please follow format)</td>
<td colspan="2">Scientific Title:
The Effect of … on …
(or creative title)</td>
<td rowspan="5">Results

Conclusions (Follow format)</td>
</tr>
<tr>
<td>Materials</td>
<td>Procedures</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>Constants</td>
</tr>
<tr>
<td>Dependent Variable</td>
<td>Control Experiment</td>
</tr>
<tr>
<td>Data Table</td>
<td>Graphs</td>
</tr>
<tr>
<td colspan="4">Pictures</td>
</tr>
</table>

Hints:

- Be organized. Make sure the display is logically presented and easy to read. A glance should permit ANYONE to locate title, experiment results, and conclusions.
- Eye-catching: Use neat colorful headings, charts and graphs. Pay special attention to labeling the graphs, diagrams, etc.
- ANYONE should be able to understand the visuals without further explanation.

Research Paper Projects

If you are planning to write a Research Paper visit:

http://science.dadeschools.net/scienceFair/researchPapers.html

Research Paper Plans are due Nov. 1-4
Complete Research Paper Projects are due:
Nov. 30 (for SECME competition)
Jan. 11-17 (for District competition)

Rubric to evaluate Research Papers:

Research Paper

Category	Exceeds Standard	Meets Standard	Nearly Meets Standard	Does Not Meet Standard	No Evidence	Score
Title Page	Title Your Name, Teacher's Name, Course Period, Date, Neatly finished-no errors	Evidence of four	Evidence of 3	Evidence of 2 or less	Absent	
Thesis Statement	Clearly and concisely states the paper's purpose in a single sentence, which is engaging, and thought provoking.	Clearly states the paper's purpose in a single sentence.	States the paper's purpose in a single sentence.	Incomplete and/or unfocused.	Absent, no evidence	
Introduction	The introduction is engaging, states the main topic and previews the structure of the paper.	The introduction states the main topic and previews the structure of the paper.	The introduction states the main topic but does not adequately preview the structure of the paper.	There is no clear introduction or main topic and the structure of the paper is missing.	Absent, no evidence	
Body	Each paragraph has thoughtful supporting detail sentences that develop the main idea.	Each paragraph has sufficient supporting detail sentences that develop the main idea.	Each paragraph lacks supporting detail sentences.	Each paragraph fails to develop the main idea.	Not applicable	
Organization-Structural Development of the Idea	Writer demonstrates logical and subtle sequencing of ideas through well-developed paragraphs; transitions are used to enhance organization.	Paragraph development present but not perfected.	Logical organization; organization of ideas not fully developed.	No evidence of structure or organization.	Not applicable	
Conclusion	The conclusion is engaging and restates the thesis.	The conclusion restates the thesis.	The conclusion does not adequately restate the thesis.	Incomplete and/or unfocused.	Absent	
Mechanics	No errors in punctuation, capitalization and spelling.	Almost no errors in punctuation, capitalization and spelling.	Many errors in punctuation, capitalization and spelling.	Numerous and distracting errors in punctuation, capitalization and spelling.	Not applicable	
Usage	No errors sentence structure and word usage.	Almost no errors in sentence structure and word usage.	Many errors in sentence structure and word usage.	Numerous and distracting errors in sentence structure and word usage.	Not applicable	
Citation	All cited works, both text and visual, are done in the correct format with no errors.	Some cited works, both text and visual, are done in the correct format. Inconsistencies evident.	Few cited works, both text and visual, are done in the correct format.	Absent	Not applicable	
Bibliography	Done in the correct format with no errors. Includes more than 5 major references (e.g. science journal articles, books, but no more than two internet sites. Periodicals available on-line are not considered internet sites.)	Done in the correct format with few errors. . Includes 5 major references (e.g. science journal articles, books, but no more than two internet sites. Periodicals available on-line are not considered internet sites.)	Done in the correct format with some errors. Includes 4 major references (e.g. science journal articles, books, but no more than two internet sites. Periodicals available on-line are not considered internet sites.)	Done in the correct format with many errors. Includes 3 major references (e.g. science journal articles, books, but no more than two internet sites. Periodicals available on-line are not considered internet sites.)	Absent or the only sites are internet sites.	

BRIDGES

If you are planning to build a bridge, please contact Mrs. Shelburne room 406, or Mrs. Rengifo room 1204 for complete set of rules and relevant information.

Bridges are due: Jan. 11-17.

Display and Safety Requirements for project boards (Read carefully)

1. Abstract: Must BE displayed on the board. Must be 250 words or less and written on the proper format.
2. Size of Display: Size Poster size cannot exceed 36" x 48".
3. Organisms: No living creatures including animals, plants and microbes (Bacteria, algae, fungi, etc) will be displayed. No type of cultured growth, spoiled food, or molds will be displayed.
4. Parts: No human or animal parts, histological sections (tissues) or wet mounts may be displayed.
5. Specimens: No taxidermy specimens or parts and no preserved animals, vertebrates or invertebrates, including embryos. No dry plant materials may be displayed.
6. Sensitive photographs: No visual presentations of surgical techniques, dissections and /or other laboratory techniques depicting vertebrate animals or humans in other than normal conditions. All pictures of human subjects must be accompanied by a consent from which grants permission to use the pictures.
7. Soil/Waste: No soil or waste materials or samples may be displayed.
8. Chemicals/water: No chemicals including water may be displayed.
9. Food: No food (human or animal) may be displayed.
10. Sharp Items: No syringes, needles, pipettes, or anything sharp may be displayed.
11. Controlled substance: No poisons, drugs, controlled substances, hazardous substances, or devices may be displayed.
12. Dry Ice/Gases: No dry ice or sublimating solids may be displayed. No gases under pressure may be displayed.
13. Fire/Heat: No flames or highly flammable materials may be displayed. No temperatures above 75º.
14. Tanks: No tanks that have contained combustible liquids or gases including butane and propane may be displayed.
15. Machinery: No unshielded belts, pulleys, chains, or moving parts that pose hazard may be displayed.
16. Lasers: No lasers which do not meet ISEF standards (Class II, student operated, with warning sign- Laser radiation: do not stare into beam, protective housing and power disconnect may be separated) No class II or IV lasers may be displayed.
17. Electricity: All ISEF standards must be observed. No unshielded high-voltage equipment, large vacuum tubes, or ray-generating device. No bare wires or exposed knife switches used in circuits of 12 volts or more may be displayed. No uninsulated wiring or connectors may be displayed.
18. Glass: No glass, glassware, or thermometers may be displayed.
19. Apparatus: no non-functional apparatus or chemical containers, empty or otherwise, may be displayed.
20. Batteries: no batteries with open top cells may be displayed.
21. Distractions: No loud disturbing sounds may be produced by a project's equipment. No bright or distractive light
22. Small Objects: No small objects that are not encased or attached to the project may be displayed.
23. Embellishments: No awards, medals, business cards, flags, etc. No personal information may be displayed. (no personal photographs, accomplishments, acknowledgements, addresses, phone or fax numbers) A one page narrative may be handed out to judges.
24. Project Data Book must be displayed if available.

More Information

MDCPS Resources

As new information becomes available, it will be posted at:
http://science.dadeschools.net/scienceFair/generalRulesAndRegulationsRSEF.html

Student Handbook and Guidelines for Science and Engineering Fairs 2016-17.
Which includes the Safety regulations click the link below:

http://science.dadeschools.net/scienceFair/documents/2013-2014/Student%20Handbook.pdf

Guidelines
http://science.dadeschools.net/scienceFair/documents/1617/SFRSEF%20Rules%20and%20Guidelines%202016-2017.pdf
General Information
http://science.dadeschools.net/scienceFair/resources.html