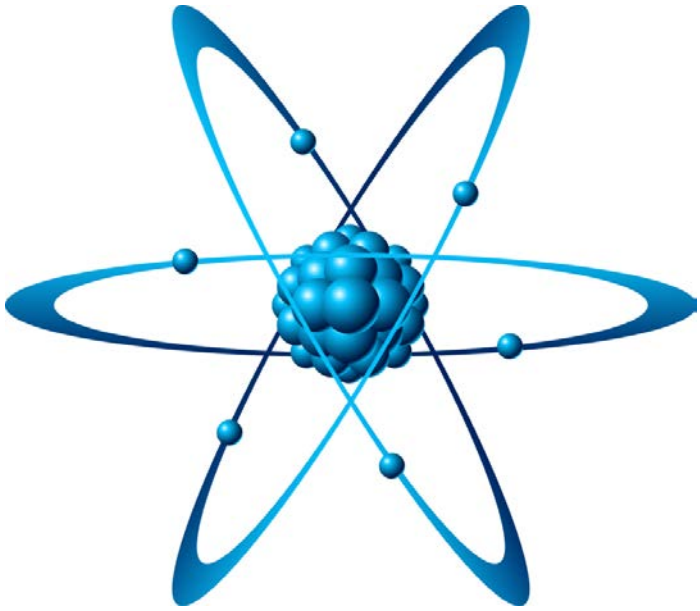

Handbook for the SARASOTA COUNTY STEM FAIR for Elementary Grades 3-5

SARASOTA County Schools

EDUCATION FOUNDATION OF SARASOTA COUNTY STEM FAIR

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Sarasota County STEM Fair Rules

Date and Location

The annual Sarasota County STEM Fair for Elementary Grades 3-5 will be held on **Thursday, January 31, 2019** at Robarts Arena, 3000 Ringling Boulevard, Sarasota, FL. South County project drop off will be on Thursday, January 24, 2019 at Heron Creek Middle School from 2-6 pm. North County project drop off will be on Tuesday, January 29, 2019, from 2-6 pm. The STEM Fair Expo will be held the evening of Thursday, January 31, 2019.

Eligibility

Students grades 3-5 enrolled in any of Sarasota County public, charter, or private elementary schools are eligible in this year's STEM Fair.

Selection

Each school will be able to enter a total of 18 projects (6 projects per grade level). These entries can be in any combination from the following five categories: Engineering, Earth/Space, Life, Physical Science, and Mathematics/Technology. Students are to be selected through a campus selection process. The campus selection process will be at the discretion of the school. It is **highly recommended** that the students go through a judging process similar to the Sarasota County STEM Fair.

Group Projects

No more than three students can compete in a group project. If team members represent multiple grade levels, the team will compete at the lowest grade level. For instance, if a team consists of a 3rd grader and a 5th grader, the team will compete against other 3rd graders.

Required Forms

Each Elementary School that wants to participate in the Sarasota County STEM Fair will need to submit a **STEM Fair School Registration Form** no later than 4:30 PM on **Friday, September 14, 2018**. This form identifies the schools that will be participating and is used for planning purposes. This form can be uploaded into your school tab on the STEM Fair One Note Notebook.

Students participating in the STEM Fair at the school level and the district level, must complete the **Elementary STEM Fair Application and Safety Assessment** before beginning the project to ensure students are aware of safety rules and project guidelines. Each project being entered in the Sarasota County STEM Fair (or each student if a team) must have the Application and Safety Assessment forms submitted through One Note no later than **Friday, December 7, 2018**.

In addition to the paperwork for each student/project, coordinators will enter all projects being submitted to the Sarasota County STEM Fair through the **Exhibit Entry Database** no later than **Friday, December 7, 2018**. Coordinators will receive direction for logging in to the database in the Fall.

NOTE: Deadlines will be strictly enforced. Project changes after the deadline will not be accepted.

Project Safety

Student projects must meet the safety requirements explained in the **STEM Fair Safety Guidelines Form**. A few key points of this form include:

- Projects **CAN NOT contain mold** or **bacterial growth**.
- All projects involving humans and live animals must involve minimal risk.

Please refer carefully to this document for further guidance. BEFORE a student begins the experiment or design, consult with STEM directors if you are unsure if the project meets the safety guidelines.

Project Display

Students are required to create a display board highlighting the important components of a science/engineering project. There are many rules and guidelines to follow. Students and teachers should adhere to the following about display boards:

1. Display must be self-standing of reinforced cardboard, plywood, or other materials. The project cannot lean on the table, wall, or other projects. Nail, glue or tape cannot be placed onto tables.
2. Maximum space allowed for each display is the length of project board while standing.
3. The display board and logbook are the two required components to have present at the STEM Fair. All projects may have a model on display that should be brought the day of the judging and should leave with the student at

the end of the fair. The model must fit within the space between the sides of the display board. However, the following **ARE NOT ALLOWED** at the project/display:

a. Living organisms, including plants
b. Soil, sand, rock, cement, and/or waste samples
c. Taxidermy specimens or parts
d. Preserved vertebrate or invertebrate animals
e. Human or animal food
f. Plant materials, living or dead (except those that are used in the manufactured construction materials in building the display)
g. All chemicals including water
h. All hazardous substances or devices
i. Items that may have contained or been in contact with hazardous chemicals
j. 3-D printers
k. Dry ice or other sublimating solids
l. Sharp items
m. Flames or highly flammable materials
n. Batteries with open-top cells or wet cells
o. Glass or glass objects
p. Any apparatus deemed unsafe by the STEM Fair Directors

4. Students MAY bring a computer or tablet on the day of judging. This technology must be on battery power only (no electricity will be available), and may show other aspects of the project, including but not limited to, Power Point, extra pictures, video of experiments, etc. Active Internet connections ARE NOT ALLOWED. These items should be brought the day of the judging and should leave with the student at the end of the fair.

5. Photographs on the display board must be of the researcher ONLY. The researcher must have parent/guardian permission to have their photograph on display on the board. This is determined by information found in the Sarasota County Student Information System (SIS). The school-based coordinators will be responsible for this information. For non-public schools, a signed media release must be turned in with student paperwork. Photographs of persons other than the researcher ARE NOT ALLOWED on the display board or other presentations.

6. Only paper and pictures should be on the display board. There should not be any other items attached to the board, such as 3-dimensional objects, vines, foam board backing, aluminum foil, fabric, lights, etc. Items other than

paper and pictures will be removed. Corrugated border or paper border is acceptable. Please, no headers that attach to the top of the display board. The display board must not display actual materials used in the project; i.e., food, seeds, teeth, crystals, etc.

7. Students will remain with their display during the judging to answer questions. During judging, all electronics (expect those used for the project/display) should not be in use.

8. Two labels with student name(s), project title, and project number will be provided by STEM Fair Directors. One label should be placed at the top center of the backside of the display board. The other label should be placed on the center of the front cover of the logbook.

9. Any items that are acknowledgements, self-promotions, or external endorsements ARE NOT ALLOWED.

10. The STEM Fair Directors will not take responsibility for any loss of materials from the project displays.

11. The STEM Fair Directors reserve the right to reject projects they deem inappropriate or unsafe and remove items not in compliance.

A complete list of rules and guidelines will be available on One Note, during the day of display check-in and the day of the STEM Fair.

Judging

Two independent judges will review each project. Scores from the two judges will be averaged together to arrive at the total score. Of the possible 100 points, 25 points are determined by an interview. If a student is not present during the judging, he/she will receive a zero for the interview portion of the rubric. Once a project has been reviewed by two judges, scores will be tallied. If there is a large disparity between the two initial judges, a third judge will review the project. Judging sheets and students' scores will not be released.

Awards

Awards will be based upon the scores provided by the judges. For each of the five categories, there will be two winners per grade level, a first place and a second place. An overall category winner will also be chosen. This category winner will have the highest score for that category, regardless of student grade level.

Special Awards

In addition to the 1st and 2nd place awards, students may also receive special award recognition. This may include, but is not limited to, Student Choice Awards, Planetary Society Innovation Award, and the Sarasota Agricultural Fair Award.

Scoring Rubrics

Judges use the scoring rubrics below when evaluating projects. All questions assessing the project itself are scored using the Project Display Rubric. All questions requiring a student response are scored using the Student Response Rubric.

	Project Display Rubric	**Student Response Rubric**
0	No evidence or incorrect	Student has no understanding or is unable to respond or section is missing.
1	A weak attempt made / many errors or major flaws	Student has little knowledge or flawed understanding.
2	Partial evidence / some flaws or omissions	Student has some knowledge but lacks complete understanding.
3	Missing some evidence / few minor flaws or omissions	Student has good knowledge but lacks complete understanding.
4	Clear evidence / minor flaws or omissions	Student is able to articulate an adequate understanding.
5	Clear evidence / no flaws	Student able to articulate a clear understanding.

Types of Projects

There are two project options for completing a STEM Fair project. An Experimental Project answers a TESTABLE QUESTION and follows the scientific method. An Engineering Project SOLVES A PROBLEM and follows the engineering design process. Refer to later sections in the handbook that delineate components of these projects.

Experimental Projects

Experimental projects REQUIRE actual manipulation of a variable to determine its effect. This type of project follows the steps of the scientific method. Projects in this category can be entered in the STEM Fair in one of the following categories:

- **Physical Science** is the study of non-living things, including sciences such as chemistry and physics. (i.e. How does paper airplane design affect the distance it can fly?)
- **Earth and Space Science** explores the interconnections between the land, ocean, atmosphere, and life of our planet, including sciences such as geology, meteorology, and astronomy. (i.e. Does the type of plant affect the amount of soil that is eroded from a hill due to rainfall?)
- **Life Science** is the study of plants, animals, and other living organisms, including sciences such as biology, botany, and zoology. (i.e. How does soil type affect the rate of germination of a bean seed?)
- **Mathematics** is the study of quantity, structure, space, and change, including investigating math rules or principles or math in nature (i.e. Do the seeds in fruits occur in specific number patterns?)
- **Technology** is the study of the practical application of science used to improve the quality of life including the sciences of computer hardware, software, and applications. (i.e. How does temperature affect how a PC operates?)

Components of an Experimental Project

TOPIC

Good science projects are based on topics. These topics should be grade appropriate so that students can investigate on their own. An effective way for students to start developing topics is by asking themselves questions that can be answered through measurable experimentation.

- Brainstorm for topic ideas as a class. Don't discard any ideas for now. List topics or questions just the way that the students suggest them.
- Discuss the qualities that make a topic good or poor. Can the topic be answered by doing a test? What variable would change? What would be measured? Having a testable question based on the topic is essential in investigating an experimental project.
- Use a bulletin board to motivate students to select their science project topics. As students turn in a written copy of their ideas, write their topic titles and names on a strip of construction paper and display on the board. Caption the board "Our Science Project Topics." The ideas displayed on the board may spark ideas in other students.
- Have students list all the science projects that they have seen or done in the past. Encourage them to come up with a new "twist" on an old idea and not to do a project for which they know the outcome - regardless of whether they have seen or done it before. They should be learning something new.

PURPOSE

This component of a science investigation explains in one statement why you are doing the experiment. The purpose can best be stated in the form of a question or a cause and effect statement.

RESEARCH

Background research is helpful to better understand your experiment or design. Areas of research can include key vocabulary, history of topic, and student questions. Sources for research include books, magazines, experts, internet articles, text books, and encyclopedias. Research should be recorded and sources should be cited in the Bibliography.

HYPOTHESIS

The hypothesis is a statement that explains what you think might happen based on general understanding of the topic. It is not a wild guess.

VARIABLES

A variable is any factor that can be controlled, changed, or measured in an experiment. The student should include an independent variable, a dependent variable, and all controlled, or constant, variables.

PROCEDURE

The procedure includes a quantitative list of the materials used in the investigation, a numbered step-by-step description of the investigative method used, and the identification of the experimental variable, the control, and factors that are held constant. If the experiment does not have a control it should be noted in the procedure. The student should understand what a control is and why it was not appropriate for his/her project.

DATA

Data refers to the measurable information gathered in an investigation. These may include:

- Hand Written Scientific Journal (sloppy copy or log)
- Drawings
- Measurements (metric)
- Photographs
- Tables, graphs

The following items should be thoroughly explained and emphasized:

- Precision in recording data
- Consistent use of uniform intervals of time
- Specific labeling of groups, specimens, subjects, etc.
- An adequate number of trials (3 or more depending on problem)
- Averaging of data where appropriate
- Use of photographs
- Appropriate graphs

GRAPHS

Graphs are an organized way to display the data collected during an investigation. They enable the student to see the relationship between the variable and the results.

CONCLUSIONS

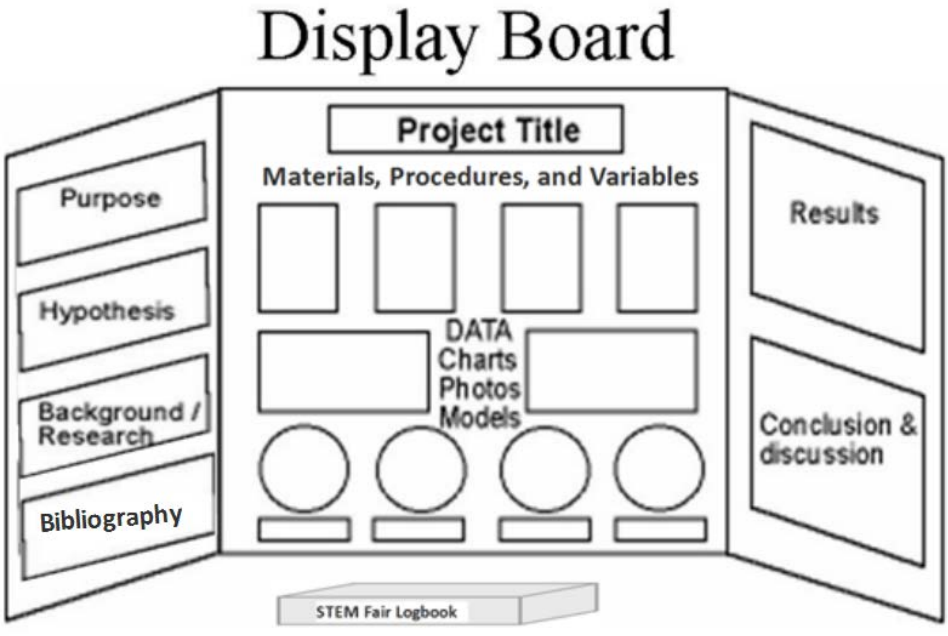
Consider the analysis of the data as it relates to the "purpose" or question when forming the conclusion. The conclusion may include a statement of support or non-support for the hypothesis, a review of the effectiveness of the experimental procedure, and real word applications.

LOGBOOK

Scientists record in a logbook and it is a required part of every project. It should contain all the information from the beginning to the end of the scientific process.

DISPLAY

This is a suggestion for placement of information on the display board. The exact location for each component is at the discretion of teacher and student. The display, however, should be easy to follow, like reading a book. Arrange information so that it is easy to read and flows in a natural order, left to right, top to bottom.



Judging Criteria for Experimental Projects

I. Purpose/Hypothesis (10 pts)
___ clear and focused purpose with a creative approach used to answer the question
___ contributes to field of study and is testable using scientific methods

II. Design and Methodology (15 pts)
___ procedure is clear, including specific directions and metric units
___ well designed plan and data collection methods with complete material list
___ variables and controls are defined, appropriate and complete

III. Execution: Data Collection, Analysis and Interpretation (30 pts)
___ systematic data collection and analysis done quantitatively, precisely and related directly to the hypothesis
___ results are reproducible
___ appropriate application of mathematical and statistical methods
___ sufficient data collected to support interpretation and conclusions (evidence of at least three trials and an overall average of those trials)
___ data displayed graphically and correctly labeled
___ clear statement that shows support of the hypothesis

IV. Creativity (10 pts)
___ project demonstrates significant creativity in one or more of the above criteria
___ project demonstrates imagination and inventiveness that offer different perspectives to new possibilities or new alternatives

V. Presentation (35 pts)
a. Poster (10 pts)
___ logical organization of material with supporting documentation displayed
___ clarity of graphics and legends

b. Interview (25 pts)
___ clear, concise, thoughtful responses to questions
___ understanding of basic science relevant to project
___ understanding interpretation and limitations of results and conclusions
___ degree of independence in conducting project
___ recognition of potential impact in science, society and/or economics and quality of ideas for further research

Engineering Projects

Engineering projects are design projects which determine a need for a new or improved product or process. This type of project REQUIRES the development of a new idea or product that will solve a problem or need. This type of project follows the engineering design process. Projects in this category will be entered in the STEM Fair as an **Engineering Project.**

Components of an Engineering Project

DEFINE THE PROBLEM

A good engineering project is based on a problem that needs a solution. Examining the world is a great way to begin defining a problem.

- An effective way to start to brainstorm engineering project ideas is to have students write down problems that they encounter over a few days. This can give many ideas of problems that one might be able to solve by changing the way something is done or by creating a new device.
- Another idea is to research inventors and their inventions. Think of changes that can be made to this invention to make it better.

RESEARCH

Research will determine that the problem does not already have a solution. It helps a scientist know what was already done. Scientists can also learn from the work that was done before. Areas of research can include key vocabulary, history of

product or problem, and student questions. Sources for research include books, magazines, experts, internet articles, text books, and encyclopedias. Research should be recorded and sources should be cited in the Bibliography.

NEED STATEMENT

Decide on one problem to solve and write a statement that explains the need and the prototype that will be invented, that is new or improved, that will meet this need.

DESIGN REQUIREMENTS

Identifying design requirements gives exact details about the prototype. It should include specific information such as size, shape, appearance, cost and material. This can include a detailed drawing of the prototype with labels, title, and dimensions (in metric units). Describe what the prototype is expected to do and how it will be tested.

MATERIALS

A clear material list should include everything needed to create and test the prototype. Remember to use the metric system for measurements.

PROCEDURES

This is a step-by-step list of steps in the process of building and testing your prototype.

PROTOTYPE

Build- Using the materials and procedure listed, build the invention prototype.
Test- Use the prototype in multiple trials as specified in the design requirements. Test a minimum of 3 times. Record data to measure if the prototype is successful. Does it solve the problem? Does it need improvements?
Redesign- After analyzing the test, redesign as necessary.
Retest- Use the redesigned prototype in multiple trials. Repeat the recreate and retest steps until satisfied with the prototype.

RESULTS

Results can be displayed as graphs, charts, or other visual representations of the data from the trials.

CONCLUSION

A conclusion analyzes the results, the prototype, and if they supported the original needs statement. It can address questions that came up during the creation and testing of the invention. State other information that was discovered in the process.

LOGBOOK

Scientists record in a logbook and it is a required part of every project. It should contain all the information from the beginning to the end of the engineering process. Logbook entries should be dated.

DISPLAY

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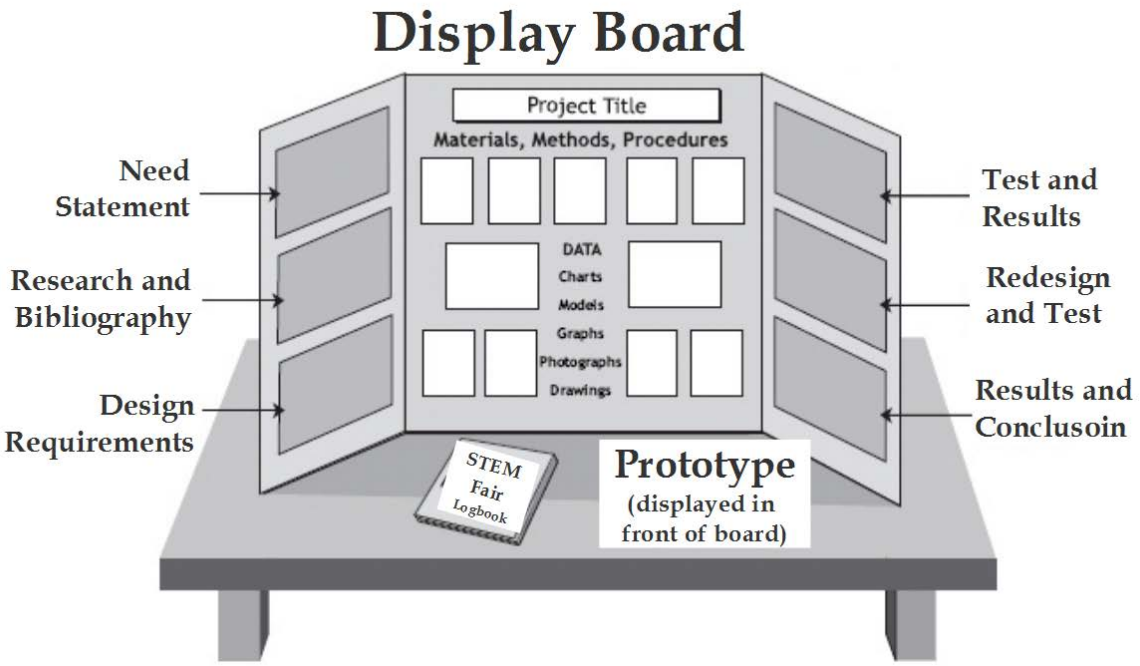

Judging Criteria for Engineering Projects

I. Research Problem (10 pts)
___ description of a practical need or problem to be solved
___ definition of process for proposed solution

II. Design and Methodology (20 pts)
___ exploration of alternatives to answer need or problem
___ identification of a solution
___ background research is diverse with multiple sources
___ procedure is sequential and describes the investigation clearly

III. Execution: Construction, Testing, and Results (25 pts)
___ prototype demonstrates intended design
___ prototype has been tested in multiple conditions/trials
___ prototype demonstrates engineering skill and completeness
___ quantitative, metric data collected and displayed appropriately
___ conclusion based on success in regards to the problem being solved and suggestions for further efforts or practical applications

IV. Creativity (10 pts)
___ project demonstrates significant creativity in one or more of the above criteria
___ project demonstrates imagination and inventiveness that offer different perspectives to new possibilities or new alternatives

V. Presentation (35 pts)
a. Poster (10 pts)
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