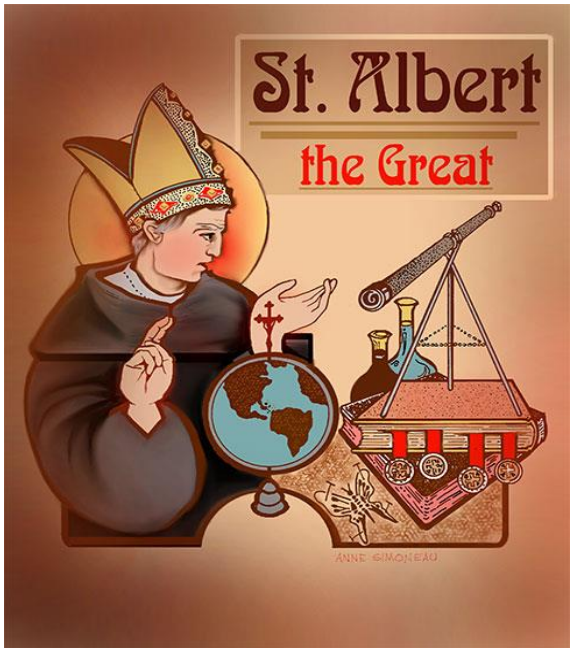
St. Albert the Great Catholic School
Science & Engineering Fair 2019



"The aim of natural science is not simply to accept the statements of others, but to investigate the causes that are at work in nature." - Albertus Magnus

<u>IMPORTANT DATES:</u>

March 29 (Friday)
Science & Engineering Fair Registration Forms Due

April 30 (Tuesday)
St. Albert's Science & Engineering Fair

- **Project check-in from 8:00 – 8:45 a.m. in the gym**
- **Public viewing from 6:30 – 7:30 p.m.**

Dear St. Albert's Families,

We are excited to announce that St. Albert's Science & Engineering Fair is back! Our goal for this special event is to stimulate our children's interest in S.T.E.M. and to foster a lifelong appreciation of engineering and scientific processes. In preparing our children to succeed in this increasingly technological society, this is a perfect opportunity for parents and students to work together on a creative, hands-on project. You are encouraged to explore and study the science and engineering principles that affect our modern lives.

Participation in the Science & Engineering Fair is optional for all grades.
St. Albert's Jr. High students will have the opportunity to earn extra credit points in Science Class for completing and presenting a grade-level appropriate, well-done project that receives a passing grade (rubric is available in the science classroom and online).

Listed below are suggestions on how you might support your child's progress on his or her project:

- ✓ Talk to your child about what they might be interested in finding out. Go exploring outside or take a trip to the museum. Make observations and ask questions!
- ✓ Brainstorm several ideas. **Do they want to do an experiment or an invention project?**
- ✓ **Experiment:** Investigate a question that can be answered by setting up an experiment or test. The best projects evaluate one variable where measurable data is collected. Results of different tests are compared; the more tests/trials, the more reliable the results.
- ✓ **Invention:** Identify a problem that can be solved using an original invention. This may be a new and/or improved technology; Can you design a model and test a prototype? Creativity, ingenuity, and research are required. Patent searches are required for all Jr. High invention projects.
- ✓ Take your child to the library or help them search online for information about their topic. Encourage them to talk to scientists or experts on the topic.
- ✓ Remember, scientists take notes! Keeping a science/engineering notebook is encouraged. This can be presented in addition to the written report.
- ✓ Help your child fill out the Science & Engineering Fair Registration Form, signatures included.
- ✓ Support your child as they work through "The Scientific Method" or "The Engineering Design Process" to complete their project.

Thank you for your support!

SCIENCE & ENGINEERING FAIR RULES:

1. Safety First!

2. Never eat or drink during an experiment; always keep your work area neat & clean.

3. Wear protective goggles when doing any experiment that could lead to eye injury.

4. Do not touch, taste, or inhale chemicals or chemical solutions.

5. Respect all life forms. Do not perform an experiment that will harm any living thing. (See Human & Animal Subjects page.)

6. Parent permission and supervision is required for all experimental procedures and/or construction projects at home.

7. Always wash your hands after working with materials or doing an experiment.

8. Dispose of waste properly; clean up your work space and any messes made.

9. Projects involving poisons, drugs, hazardous substances or devices (such as firearms, weapons, or explosives) are NOT allowed.

10. Sharp items such as syringes, needles, and knives are not allowed to be displayed with your project.

11. Human/animal parts or body fluids are not allowed to be displayed with your project.

12. The use of flames or highly flammable materials is NOT permitted at the fair.

13. All photography and/or visual depictions must not be offensive or inappropriate; credit must be given and sources cited for all images used.

14. All projects must be authorized by parents and approved by Ms. Johnson.

15. Students must complete their projects using "The Scientific Method" for experiments OR "The Engineering Design Process" for inventions.

16. MOST IMPORTANTLY... HAVE FUN!

CONTACT:

Email Ms. Johnson with any questions: **sjohnson@stalbertreno.org**

Stop by the science room after 3:20 pm if you'd like to speak with Ms. Johnson.

You can also check out any available and appropriate lab equipment from the science classroom!

THE SCIENTIFIC METHOD

STUDENTS:

1. Choose a topic. Be sure it interests you. Don't pick one because you think it will be easy; challenge yourself! Talk it over with your parents.

2. State your purpose as a **QUESTION**. What is it that you want to find out by doing this project?

3. **RESEARCH** your problem. This is the part of the report that contains all the background information that you collected about your topic. Any books or articles you read, experts that you talked to, or outside materials collected should be ***summarized*** in this section, written in your worn words and NOT copied and pasted. (A minimum of 3 resources, cited in MLA format on your reference page, is required for Jr. High projects.)

4. Form a **HYPOTHESIS**. You must have a hypothesis before you complete the project. This is an educated guess about what you think will occur as you complete your experiments. What do you think is going to happen? Based on what you know or found out from your research, what do you think the results of your experiments will be? After doing the experiments, it may turn out that your guess was wrong. This is okay!

5. Plan out your project. How will you test your hypothesis? What experiments will you do? How will you measure the results? Where will you keep your information? Be sure to keep notes!

6. List out and collect all needed supplies and **MATERIALS.** Use the appropriate equipment for the project at hand. Find a place to keep things where others won't bother them. Let family members know what you are doing so they do not throw your materials away by mistake.

7. Follow your **PROCEDURES** and conduct your experiment. Write out all the steps needed to conduct your experiment and complete your project. Do several tests. Remember, the more times you do an experiment the more reliable and accurate the results will be.

8. Record your **RESULTS and OBSERVATIONS**. As you do your experiments, you will want to write down all the data and observations you can collect. Remember to record the times and dates that you collect all data. Organize this information into tables, charts, and graphs. Jr. High students are required to use the Metric System for all measurement data collected (including U.S. Customary measurement is fine, if you include the Metric conversions as well.)

9. Draw **CONCLUSIONS.** This is a brief statement explaining why your project turned out the way it did. What did you learn by completing the experiment? You should explain why the events you observed occurred. The conclusion should tell whether the hypothesis was proven or disproven. Also give the reason(s) why you chose to learn more about the subject and discuss what you learned by completing your project.

10. Prepare your titles, charts, graphs, drawings, pictures, and diagrams. Make them large enough to see, neat, and colorful. Be sure to include titles, labels, and captions.

11. Compile a reference page. The project bibliography should list all printed and digital materials the student used to carry out the project. Items should be listed in alphabetical order in standard MLA format.

12. Construct your science fair display and complete your lab report (see attached examples)

13. Present your project at the Science & Engineering Fair!

The Engineering Design Process

1. IDENTIFY: Understand the engineering problem

- ✓ Define the problem in your own words
- ✓ Identify the need for a solution to this problem

2. INVESTIGATE: Research the problem and gather details

- ✓ Collect background information about your topic
- ✓ **Conduct a patent search online** - learn about what others have done (required for Jr. High)
- ✓ Explore possible materials or processes you could use for your design
- ✓ Define criteria and constraints for your design
- ✓ Books or articles read, experts that you talked to, or outside materials collected should be ***summarized*** in this section, written in your own words, not copied & pasted. (A minimum of 3 sources, cited in MLA format on your reference page, is required for Jr. High)

3. IMAGINE: Come up with different ways to solve the problem

- ✓ Use your creativity to think of lots of ideas that could work
- ✓ Evaluate the pros and cons of each idea
- ✓ Pick one idea that is a good starting point

4. PLAN: Figure out the details of your design

- ✓ Draw diagrams and list materials, including quantities
- ✓ List and describe the steps to assemble your prototype
- ✓ Discuss how your prototype will work; how you will test and evaluate it?

5. CREATE: Build your design prototype

- ✓ Follow your plan to assemble your prototype
- ✓ Fix small problems and record any changes to your plan

6. TEST: Evaluate how well your design works

- ✓ Test multiple times
- ✓ Record your observations and findings (record times and dates that you collect all data)
- ✓ Organize this information into tables, charts, and graphs. *Jr. High students are required to use the Metric System for all measurement data collected (including U.S. Customary measurement is fine, if you include the Metric conversions as well)*
- ✓ Figure out which parts are working well and which parts are not

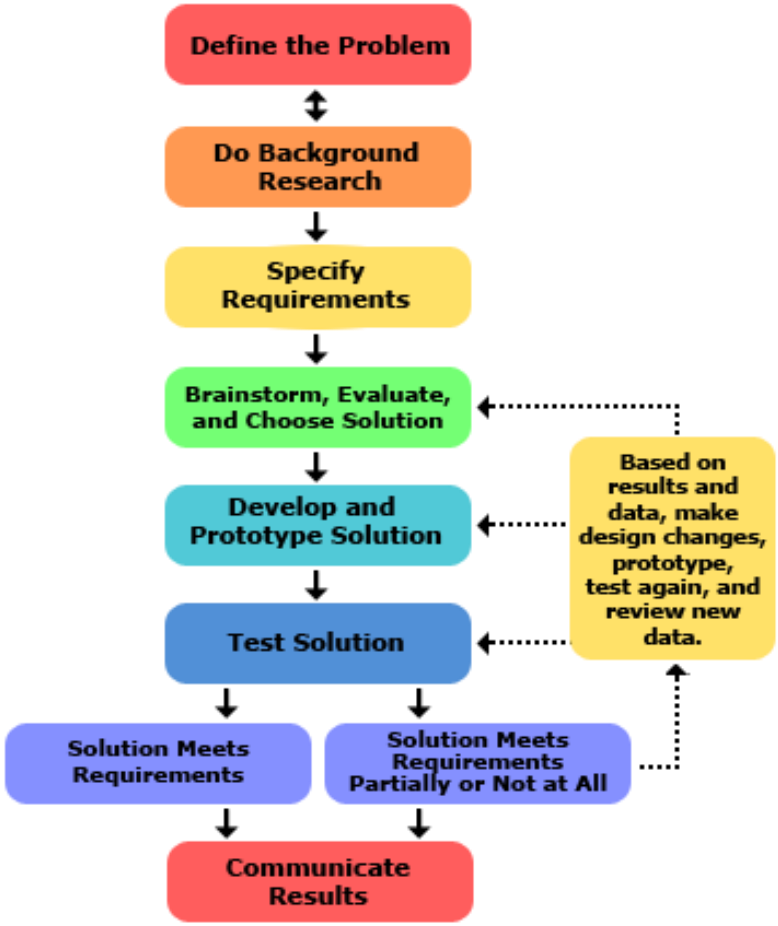
7. IMPROVE: Make changes to your design based on testing

- ✓ Decide what to change and come up with a new plan
- ✓ Build your improved design and test again

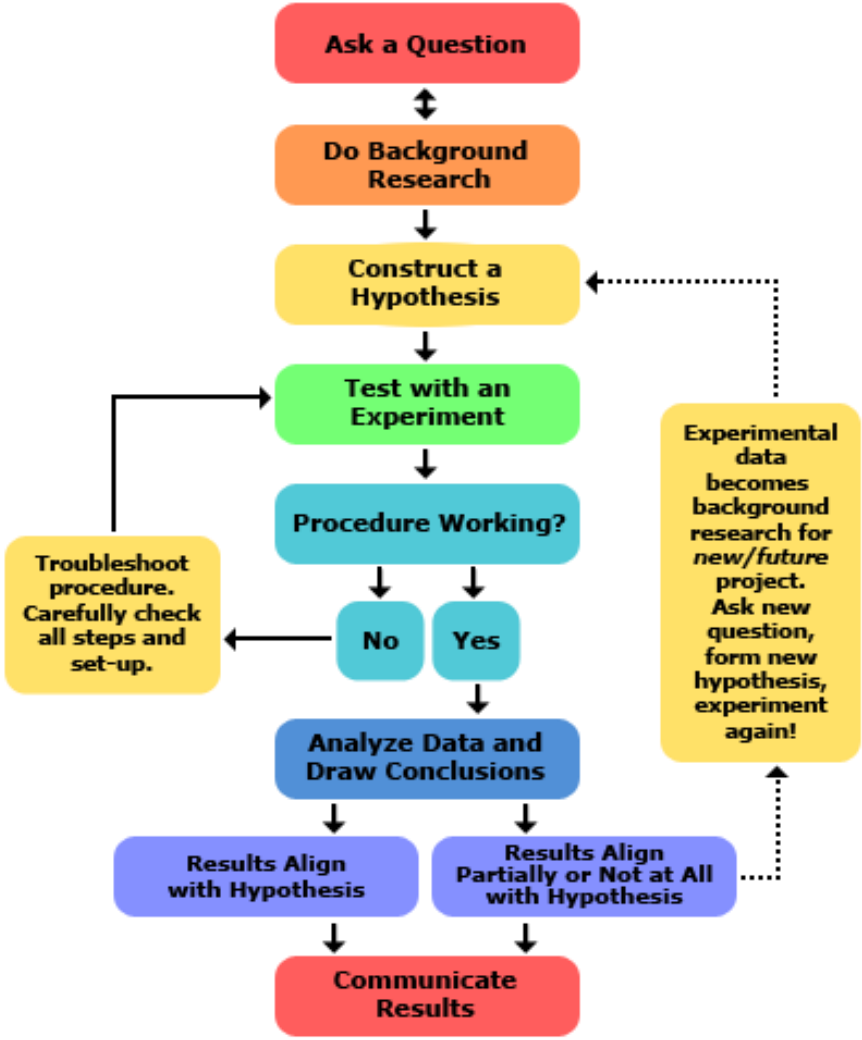
8. COMMUNICATE: Share your solution with others

- ✓ Construct your engineering project display and write your report
- ✓ Discuss your **conclusions**:
  - Explain strengths and weaknesses of your solution
  - Summarize the design and testing work you completed for your project
  - Discuss the results of any tests
  - How well did your design meet the need for the solution to the problem stated?
  - If the design did not meet the need, analyze why it did not and what could be modified to make the design a success
  - How can this design be used in the future?
- ✓ Share how you used the Engineering Design Process
- ✓ Ask people for feedback
- ✓ Present your project at the Science & Engineering Fair!

Engineering Method



Scientific Method



Science & Engineering Fair Written Report

(Required for Grades 3-8; student's display board may serve as written report for Grades K-2)

The written report is a summary of everything that you did to investigate your topic as you worked through "The Scientific Method" or "The Engineering Design Process." This report provides ***you*** with the opportunity to think about all the aspects of your project and share your ideas with others. This report provides ***others (judges, teachers, parents, peers)*** with vital information about your project as well as its effect on your understanding of the topic. An average report is 5-20 pages in length, depending on grade level and depth of knowledge. **All project information (detailed on previous pages) should be included in the written report. Depth and complexity of report should increase with grade level.**

Report requirements:

- Typed, double-spaced, one-inch margins, 12-pt font
- Neatly bound in a binder or folder
- All graphs/charts/tables include tittles, labels, captions
- All photographs must have captions explaining their significance
- Reread, revise, and rewrite as needed
- Double check your calculations, spelling, and grammar
- Grade level appropriate work is expected

Written report for an Experiment using "The Scientific Method" should include:

✓ **Title Page** (No names, please.)

✓ **Question** (State the purpose of the project in the form of a question.)

✓ **Hypothesis**

✓ **Research**

✓ **Materials**

✓ **Procedure**

✓ **Results & Observations**

✓ **Conclusion**

✓ **Reference Page** (Sources cited in MLA format; 3+ sources are required for Jr. High.)

✓ **Acknowledgments (**It is nice to acknowledge anyone who helped you with and/or participated in your project.)

Written report for an Invention using "The Engineering Design Process" should include:

✓ **Title Page:** (No names, please.)

✓ **Problem Statement** (Define the problem and identify the need for a solution.)

✓ **Research**

✓ **Materials**

✓ **Plans & Design**

✓ **Procedures & Prototype Development**

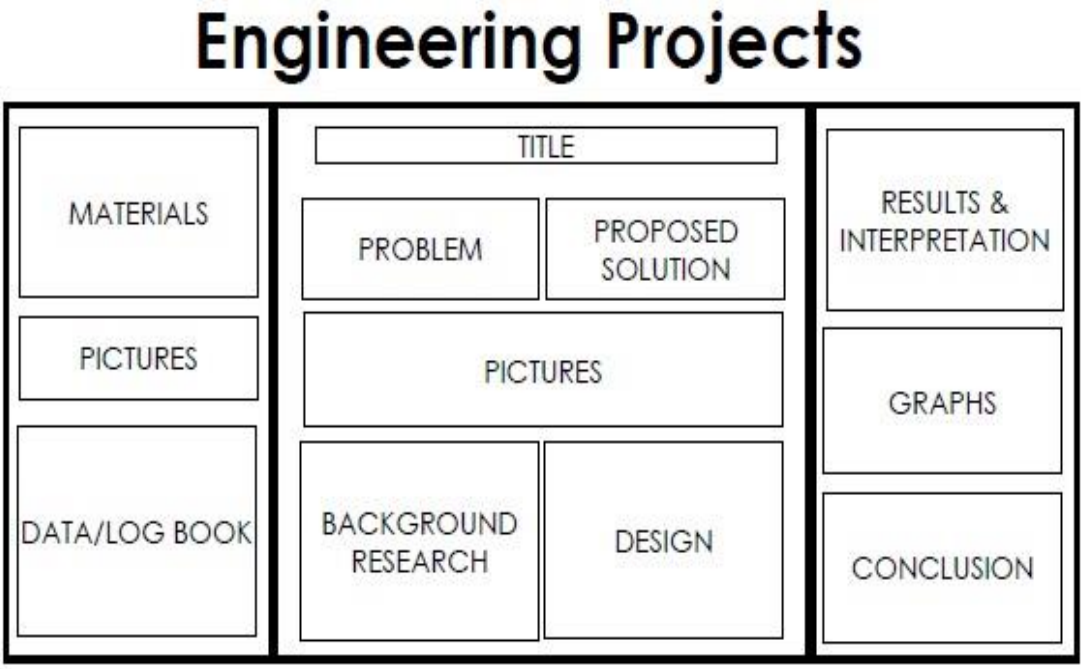
✓ **Tests & Results**

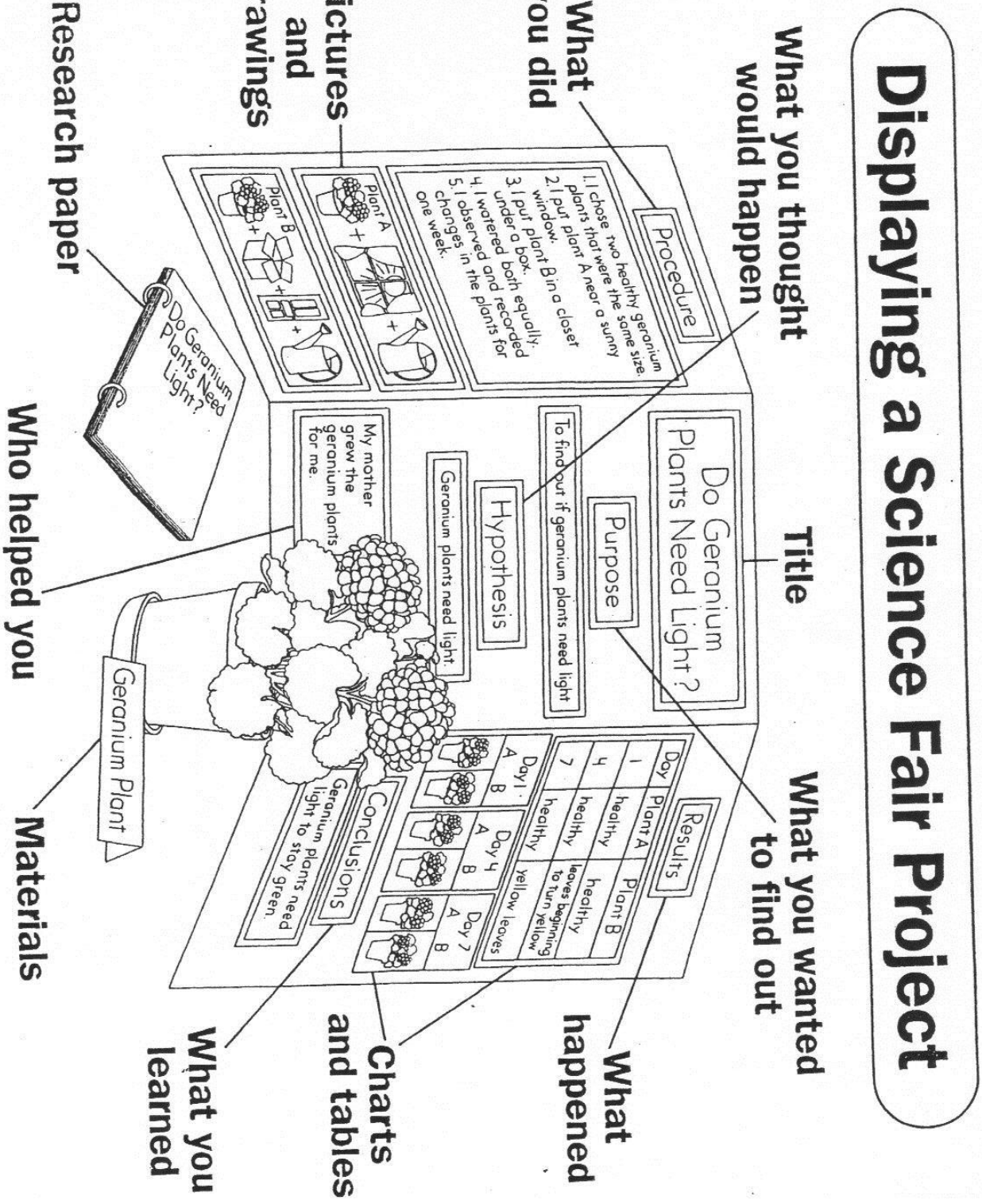
✓ **Conclusion**

✓ **Reference Page** (Sources cited in MLA format; 3+ sources are required for Jr. High.)

✓ **Acknowledgments (**It is nice to acknowledge anyone who helped you with and/or participated in your project.)

Sample Display:





***<u>DO NOT</u> INCLUDE STUDENT NAMES AND/OR PICTURES SHOWING STUDENT FACES ON YOUR DISPLAY BOARD.**

****STUDENT NAME(S) AND GRADE SHOULD BE WRITTEN ON THE BACK OF THE BOARD. THANK YOU!**

ST. ALBERT'S SCIENCE & ENGINEERING FAIR

JUDGING AND AWARDS

All projects will be judged and awarded a ribbon.
In addition, we have some NEW awards this year!

Special Award Categories

Green Earth Award - best study/use of "Reduce, Reuse, and Recycle" in a project

Earth Science Award - best study of earth science in a project (rocks, water, soil, fossils, weather, etc.)

Physical Science Award - best study/use of physics and/or chemistry in a project (magnetism, gravity, energy, chemical changes, electricity, simple machines, etc.)

Zoology Award - best use of animals in a project

Botany Award - best use of plants in a project

Environmental Science Award - best study of the environment in a project (pollution, climate change, natural resources, conservation, human impact, etc.)

Product Science Award - best use/study of commercial products in a project

Medicine & Health Award - best study of human health and wellness in a project

Mathematics Award - best use of mathematics in a project (equations, graphs, charts, data collection and analysis)

Engineering Award - best use of The Engineering Design Method in a project

Technology Award - best use of technology in a project

Food Science Award - best use of food products in a project

Behavior & Social Science Award - best study of human behavior in a project

Creative Display Award - most artistic display of a project

Human and Animal Subjects & Risk Assessment

Three basic questions need to be asked:

1) Are students involved in the study? If, Yes, then you need to have parent permission slips before conducting the research. **Please see Ms. Johnson for permission slips.**

2) Are animals involved in the study? If, Yes, and the animal(s) could be harmed, in any way, then you need to have a veterinarian check the condition of the animal(s) prior to conducting the research. (Keep all paper work.) **Please see Ms. Johnson before registering a project that involves the use/study of animals.**

3) What is the "Risk Assessment?"

Risk Assessment

1. Physical Risks

a. Exercise other than ordinarily encountered in DAILY LIFE would be considered more than minimal risk

b. Ingestion, tasting, smelling, or application of a substance would typically be considered more than minimal risk. However, ingestion or tasting projects that involve commonly available food or drink should be evaluated by the fair director **and** parents/guardians who will determine risk level based upon the nature of the study. ***An ingredient listing of all food ingested or tasted must be supplied to each test subject prior to the start of the experimentation.***

c. Exposure to any potentially hazardous material would be considered more than minimal risk.

d. PROJECTS INVOLVING UNKNOWN MICROORGANISMS. Studies involving unknown microorganisms present a challenge because the presence, concentration, and pathogenicity of any agents isolated are unknown and, potentially, could be of danger to human health. In science fair projects, these studies typically involve the collection and culturing of microorganisms from the environment (e.g., soil, household surfaces, skin and so forth). For purposes of competition in St. Albert's Science & Engineering Fair, studies involving unknown microorganisms can be considered acceptable only if **ALL** of the following conditions are met:

1. The organisms are cultured in a plastic petri dish (or another standard non-breakable container) and sealed.
2. The study involves only procedures in which the Petri dish remains sealed throughout the experiment (ex. counting presence of organisms or colonies).
3. The sealed Petri dish is disposed of via autoclaving or disinfection under the supervision of the fair director or other qualified science professional.

2. Psychological Risks

a. A research activity or experimental condition that could potentially result in emotional stress would be considered more than minimal risk **(e.g. survey, questionnaire, test/quiz, viewing of stimuli**.)

SCIENCE & ENGINEERING FAIR REGISTRATION FORM

***DUE NO LATER THAN Friday, March 29, 2019**
***Every participating student must return this form to his or her teacher**
***All parents must approve of their child's project and sign below**

STUDENT NAME: ____

CIRCLE ONE: **INDIIVIDUAL PROJECT** *or* **TEAM PROJECT (2 STUDENTS)** *or* **CLASS PROJECT**

TEAM MEMBERS: ____

GRADE: ____________ TEACHER: ____

PROJECT TYPE (CIRCLE ONE): **EXPERIMENT (SCIENTIFIC METHOD)** ***or*** **INVENTION (ENGINEERING DESIGN)**

PROJECT TITLE:

____

DESCRIPTION (EXPLAIN YOUR PROJECT WITH AS MUCH DETAIL AS POSSIBLE):

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☐ I acknowledge that I have received and reviewed the materials for the Science & Engineering Fair and I am aware that my child has chosen to participate.

☐ I approve of the information provided above and give permission for my child to participate in St. Albert's Science & Engineering Fair.

Parent's Signature ____ Date ____________

Student's Signature ____ Date ____________

- -

☐ Project Approved (Ms. Johnson will sign and return a copy of this form to student)

Signature ____ Date ____________