LCES ANNUAL SCIENCE FAIR

January 11, 2024

Dear Parents,

All SPOTLIGHT students are required to complete a science fair project and take part in the science fair, an exciting event that encourages students to think like young scientists. Again, participation is mandatory for all gifted students. During the next several weeks your child will be designing a science project that uses scientific methods to solve a problem. We hope you agree that the educational benefits are numerous, as students develop skills in writing, oral presentation, creative thinking, and problem solving. Attached are instructions and handouts detailing the various steps required for this project. **Projects will be completed at home**. For assistance and suggestions on helping your child through this process — from choosing a topic to the final report - visit one or more of the Web sites listed below:

- http://www.sciencebuddies.org (Science Buddies)
- http://www.all-science-fair-projects.com/
- http://school.discovery.com/sciencefaircentral (Science Fair Central)
- http://www.need.org/energyfair.php (National Energy Educ. Devel)
- http://www.elmers.com/sciencefair/index.asp (Elmers Science Site)
- http://www.scifair.org (Dr. Shawn's Support Center)
- http://scienceclub.org//kidproj1.html (The Science Club)
- http://www.cdli.ca/sciencefairs (Science Fairs Homepage)
- http://www.isd77.k12.mn.us/resources/cf/welcome.html (Cyber-Fair)
- http://www.energyquest.ca.gov/projects/ (Energy Quest)
- http://www.ipl.org/div/kidspace/projectguide (Kidspace)

We ask that you encourage your child and monitor his or her progress along the way. Your support is the key to a successful project, but please do not allow your involvement to extend any further in order to assure equity and promote student learning! It is important that your child wrestles with problems and tries to solve them. Guide your child whenever and wherever you can, but let the final project reflect your child's individual effort and design. We look forward to watching your child enjoy this unique opportunity for scientific discovery! Please feel free to email us with any questions or concerns. As always, thank you for your support!

Mrs. Engles & Mrs. Rowell

Step by Step Science Project Instructions

A science project is an investigation using the scientific method to discover the answer to a scientific problem. Before starting your project, you need to understand the **scientific method**. The scientific method is the "tool" that scientists use to find the answers to questions. It is the process of thinking through the possible solutions to a problem and testing each possibility to find the best solution. The scientific method involves the following steps: research, identifying a problem, stating a hypothesis, conducting project experimentation, and reaching a conclusion.

1. PURPOSE: This is your **question**. Why are you doing the project? What are you trying to find out? It is usually something you wonder about. Do you really have more germs on your hands before you wash them? Are cats smarter than dogs? Do most toys live up to the advertising on TV?

2. HYPOTHESIS: Now that you have learned more about your topic, what do you THINK the answer to your question might be? This is your hypothesis. It's an informed guess or inference. A hypothesis is not a question. It is a statement of what you think is true, based on your research. The hypothesis should be written as an "IF...THEN" statement. For example: Question: Which seeds germinate quicker, carrot seeds or tomato seeds? Hypothesis: **If** I plant carrot seeds and tomato seeds, **then** carrot seeds will germinate quicker. Question: Which type of dog food does Pebbles like best: dry food or moist food? Hypothesis: If I give Pebbles a choice of dry food or moist food, **then** he will eat the moist food first. Your hypothesis might be true, or it might be false, therefore you need to test it.

3. MATERIALS: List all materials you will use in the experiment. Indicate what was used and how much was used (You should bullet your list).

4. PROCEDURE: List step by step directions used in conducting the experiment (number each step). Think about the factors that could change the results of your experiment ... light, heat, cold and humidity, for example. You want to control as many variables as you can. Remember- **variables** are the factors or conditions that change and your **controls** are the factors or conditions that stay the same. When you do your experiment, you might want to take pictures along the way. You want to document each step so that other scientists are able to do your experiment and get the same results. Be sure to write everything down through proper documentation in a log or journal. Always be as specific and clear as possible.

5. OBSERVATIONS and DATA: Collect and record information as you conduct your experiment. You should keep this information in a data folder or small notebook. Use charts, graphs, photographs, logs, or records to display what was observed and the data collected during the experiment. A good scientist always **double-checks** results. This is especially important if your hypothesis is different from what most people think. It is also important if your research disproves your hypothesis. You need time to do the experiment **a second or even a third time**. Follow the directions in your procedure. Does it turn out the same way each time? If not, what happened? Did you forget to follow one of the steps? Were there other variables that might have changed the results? Once you are sure your results can be **repeated by other people**, you need to draw a conclusion.

6. RESULTS: Write a paragraph about the results you obtained. Be specific and use numbers to describe your results. Do not use vague terms like “some” or “most.”

7. CONCLUSION: Write a statement about the results of your experiment. Your graphs and charts should show your conclusion. Your conclusion must include **a statement of support or non-support for the hypothesis.**

Sample of **supported hypothesis**: "The hypothesis is supported by the data. Orville Redenbacher's Gourmet Popping Corn leaves the fewest number of un-popped kernels."

Sample of **non-supported hypothesis**: "The hypothesis is not supported by the data. Orville Redenbacher's Gourmet Popping Corn did not leave the fewest number of un-popped kernels. Publix Gourmet Popping Corn left the fewest number of un-popped kernels.

8. FINAL REPORT: Your final report will include a title page, abstract, table of contents, purpose, hypothesis, background research, materials list, procedure, data analysis (charts/graphs/etc), results, conclusion, and bibliography (with at least 3 sources). This will be displayed in a folder in front of your science project board.

Research: After you have narrowed your subject down, you now need to do some research to find out as much as you can about the topic. Pick three related areas that will help you with your experiment. For example: If your experiment is *Does Fat Keep an Animal Warm*, you might want to research such topics as "whale blubber", "insulation", and "animal adaptation". If your experiment is *Does Music Affect Plant Growth?*, you might want to research such topics as "plant growth", "tropism", and "sound frequency". If your experiment is *What Type of Soda is Most Dense?*, you might want to research such topics as "density", "sinking and floating", and "the different ingredients in regular soda, diet soda, and caffeine free soda". You can look up your topic in books, encyclopedias, magazines/journals, and on the Internet. You can also ask questions of people who might know more about your topic. For example, your doctor would know about germs. Your dog's vet would know about dogs. Doing research tells you if this topic is interesting to you. In fact, your research helps you think about what the answer to your question might be and you can then form an educated hypothesis. The more informed you are, the better your experiment will be.

Books: Author (Last Name, First Name). Title of Book. City: Publishing Company, Date. (Ex: Duggan, Alfred. The Castle Book. New York: Dodd, Mead & Co., 1991.)

Encyclopedia: "Title of Article." Complete Title of Encyclopedia, year. (Ex: "Laser", World Book Encyclopedia, 1995.)

Internet: Author (Last Name, First Name). "Title of Work". Date posted on WWW. Full protocol/and full address. (Ex: Burka, Lauren. "Hypertext History". http://www.ccs.new.edu/home)

9. LOGBOOK: This is a journal you will keep from the very beginning of your project. Write down everything you do, observe, and think. Be sure to date each entry. This can be handwritten or typed. This will be displayed in a folder in front of your science project board.

10. ABSTRACT: This is an abbreviated version of your science fair project final report. It is limited to a maximum of 250 words. This will be displayed in a folder in front of your science project board. Almost all scientists and engineers agree that an abstract should have the following five pieces:

Introduction. This is where you describe the purpose for doing your science fair project or invention. Why should anyone care about the work you did? You must tell them why. Did you explain something that should cause people to change the way they go about their daily business? If you made an invention or developed a new procedure, how is it better, faster, or cheaper than what is already out there? Motivate the reader to finish the abstract and read the entire paper or display board.

Problem Statement. Identify the problem you solved or the hypothesis you investigated.

Procedure. What was your approach to investigating the problem? Don't go into detail about materials unless they are critical to your success. Do describe the most important variables if you have room.

Data. Observations, data tables, and graphs. What data did you collect?

Results. What answer did you obtain? Be specific and use numbers to describe your results. Do not use vague terms like "most" or "some."

Conclusions. State what your science fair project or invention contributes to the area you worked in. Did you meet your objectives? For an engineering project state whether you met your design criteria.

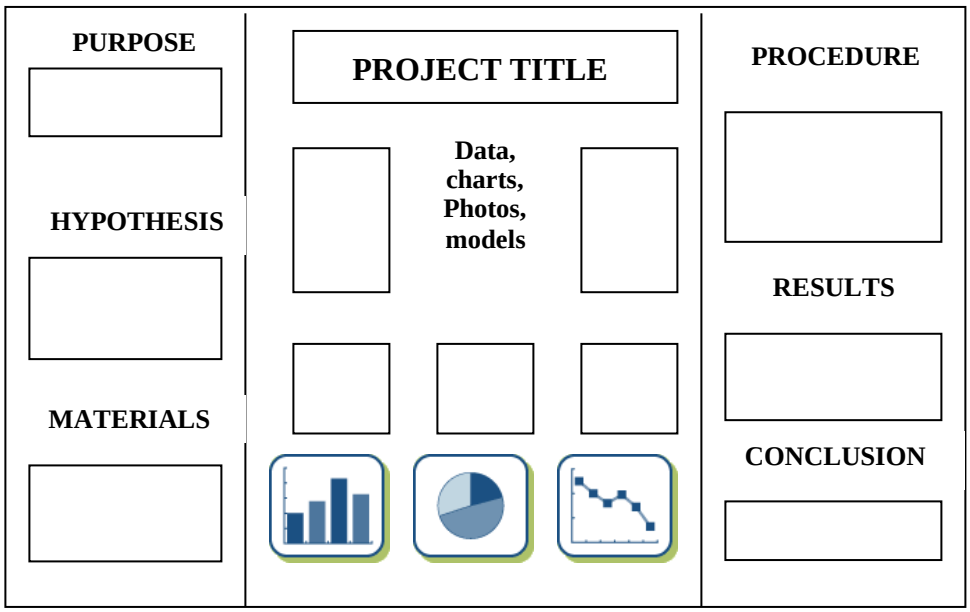
REMINDERS:

- ✓ **Don't copy**. It's okay to get the idea for your project from someone else, but don't copy another student's work. Start from the beginning and do everything yourself. Copying someone else's work is called **plagiarism.** It is wrong.
- ✓ Don't let your parents help too much. It's okay to ask them for advice or some help. But if they try to take over your project, remind them this is **YOUR** project, not their project.
- ✓ Begin early – don't wait until the last minute to begin working on your project.
- ✓ Credit your sources. While you do your project, you will probably get some help from people, books or web sites. Be sure to list the help you got as part of your written report.
- ✓ Make sure that you have checked for any spelling, grammar, and capitalization errors.
- ✓ Before attaching anything to your board, place it flat on the floor and lay out all the lettering and written material, graphs, pictures, etc. DO NOT attach anything until you are sure that you have room for everything and that all your material looks neat and centered. If you would like me to assist you with this, ask me in advance and we will schedule a morning to work on it. Don't wait until the day before it is due.

PROJECT RESTRICTIONS:
The items below may be used in your project, but **not displayed at the fair**. The following are **NOT allowed** on your display board: *organisms, living or dead, including plants, animals, fungi, molds, bacteria, and all other microbes *photographs of animals in other than natural conditions *human or animal food *soil or waste samples *gases under pressure or super-cooled gases, including dry ice *liquids, unless they are a critical part of an operative apparatus *highly flammable display materials, flames, or temperatures in excess of 75 degrees C *small objects that are not encased or attached to the project *sharp or sharp edged items (i.e. staples, tacks, syringes, needles, pipettes, corners, edges) *glass (NO unsecured glass of any kind- lenses, glass containers, frames, etc.) *unshielded lights, belts, pulleys, chains, or moving parts that pose a hazard (unless for display only- CANNOT BE OPERATED) *batteries (dry, wet, or gel cell) with open top cells, car or motorcycle batteries *un-insulated wiring or connectors, bare wire, exposed knife switches (except in DC circuits of 12 volts or less) *lasers (or other scientific instrumentation) that do not meet ISEF standards *equipment producing disturbing or distractive bright lights and/or loud sounds.

PROJECT BOARD DISPLAY

- Choose a catchy, attention-grabbing title that accurately summarizes your research. It can be the Purpose in a "catchy" form (i.e. your purpose might be, "Which Bath Soap Cleans the Best?", but your title might be "Splish Splash I Was Taking a Bath").
- Everything on your board should be neatly written or typed.
- You should have all of the following components displayed similar to the order shown below:



DISPLAY:
A three-sided display is recommended. The suggested size is no wider than 122cm (48in), no deeper than 76cm (30in), & no taller than 247cm (108in) from the floor to the top of the display. Please make all labeling clear, neat, and informative. Make your display as colorful as possible. **Do not put your name on the front.** Pictures are encouraged, but no faces are allowed to be identifiable, including your own. Place stickers on the faces or cut them out of the pictures. Also, make sure all aspects are neat and colorful – be creative! The following is an **example** of a project display set up. Logbooks, abstracts, & reports can be displayed in front of the project on the table.

The most important objective for your board is to **effectively communicate** the facts about your project. It can only achieve that objective if it's easy to read.

- **Neatly write or type** your information**.** Use a **font size** of at least **16 points** for your main body text. Anything smaller is too hard to read.
- Stick with **traditional fonts** like Arial, Times New Roman, or similar typefaces.
- Use *italics* or **bold** for emphasis, not for all your text.
- **Don't place your text on top of a picture**; that makes it difficult to read.
- Don't use ALL CAPS; THEY ARE MUCH HARDER TO READ.
- Don’t use reverse type (white text on a dark background) it is hard to read. Use black characters on a white (or pastel) background.
- Don’t Use Artistic Fonts! They are much harder to read.
- Don't use more than two or three different fonts on your board. Times New Roman for body copy and Arial for headings makes for a nice combination.
- Your project should be neat and visually appealing.

JUDGING: Your project will be judged in the following areas: originality, how well you clearly displayed your investigation, how well you talked about your project during the interview, careful design of your hypothesis and experiment, thoroughness, and how much help you had. Be sure to be prepared to talk about your project. Practice explaining your investigation to others.

The judges might ask questions such as:

If you could do this project differently, what changes would you make?
What would you do if you had more time?
After doing this experiment, did you find that you had more questions than when you started?

Is there anything in your project that you would like to fix?
If you could take this experiment a step further, what would you do next?

SCIENCE FAIR PROJECT TIMELINE

**Topic/Title/Category	Nov 3rd
**Completed Project Board	Jan 10th
**Science Fair	Jan 11th

CATEGORY DESCRIPTIONS

0100-BEHAVIORAL AND SOCIAL SCIENCES

The study of the thought processes and behavior of humans and other animals in their interactions with the environment studied through observational and experimental methods --psychology, sociology, anthropology, archaeology, ethology, ethnology, linguistics, learning, perception, urban problems, reading problems, public opinion surveys, educational testing, etc.

0200-BIOCHEMISTRY

The study of the chemical basis of processes occurring in living organisms, including the processes by which these substances enter into, or are formed in, the organisms and react with each other and the environment. Chemistry of life processes--molecular biology, molecular genetics, enzymes, photosynthesis, blood chemistry, protein chemistry, food chemistry, hormones, etc.

0300- INORGANIC CHEMISTRY

The study of the properties and reactions of inorganic and organometallic compounds. Studies exploring the science of the composition, structure, properties, and reactions of matter not involving biochemical systems or carbon.

0400- ORGANIC CHEMISTRY

The study of carbon-containing compounds, including hydrocarbons and their derivatives. Studies exploring the science of the composition, structure, properties, and reactions of matter do not involve biochemical systems.

0500-EARTH & ENVIRONMENTAL SCIENCES

Studies of the environment and its effect on organisms/systems, including investigations of biological processes such as growth and life span, as well as studies of Earth systems and their evolution--geology, mineralogy, physiography, oceanography, meteorology, climatology, speleology, seismology, geography, etc.

0600-ANIMAL SCIENCES

This category includes all aspects of the animals and animal life, animal life cycles, and animal interactions with one another or their environment--animal genetics, ornithology, ichthyology, herpetology, entomology, animal ecology, paleontology, cellular physiology, circadian rhythms, animal husbandry, cytology, histology, animal physiology, invertebrate neurophysiology, studies of invertebrates, etc.

0700-MEDICINE AND HEALTH

This category focuses on studies specifically designed to address issues of diseases and health of humans. It includes studies on the diagnosis, treatment, prevention or epidemiology of disease and other damage to the human body or mental systems. Includes studies of normal functioning and may investigate internal as well as external factors such as feedback mechanisms, stress or environmental impact on human health and disease--

dentistry, pharmacology, pathology, ophthalmology, nutrition, sanitation, pediatrics, dermatology, allergies, speech and hearing, etc.

0800-MICROBIOLOGY
Biology of microorganisms--bacteriology, virology, protozoology, fungi, bacterial genetics, yeast, antimicrobial and antibiotic substances, etc.

0900-PHYSICS & ASTRONOMY
Physics is the science of matter and energy and of interactions between the two. Astronomy is the study of anything in the universe beyond the Earth--solid state, optics, acoustics, particle, nuclear, atomic, plasma, superconductivity, fluid and gas dynamics, thermodynamics, semiconductors, magnetism, quantum mechanics, biophysics, etc.

1000-ENGINEERING
Studies that focus on science and engineering that involve movement or structure. The movement can be by the apparatus, or the movement can affect the apparatus—aerospace and aeronautical engineering, civil engineering, computational mechanics, control theory, ground vehicle systems, industrial engineering-processing, mechanical engineering, naval systems.

1100- COMPUTERS SCIENCE & MATH
The study or development of software, informational processes or methodologies to demonstrate, analyze, or control a process/solution. The study of measurement, properties, and relationships of quantities and sets, using numbers and symbols. The deductive study of numbers, geometry and various abstract constructs, structures, and the application of these principles--calculus, geometry, abstract algebra, number theory, statistics, complex analysis, probability.

1200- ROBOTICS AND INTELLIGENT DESIGN
Studies in which the use of machine intelligence is paramount to reducing the reliance on human intervention—biomechanics, cognitive systems, control theory, machine learning, robot kinematics.

1300-BOTANY
Study of plant life and how they live, including structure, physiology, development and classification—plant cultivation, development, ecology, genetics and plant breeding, agriculture, agronomy, horticulture, forestry, plant taxonomy, plant physiology, hydroponics, algae, etc.

Cut this out and place it on the back of your board. Project #'s will be completed by the school.

Name _____

Title _____

Category _____

Teacher _____

Project # _____

Parent Signature_____

Science Fair Project Information…Due by Fri., September 30th.

Name: _____ Topic: _____

Category: _____

Problem/Question:_____