LISA ACADEMYNORTH 2011-2012 SCIENCE FAIR CALENDAR

DUE DATES FOR MIDDLE AND HIGH SCHOOL

	STEP	ASSIGNMENTS	DUE DATES	MAXIMUM GRADE/GRADE LOG			
				SCIENCE	ENGLISH	Completed	grade
1st QUARTER	1	Students will receive their Science Fair Booklets.	September 8				
	2	Informative Science Fair Meeting for Parents	September 14				
	3	Turn in the Parental Notification Form	September 12	50			
	4	Topic Approval	September 19	50			
	5	Research Plan Attachment (Problem, Hypothesis, Procedure and Bibliography)	October 7	100			
	6	Safety and Approval Forms	October 18	100			
2nd QUARTER	7	Rough Draft	November 7	150	150		
	8	Research Paper	November 28	300	150		
	9	Class wide Junior Academy of Science (Power Point Presentation of the Projects)	December 12-16	200			
3rd QUARTER	10	Display Board	January 11	250			
	11	*4th Annual School wide Science Fair (Mandatory for Everyone)*	January 21	300			
	☺	Awards Ceremony	TBA	☺	☺		
	12	Registration Deadlines for Central Arkansas Regional Science Fair (CARSF) and Junior Academy of Science (JAS)	CARSF February 10 JAS February 10				
	13	Central Arkansas Regional Science Fair (CARSF) and Central Arkansas Regional Junior Academy of Science (JAS)	March 2				

All students are required to complete a Science Fair Project.

6th Grade students are not eligible for JAS

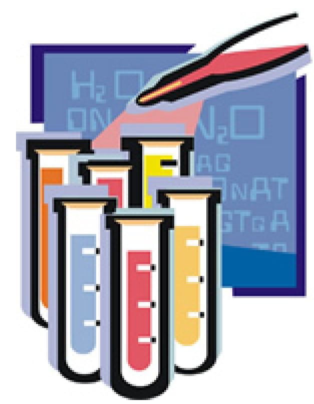
SCIENCE FAIR GOALS

Science teachers have many reasons why we believe the Science Fair is an invaluable experience for our students. Some of the top reasons or goals that we hope our students achieve are:

1. To stimulate interest, curiosity, and desire to explore the mysteries of the world.
2. To learn, understand, and apply the scientific method.
3. To provide real experiences and methods by which all scientific knowledge has been and is still being gathered.
4. To help develop skills in communicating both verbally and in writing.
5. To help develop skills of interpretation and analysis of data.
6. To learn how to complete long range projects.
7. To acquire skills of research using a variety of resources such as the Internet, interviews, books, magazines, etc.
8. To show a connection between what is learned in the class and what happens in real life.
9. To promote unique opportunities for us (teachers) to work individually with you (the student) in an interdisciplinary project.
10. To foster independence in the student by providing the opportunity for you to take initiative and responsibility in studying a topic for your own learning.

FOUR MAJOR COMPONENTS

The science fair project can be divided into four major components or parts.



1. The Experiment:
    1. choosing a topic
    2. performing an experiment
2. The Research Paper:
    1. review literature (research) about your topic and closely related topics
    2. summarize the experiment and draw conclusions from the experiment
    3. write a properly formatted and cited research paper
3. The Visual Display
    1. prepare a backboard that illustrates the complete science project
    2. display equipment and materials needed to explain the project
4. The Oral Presentation
    1. present orally a summary of the project to your teacher, classmates, or judges
    2. share and explain all phases of the project in an open setting

GENERAL RULES AND REGUALTIONS

1. All students in LISA in grades 4 thru 11 are required to complete and submit a science fair project.
2. Students will receive grades for their research as well as their exhibits/projects. These grades will determine the majority of 2nd and 3rd Report Card grades in Science class.
3. Students are to do individual science projects until they are in high school. Even then, students are encouraged to do individual projects, group projects are allowed in all divisions, including the Senior Division. Maximum three students may be involved in a group project.
4. All exhibits will be turned in on the due date. See the calendar of events. **No** late exhibit is **accepted!**
5. All exhibits should be taken home by the student one week after the school-wide science fair. Some projects will be asked to stay at school for future demonstrations, or for use in further science fairs. Exhibits not taken home will be discarded. LISA Academy does not take the responsibility for loss or damage to any of the exhibits.
6. Exhibits will have access to electrical power. If your project will need power, request one week in advance to due date.
7. Fair rules will be distributed to the students before school-wide science fair. Failure to follow these rules may result in disqualification from the fair.
8. If a student wins a trophy or medal in the city-wide or state-wide science fair, or in any other competition/contest in which he/she represents the school, the school would like to keep the trophy or medal to display in a display case recognizing our student's accomplishments.

SAFETY GUIDELINES

LISA Academy follows all rules and requirements specified by Little Rock science fair competition. Students should obtain approval for the projects include biological cultures, chemicals, fire, and radiation.

The exhibits **must not** include any of the following:

1. Microbial cultures or fungi, live or dead (no rotten or moldy stuff either!) Try photographs instead.
2. Displays of live animals.
3. Preserved vertebrate animals, whether whole or their parts (this includes humans).Teeth, hair, nails, and histological sections are permissible if properly acquired and form is filed.
4. Photographs showing vertebrate animals in any non-normal condition.
5. Open or concealed flames, matches, or lighters.
6. Dangerous chemicals, including caustics, acids, and many household chemicals.
7. Highly combustible solids, fluids, or gases. (No rocket engines!)
8. Controlled substances.
9. Radioactive materials.
10. Operating lasers.
11. Anything potentially hazardous to the public.

Special care must be given to the following:

12. High temperature.
13. Batteries. (Open top cells are not permitted.)
14. High voltage equipment must be shielded with a grounded metal box or cage to prevent accidental contact. Wiring, switches, and metal parts must be located out of reach.

15. Electric circuits for 110 volts AC must have an underwriters laboratories approved card equipped with a grounded (3 pronged) plug. Exhibits are limited to 300 watts. All wiring must be properly insulated.
16. Bare wire and exposed knife switches are permissible only in low voltage, low current circuit of 12 volts or less.
17. Electrical connections in 110 volt circuits must be soldered or fixed with approved connectors.
18. Devices emitting ultraviolet light must be equipped with the proper filters for eye protection

DIVISONS & CATEGORIES

Animal Sciences
Behavioral and Social Sciences
Biochemistry
Cellular and Molecular Biology
Chemistry
Computer Sciences
Earth and Planetary Science
Engineering
Energy and Transportation
Environmental Science
Mathematical Science
Medical and Health
Microbiology
Physics and Astronomy
Plant Science

STEPS IN DOING AN EXPERIMENTAL SCIENCE PROJECT

The steps in the experimental scientific method as usually presented are: Observation, Hypothesis, Controlled Experiment, and Conclusion. To actually do a science experiment, many more steps are needed. The following more accurately reflects the course of an actual experimental investigation.

Initial Observation

You notice something, and wonder why it happens. You see something and wonder what causes it. You want to know how or why something works. You ask questions about what you have observed. You want to investigate. The first step is to clearly write down exactly what you have observed. You may ask more than one question in your project.

Information Gathering

Find out about what you want to investigate. Read books, magazines or ask professionals who might know in order to learn about the effect or area of study. Keep track of where you got your information from.

Title the Project

Choose a title that describes the effect or thing you are investigating. The title should be short and summarize what the investigation will deal with. The title will be placed on the display board so choose wisely.

State the Purpose of the Project

What do you want to find out? Write a statement that describes what you want to do. Use your observations and questions to write the statement.

Identify Variables

Based on your gathered information, make an educated guess about what types of things affect the system you are working with. Identifying variables is necessary before you can make a hypothesis. You must include constant, independent and dependent variables for your project. You will also be required to have a control group.

Make Hypothesis

When you think you know what variables may be involved, think about ways to change one at a time. If you change more than one at a time, you will not know what variable is causing your observation. Sometimes variables are linked and work together to cause something. At first, try to choose variables that you think act independently of each other. At this point, you are ready to translate your questions into hypothesis. *A hypothesis is an educated guess that describes what you think the results of your experiment will be.* If you ask more than one question in your project, you will have more than one hypothesis.

Make a list of your answers to the questions you have. This can be a list of statements describing how or why you think the observed things work. These questions must be framed in terms of the variables you have identified. There is usually one hypothesis for each question you have. You must do at least one experiment to test each hypothesis. This is a very important step. If possible, ask a teacher to go over your hypothesis with you.

Design Experiments to Test Your Hypothesis

Design an experiment to test each hypothesis. Make a step-by-step list of what you will do to answer each question. This list is called an experimental procedure. For an experiment to give answers you can trust, it must have a "control."

A control is an additional experimental trial or run. It is a separate experiment, done exactly like the others. The only difference is that no experimental variables are changed. A control is a neutral "reference point" for comparison that allows you to see what changing a variable does by comparing it to not changing anything. Dependable controls are sometimes very hard to develop. They can be the hardest part of a project. Without a control you cannot be sure that changing the variable causes your observations. A series of experiments that includes a control is called a "controlled experiment."

Experiments are often done many times to guarantee that what you observe is reproducible, or to obtain an average result. Reproducibility is a crucial requirement. Without it you cannot trust your results. Reproducible experiments reduce the chance that you have made an experimental error, or observed a random effect during one particular experimental run. They experiment should be performed at least 3 times for the results to be considered accurate.

Some Guidelines for Experimental Procedures

- Select only one thing to change in each experiment. Things that can be changed are called variables.
- Change something that will help you answer your questions.
- The procedure must tell how you will change this one thing.
- The procedure must explain how you will measure the amount of change.
- Each experiment should have a "control" for comparison so that you can see what the change actually did.

Obtain Materials and Equipment

Make a list of the things you need to do the experiment, and prepare them.

Do the Experiments and Record Data

Experiments are often done in series. A series of experiments can be done by changing one variable a different amount each time. A series of experiments is made up of separate experimental "runs." During each run you make a measurement of how much the variable affected the system under study. For each run, a different amount of change in the variable is used. This produces a different amount of response in the system. You measure this response, or record data, in a table for this purpose. This is considered "raw data" since it has not been processed or interpreted yet. When raw data gets processed mathematically, for example, it becomes results.
As you do experiments, record all numerical measurements made. Data can be amounts of chemicals used, how long something is, the time something took, etc. If you are not making any measurements, you probably are not doing an experimental science project.

Record Your Observations

Observations can be written descriptions of what you noticed during an experiment, or problems encountered. Keep careful notes of everything you do, and everything that happens. Observations are valuable when drawing conclusions, and useful for locating experimental errors.

Perform Calculations

Do any calculations needed from your raw data to obtain the numbers you need to draw your conclusions. For example, you weighed a container. This weight is recorded in your raw data table as "wt. of container." You then added some soil to the container and weighed it again. This would be entered as "wt. of container + soil." In the calculation section, do the calculation to find out how much soil was used in this experimental run:

(wt. of container + soil) - (wt. of container) = wt. of soil used

Each calculated answer is entered into a table in a Results section.

Not all experiments need a calculation section. However, if you do not have any calculations you may not be using the experimental scientific method. If you have calculations to make, you probably are using the experimental scientific method.

Summarize Results

Summarize what happened. This can be in the form of a table of processed numerical data, or graphs. It could also be a written statement of what occurred during experiments.

It is from calculations using recorded data that tables and graphs are made. Studying tables and graphs, we can see trends that tell us how different variables cause our observations. Based on these trends, we can draw conclusions about the system under study. These conclusions help us confirm or deny our original hypothesis. Often, mathematical equations can be made from graphs. These equations allow us to predict how a change will affect the system without the need to do additional experiments. Advanced levels of experimental science rely heavily on graphical and mathematical analysis of data. At this level, science becomes even more interesting and powerful.

Draw Conclusions

Using the trends in your experimental data and your experimental observations, try to answer your original questions. Is your hypothesis correct? Now is the time to pull together what happened, and assess the experiments you did.

Other Things You Can Mention in the Conclusion

- If your hypothesis is not correct, what could be the answer to your question?
- Summarize any difficulties or problems you had doing the experiment.
- Do you need to change the procedure and repeat your experiment?
- What would you do different next time?
- List other things you learned.

A SAMPLE PROJECT *** This is not the format the student will use. Teachers will give format for actual use.**

The Effect of Salt on the Boiling Temperature of Water

INITIAL OBSERVATION

Cooking instructions tell you to add salt to water before boiling it.

PROJECT TITLE

The Effect of Salt on the Boiling Temperature of Water

PURPOSE OF THE PROJECT

To find out how table salt affects the boiling temperature of water.

PROBLEM OF THE PROJECT

How does salt effect the boiling temperature of water?

HYPOTHESIS

Adding table salt to boiling water will cause the water to boil at a higher temperature.

MATERIALS AND EQUIPMENT

- Table Salt
- Distilled Water
- 2 Quart Cooking Pot
- Pint measuring cup
- Teaspoon and tablespoon measuring spoons
- Thermometer
- Stirring spoon
- Stove

EXPERIMENTAL PROCEDURE

1. Fill 2 quart cooking pot with one quart of distilled water.
2. Place on the stove and turn burner on high.
3. Bring the distilled water to a boil.
4. Using the thermometer, measure the temperature of the boiling water. Record the highest temperature reading. This is the **control** to compare with.
5. Measure out table salt using a kitchen measuring spoon. Level the spoonful.
6. Add the measured salt to the boiling water and stir.
7. Measure the temperature of the boiling water with the salt in it. Record the highest temperature reading.
8. Repeat for other amounts of salt.

DATA

Data Obtained: 2/25/07, Mankato, MN	
Amount of boiling water	2 Cups
Temperature of boiling water **(Control)**	212.9° F
Amount of table salt added to boiling water: Run #1	1 Tbs.
Temperature of boiling water after adding salt: Run #1	215.6° F
Additional amount of table salt added to boiling water: Run #2	1 Tbs.
Temperature of boiling water after adding salt: Run #2	218.3° F

EXPERIMENTAL OBSERVATIONS

When the salt was added to boiling water it bubbled up more, and then stopped boiling. Shortly afterwards, it boiled again.

If the thermometer extends beyond the outside of the pot it reads a higher temperature. Heat from the stove burner makes the thermometer read higher. Keep the thermometer over the pot when making temperature measurements.

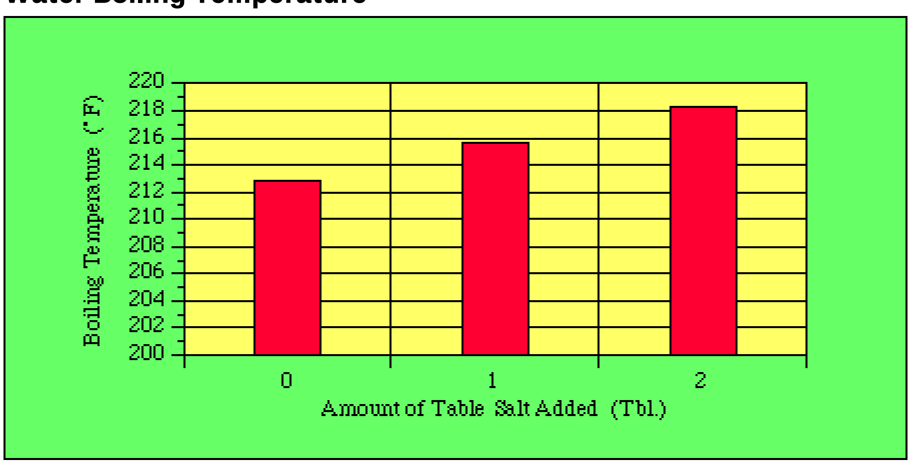
CALCULATIONS

- Total amount of table salt added for Run #1: 0 + 1 = 1 Tbs.
- Total amount of table salt added for Run #2: 1 + 1 = 2 Tbs.

RESULTS

Temperature of boiling water **(Control)**	212.9° F
Amount of table salt added to boiling water: Run #1	1 Tbs.
Temperature of boiling water after adding salt: Run #1	215.6° F
Total amount of table salt added to boiling water: Run #2	2 Tbs.
Temperature of boiling water after adding salt: Run #2	218.3° F

Amount of Table Salt Added Versus
Water Boiling Temperature



CONCLUSIONS

- Is the hypothesis correct?
  Yes. Adding table salt to water causes the water to boil at a higher temperature.
- Problems with doing the experiments.
  The temperature readings were hard to make. Gloves had to be worn to keep my hands from getting too hot. Had to be careful that the stove heat was not hitting the thermometer.
- Other things learned.
  Be careful when adding salt to boiling water. It makes the water boil vigorously for a second or two.

RELATED QUESTIONS

- Why do you think cooking instructions tell you to add salt when boiling water?
  When the water is hotter, you can cook food faster. Salt also makes the food taste better.

PARTS OF A RESEARCH PAPER & POWERPOINT PRESENTATIONS

Each student is required to submit a research paper for their research project. After their project is approved, Students will prepare a PowerPoint presentation and they will decorate a display board.

The following parts should be in the research paper and each part should be on a **separate** sheet of paper.

1. TITLE PAGE Topic, your name, school's name, grade, sponsor, city, state, and zip code
2. TABLE OF CONTENTS
3. ABSTRACT

   After finishing research and experimentation, you need to write a (maximum) 250-word, one-page abstract. An abstract should include the (a) purpose of the experiment, (b) procedures used, (c) data, and (d) conclusions. It also may include any possible research applications. Only minimal reference to previous work may be included. The abstract must focus on work done since the last fair and should not include: a) acknowledgements, or b) work or procedures done by the mentor.
4. ACKNOWLEDGEMENTS
5. INTRODUCTION (Explain your topic. What is it about?)
6. PURPOSE (The purpose of a statement of what you intend to do. What is your goal? What idea are you trying to test?)
7. PROBLEM (What is the scientific question you are trying to answer?)
8. HYPOTHESIS (Explain how you think your project demonstrate your purpose. Make a prediction regarding the outcome of your experiment. State the results you are predicting in measurable terms.)
9. VARIABLES (Independent, dependent, constants, and control group. Be clear about the variables (elements of the experiment that change to test your hypothesis) versus your controls (elements of the experiment that do not change).
10. MATERIALS (**List** all materials and equipment that were used. Your list of materials should include all of the ingredients of the procedure recipe.)
11. PROCEDURE (**In steps** not in paragraphs), if possible, with pictures. Give a detailed explanation of how you will conduct the experiment to test your hypothesis. Be very specific about how you will measure results to prove or disprove your hypothesis. You should include a regular timetable for measuring results or observing the projects (for example, every hour, every day, and every week). Your procedure should be like a recipe – Another person should be able to perform your experiment following your procedure. Test this with a friend or parent to be sure you have not forgotten anything.)
12. PICTURES (no faces allowed except the person who owns the project)

13. DATA TABLES (All of your data in tables)
14. GRAPHS!
15. ANALYSIS (Explain your observations, data and results. This is a summary of what your data has shown you. List the main points that you have learned. Why did the results occur? What did your experiment prove? Was your hypothesis correct? Did your experiment prove or disprove your hypothesis? This should be explained thoroughly.)
16. CONCLUSION (Answer your problem/purpose statement. What does it all add up to? What is the value of your project?)
17. APPLICATIONS & FURTHER RESEARCH (What is the application of your project in daily life/economy? What further study do you recommend given the results of your experiment? What would be the next question to ask? If you repeated this project, what would you change?)
18. BIBLIOGRAPHY List the books, magazines, or other communications you used to research your topic. **APA format** is required!!!

Write in complete sentences. Add titles, units and labels where necessary.

DISPLAY BOARD

Your science fair display represents all the work that you have done. It should consist of a backboard, the project report, and anything that represents your project, such as models made, items studied, photographs, surveys, and the like. It must tell the story of the project in such a way that it attracts and holds the interest of the viewer. It has to be thorough, but not too crowded, so keep it simple. The allowable size and shape of the display backboard can vary, so you will have to check the rules for your science fair. Most exhibits are allowed to be 48 inches (122 cm) wide, 30 inches (76 cm) deep, and 108 inches (274 cm) high (including the table it stands on). These are maximum measurements, so your display may be smaller than this. **DO NOT USE THE SMALL DISPLAY BOARDS OR IT WILL HAVE TO BE REDONE.** A three-sided backboard is usually the best way to display your work. Sturdy cardboard or other heavy material is easier to work with and is less likely to be damaged during transportation to the fair. Some office supply stores sell inexpensive premade backboards such as Hobby Lobby, Office Depot. Purchased backboards generally come in colors such as black, blue, red, yellow, pink, green and white. You may use one of these colors. The title and other headings should be neat and large enough to be read at a distance of about 3 feet (1 m). A short title is often eye-catching. Self-sticking letters, of various sizes and colors, for the title and headings can be purchased at office supply stores and stuck to the backboard. You can cut your own letters out of construction paper or stencil the letters for all the titles directly onto the backboard. You can also use a word processor to print the title and other headings.

Some teachers have set rules about the position of the information on the backboard.
The following headings are examples: Problem, Hypothesis, Experiment (materials and procedure), Data, Results, Conclusion. The project title should go at the top of the center panel, and the remaining material needs to be placed neatly in some order.

MRS. HESLEP WILL GIVE STUDENTS THE FORMAT TO USE WHEN CREATING THE DISPLAY BOARD. Do not make the display board before your teacher gives you approval to do so.

You want a display that the judges will remember positively. So before you glue everything down, lay the board on a flat surface and arrange the materials a few different ways. This will help you decide on the most suitable and attractive presentation. The figure below shows what a good display might look like.

``THE PRESENTATION

1. The presentation along with the backboard is very important within the scientific community. Using the backboard as your prop, you will present your project in an objective and scientific perspective. The following topics should be addressed while presenting.
2. INTRODUCTION: Give the project title, your name, grade, school, and science teacher. Explain the topic to be discussed and why you became interested in this topic.
3. ACKNOWLEDGMENTS: Thank the people who helped you and those whom you contacted for interviews or research information.
4. PURPOSE AND HYPOTHESIS: State clearly the purpose and hypothesis. A short explanation of the reasoning behind the hypothesis is appropriate.
5. BACKGROUND INFORMATION: The background section is like a short review of literature. Give some of the information from the review but just enough to familiarize the audience.
6. PROCEDURE: A detailed and complete explanation of how you completed the experiment. Use the step by step method just as you wrote for the paper. Start with the first step and proceed including explanations of designs and techniques used while experimenting.
7. RESULTS: Use the charts and graphs on the backboard to explain the results and numbers that were produced from the experiment.
8. CONCLUSION: State clearly the conclusion, whether the hypothesis was accepted or rejected. Admit any deficiencies or errors that may have occurred during the experiment and may affect the conclusion. All scientists respect the fact that all experiments have some deficiencies.
9. FUTURE PLANS: Discuss any possible future investigations that can be done to continue with your project.
10. QUESTIONS: At the end, ask if anyone has questions for you. Take your time and think about the answer, then answer slowly. If you do not know the answer, admit it! Offer to look for the answer and then ask for more questions. It is better to admit to not knowing, than to be wrong! If questions are not related to your topic, try to clarify the question. If the question is still unrelated, then redirect the conversation back to your topic.
11. THANK THE AUDIENCE AND JUDGES FOR LISTENING!

HELPFUL HINTS:

- Use note cards and the backboard to make sure that you hit all points.
- Do NOT read the backboard or note cards.
- Speak slowly and face the audience.
- Be dynamic and enthusiastic.
- Practice! Practice! Practice in front of parents, friends, teachers, mirrors, etc.

SCIENCE
FAIR
HANDBOOK

2011-12