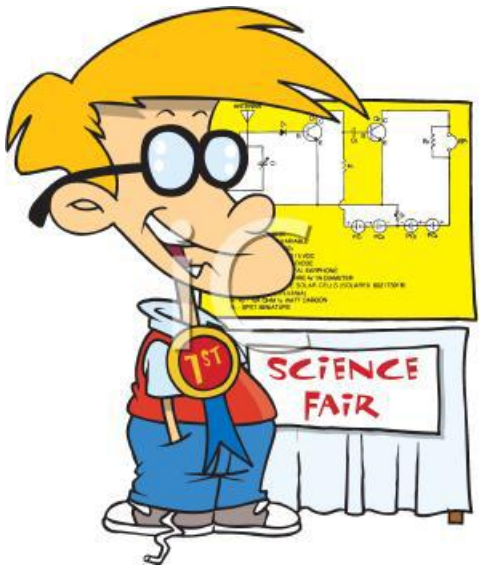
Science Fair



Student/Parent Packet

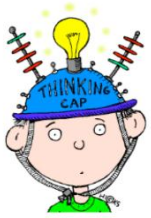
I. ACSI SCIENCE FAIR PHILOSOPHY

The Psalmist declares that God is the Creator and Sustainer of the world in which we live (89:11). Paul reminds us that this world is governed in an orderly way by specific laws and properties of matter and energy that God has established (Colossians 1:16-17). In order to fulfill His biblical mandate to subdue the earth and be good stewards of its resources, we must discover and understand all we can about the world in which we live.
Integrating the Bible with the school's science curriculum goes deeper than the use of scientific facts to illustrate spiritual truth, though such use is clearly scriptural. It also goes deeper than merely quoting Bible verses that refer to scientific subjects. It involves finding the scientific facts and principles that are taught in the Bible and incorporating them into the teacher where they are relevant to the subject at hand, thus consolidating truth gained from Bible study and from observations by men.

II. PURPOSE

ACSI provides the Science Fair so that students in our member schools can research, observe, analyze and draw conclusions in an area of science that is of interest to them. The Science Fair is designed to encourage students to study science from a biblical perspective. While we realize that younger students will need some assistance in developing their ideas and supervision as they do their experiments, 90% of the work is to be done by the students.
This packet is provided to help parents understand the process students are to follow in preparation for the Science Fair. Please direct specific questions to the science teacher at your child's school.

III. HOW TO HELP AS A PARENT



It is up to the student to decide what to study. You can help by motivating your child and listening to his or her ideas. However, it is crucial to remember that it is up to your child to design and execute the entire project. Judges at a science fair take particular care to note that the work is the student's and that the student understands the topic, the research, the experiments, the analysis of data, and the conclusion. The judges expect that the student has received some help from another person, such as a parent or teacher, **and that such help will be credited in the display.**

Support the Troops Your child may need more attention than a teacher can give to each student in a large class. Some class time will be devoted to researching at the library; however, your child may find it helpful to do more library research outside of school. Expect your child to spend time brainstorming, researching, planning, experimenting, analyzing data, writing a report, and constructing a display. You may offer to spend time with your child at the library. You can also help by encouraging your child to record everything in his or her science project journal, such as notes from brainstorming, sources used during research, and observations made during data collection.
Your child has been told that an adult must be present during all data collection. Please supervise the experimental phase for safety purposes. You may refer to the Safety Guide to help avoid accidents during data collection.

When You Should Help It is very easy to take control of a student's project, especially if you think it should be done differently. Remember that this project is a learning experience for your child, and he or she will not benefit from a project performed by you. If your child is performing all the necessary tasks to an acceptable standard and is not requesting assistance, your job is to supervise. If your child asks for help, appears to be struggling, or is performing below acceptable standards or with disregard for safety measures, then you may wish to offer assistance.
(Science Fair Guide: Resources for Students, http://go.hrw.com/resources/go_sc/hst/HSTGP221.PDF)

THE PLAN

I. Steps for deciding on a science project topic:
   A. Decide on an interesting field.
   B. Choose a subtopic which relates to your hobby.
   C. Choose a modern problem which relates to the subtopic. The following are important to this choice:
      1. Topic problem must be able to be tested.
      2. Topic problem should yield numbers, that is, it must be quantifiable…
      3. Topic is within means of student, that is, the student must have the:
         a. Research sources available.
         b. Equipment available.
         c. Time to do the project.
   D. Write out your question. Begin your logbook.

II. Research the question and the related topics. Use the following resources:
   A. Use the library (concentrate on periodicals).
   B. Interview an expert.

III. Write out your hypothesis.

IV. Determine your procedure. Go ahead and do these steps:
   A. Set up your equipment.
   B. Write out the procedure.

V. Perform the experiment. This includes:
   A. Standardize the equipment. (Calibrate the instruments, etc.)
   B. Do the experiment.
   C. Write out your observations and sources of error.

VI. Evaluate the results by doing the following:
   A. Compare your results with your problem as written. Did the experiment answer your question?
   B. Write out your results and calculations steps.

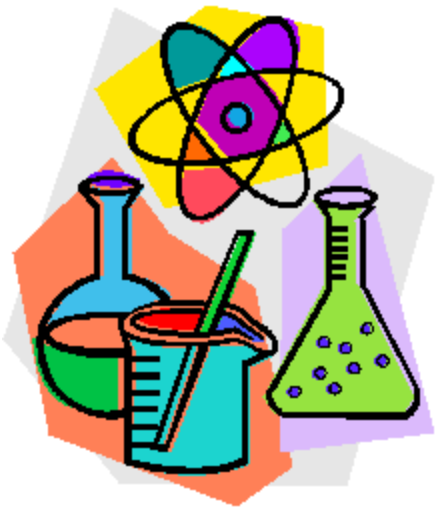
VII. Conclusion.
   A. Compare your results to your hypothesis.
   B. Write your conclusion.

VIII. Put together your paper.
   A. Finish all steps.
   B. Put the written work in order.
   C. Have someone proofread your paper.
   D. Write your abstract.

IX. Finish your logbook.

X. Put together your display.

XI. Prepare your oral presentation.



Science Fair Guidelines

*(This is a summary of the **ACSI requirements. Please read the details in the enclosed packet**.)*

- **Choose a topic and problem to be solved.** A good topic is one that is chosen to fit your interests and abilities. There are many good ideas for projects in the school library.

- **Logbook** (notebook)**.** It is the history and the record of progression of your project. Begins on the first day you receive the assignment and ends the day you turn it in. It is your science project diary. Record your work in your logbook: when your experimentation begins; refine your procedures in detail and write it out; step-by-step; of all work done on your project. Make sure your name is on the Title/Cover page of your logbook. Keep track of all work done and time spent on your project. **Resulting data will be summarized in your written report** (T*he ACSI Project Approval Form and Consent Form for Photographs must be included in your logbook*).

- **Fill out the Science Project Worksheet.** Talk to your teacher and your parents to verify that your project is suitable for your grade level and satisfies the guidelines.

- **Select a Bible verse** which relates to your topic. Include on visual display and written report.

- **Write a written report** on the area you have chosen. All science projects need to be experimental. You may use note cards to organize your research. All sources must be identified and referenced, whether they are from the internet, computer software, books, magazines, etc. Must have title page, footnotes and bibliography. The written report must include the biblical application/illustration that also appears on the display.

  3rd-4th Grade: Length of report--minimum of **200 words**.
  The Written report should be typed.

  5th-6th Grade: Length of report—minimum of **250 words**.
  The Written report must be typed.

  7th-8th Grade: Length of report—minimum of **500 words**.
  The written report (must be **typed in APA or MLA style)**.
  The report must include details of literary research done on the hypothesis but also an explanation of biblical application.

- **Do Science Experiment.**

  Identify problem. State the problem in the form of a question.
  Do background research. Literature research is done from several sources (books, magazines, pamphlets, etc.) in order to gain a broad understanding of the scope of the subject. This helps to form an idea for possible solution to the given problem.

  Form a hypothesis. A hypothesis is a proposed solution to the problem being considered. It is a tentative assumption made for the purpose of testing—an educated guess as to the solution of the given problem.

Test your hypothesis by conducting an experiment. Record the materials used and procedure that was followed. Clear, measurable records need to be recorded. Remember to keep a diary of everything you do in your logbook.

Do not use dangerous chemicals or devices. Take all necessary safety precautions when conducting your experiment. Anything potentially dangerous will not be allowed on or with your Science Fair display.

Write a conclusion. It should be a statement specifying whether your hypothesis was correct or incorrect. It may also include statements recommending what further experiments could be done to broaden the research and prove or disprove your hypothesis. You may also state why the experiment was inconclusive.

- **Prepare a Display Board.**

Maximum Size: 48" wide x 30" deep x 72" high (from the table top)

Include the following:

Title (short, descriptive, in the form of a question)
Abstract (summary of experiment- 250 words or fewer)
Hypothesis
Procedure
Data (data tables, pictures, graphs, etc.)
Conclusion
Bible verse
Student name, grade and school on an identification label on the **back** lower right-hand corner of the display board

Tips: Lettering should be large and attractive, **not hand written**.
Include lots of pictures of yourself doing your experiment.
Decorate with color and "extras" to give it eye-appeal.

- **Prepare an oral presentation**—3 to 5 minutes long.

State your topic/problem.
You may mention background information gathered in research.
Explain your experiment.
Mention results of the experiment including your tables & graphs.
State your conclusion. Also explain what further experimentation could be done to broaden the scope of the problem. (It is okay if your conclusion disproves your hypothesis)
Maintain eye contact with the judge when not pointing out something on your board.

Judge may ask questions such as:

- What was your hypothesis?
- What were your variables?
- What was your control? (Part that remained the same throughout the experiment.)
- What were the results of your experiment—did it prove or disprove your hypothesis?
- What was your conclusion?
- Did you encounter any problems in conducting the experiment?

IV. FIVE PARTS OF THE SCIENCE FAIR PROJECT

1. The experiment using the Scientific Method
2. The Logbook
3. The Written Report
4. The Display Board
5. The Oral Presentation

A. *THE EXPERIMENT*

A project is experimental if it meets the following criteria:

- A hypothesis is posed (a statement, not a question)
- A student experiment is conducted, using the scientific method
- Data/records are collected and analyzed (the experiment results in data that can be measured)
- The solution to a problem is sought

STEPS IN THE SCIENTIFIC METHOD

1. **Select a topic** – the topic should be interesting, original, allow for completion by the due date, not be too expensive, and it should have data that is measurable.

2. **Research and planning** – check with the classroom teacher as to how many resources are required. The research should help the student in planning the experiment and developing the hypothesis statement. The hypothesis is an educated guess, based on the research, about the answer to the investigative question (title). Don't forget – professionals are also a good resource.

3. **Experiment** - Plan the experiment. What materials will you need and what steps will you take in testing your hypothesis? Record these steps in your logbook. Test the hypothesis at least **three** times. There should only be ONE variable in the experiment. The more times you repeat the experiment, the more reliable your results will be. Be sure to collect data for all trials. You can take photos to document your work as you go.

4. **Observe**, record and analyze data – Write down the steps that were followed and the data results in the logbook. Organize data from the research and experiment, looking for patterns.

5. **Draw a conclusion** – determining if the hypothesis is supported or disproved by the experimental results.

6. **Write the report** – the written report is not written the same way a report may be written for an English class. Please follow guidelines for writing this report.

7. **Display** – the classroom teacher has the specific dimensions of the display board. Although it is tempting for students to use all computer graphics – or for younger students to have parents develop computer graphics, the best display boards are not always the "prettiest" boards. Please allow your student to design their board with your guidance.

8. **Oral presentation** – each student will give an oral presentation describing how they did their experiment, what they learned, what they would do differently, etc., to the judges. Students should be comfortable explaining their project to the judges. Judges may also ask questions to clarify their understanding of the process.

B. LOGBOOK

Everything you do on your project is in your logbook!

- History and record of progression of project (begin day of assignment, end the day turned in)
- Like a diary of science project – every time you work on your project record in logbook
- When experimentation begins, include procedure in detail and write out step-by-step
- Include drawings and labels
- Explain how all variables are controlled

Include

☐ *Title Page* – title of project; name of student researcher; name of student's school

☐ *Second Page (and those following)* – question being investigated; list of materials; method for conducting experiment (plan); notations of safety precautions

☐ ACSI Project Approval Form, any required ISEF forms, consent forms for photographs of individuals used on display or in reports

☐ *Subsequent pages* – record experimental procedures and actual data should be written down immediately (not scribbled on scraps of paper and entered later); dated pages

The logbook should be with you at all times while you are working on your experiment.

*Remember – an experiment can support or not support the hypothesis. Thomas Edison failed more times than he succeeded in his lifetime, but is still considered one of the greatest inventors of all times. The important thing is that the student uses the data in analyzing what happened and draw a conclusion as to why it happened.

C. WRITTEN REPORT

Requirements

Grades 1-2: few sentences; handwritten
Grades 3-4: min. of 200 words; neatly handwritten or typed
Grades 5-6: min. of 250 words; typed
Grades 7-8: min. of 500 words; typed

A Science Fair report is not written the same way a report would be written for an English class. When finished, the written report should be a neatly typed or handwritten summary of your logbook. The written report should be divided into sections with headings labeled according to the list below.

Content

- ☐ ***Title Page*** – include title (question format) and date
- ☐ ***Table of Contents*** – shows organization of report
- ☐ ***Abstract*** – brief description (paragraph) about what happened during project
- ☐ ***Introduction*** – begins with hypothesis
  - include background research (information needed to understand project) and biblical illustration ends with statement of what was studied in project
- ☐ ***Materials and Methods*** – detailed information so someone could repeat your experiment
  - using lists and step-by-step format NOT WRITTEN as paragraph
  - include variables and control
- ☐ ***Results*/Data** – uses data from logbook, in sequence; include graphs and charts NOT explaining results
- ☐ ***Discussion*** – EXPLAIN what did or did not happen in your experiment (do not repeat data, DISCUSS it)
  - explain possible sources of errors
  - cite literature to support conclusions
  - DO NOT state hypothesis was proven or disproven, only that data supports or disagrees
- ☐ ***Conclusion*** – summarize major discoveries found in experiment
- ☐ ***Acknowledgements*** – students acknowledge outside help received in performing project or conduction of research
- ☐ ***Literature Cited*** – all sources must be identified/referenced, including internet and computer software only works quoted are to be included, not research in preparation

Format: Author last name, first name initials, date of publication, title of book, location where published
Ex: Jones, T. *Hypertension in Young Adults*. New York: HarperCollins, 1998.

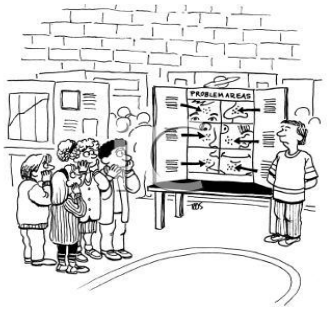
D. DISPLAY BOARD

- ☐ ***Title*** – Use QUESTION format, *Use on BOARD, LOGBOOK, and REPORT
- ☐ ***Biblical application/illustration*** - Each project must include a biblical illustration to be displayed on board and included in report

  Students should demonstrate an understanding in written report and oral presentations
  *Use on BOARD, WRITTEN REPORT
- ☐ ***Abstract*** - Summary description of what was done
  *Use on BOARD, LOGBOOK, and REPORT
- ☐ ***Background information*** (including problem, hypothesis, variables, control)
- ☐ ***Experimental Design*** – include a drawing or diagram of the project
  Results - include tables and graphs of data
  *Use on BOARD, LOGBOOK, and REPORT

- ☐ ***Conclusion*** - State whether hypothesis was correct; if not state needed changes, State what could be done to broaden scope of problem
  *Use on BOARD, LOGBOOK, and REPORT
- ☐ ***Written Report*** – this MUST be with your display
- ☐ ***Logbook*** (including ACSI Project Approval form) – MUST be with display and separate from written report
- ☐ ***Equipment***, samples, or other items from experiment may be included – do NOT include prohibited items such as glass, chemicals, etc.)
- ☐ ***Photographs and/or Diagrams*** - Included on display board and/or logbook to demonstrate the experimental process
  Origins must be credited if not part of student's experimental process
  Photographs of human subjects (other than student) must be accompanied by consent forms
- ☐ ***Science Fair ID label*** on lower right hand side of display board

E. *ORAL PRESENTATION*



Each student will have several minutes to discuss their project with the judges. Judges are interested in knowing if the student is knowledgeable about the topic. Can the student explain the project in knowledgeable/scientific terms and explain background information? Can the student accurately interpret the results of the experiment? Has a biblical application/ illustration been integrated into the presentation? (Fifth through sixth graders should give a short presentation; younger students should be led, or prompted, by judges 'questions to draw out the information.)

Examples of questions a judge may ask (depending on age of the student):

- Why did you decide on this topic?
- What is the purpose of your project?
- What was your hypothesis?
- Which variable did you change?
- For each value of the variable that you changed (the independent variable), how many trials did you conduct?
- What response did you observe or measure?
- What are some of the things you were careful not to let change (the constants) as you did the experiment?
- What procedures did you follow?
- In your experiment, what was the control? What sample did you use to compare the others with?
- What results did you find?
- What conclusions did you draw?
- How did your results relate to your original hypothesis?
- If you had a mentor, in what ways did your mentor assist you?
- In doing your library research, what related research did you find that was helpful to you in conducting your project?
- What would you do differently if you were to do the project again?
- What might you do in the future to continue your project?

V. RESOURCES

For more detailed information please contact the classroom teacher. The *ACSI Science Fair Coordinator Handbook* contains more detailed descriptions of the written report, logbook and display board.
Science Fair ideas – you can do a SEARCH on your browser for *science fair project ideas for grades…..*

V. NOT ALLOWED IN PROJECT DISPLAY

Anything that could potentially be dangerous to the public is **NOT** allowed to be included in your ACSI Science Fair display, including, but not limited to, the following list.

- No living organisms, including plants
- No taxidermy specimens or parts
- No preserved vertebrate or invertebrate animals
- No human or animal food
- No human/animal parts or body fluids (*for example, blood, urine*)
- No plant materials (living, dead, or preserved) that are in their raw, unprocessed, or non-manufactured state *(exception: manufactured construction materials used in building the project or display)*
- No laboratory/household chemicals, including water *(exception: water that is integral to an enclosed apparatus)*
- No poisons, drugs, controlled substances, hazardous substances or devices *(for example, firearms, weapons, ammunition, reloading devices)*
- No dry ice or other sublimating solids
- No sharp items *(for example, syringes, needles, pipettes, knives)*
- No flames or highly flammable materials
- No batteries with open-top cells
- No photographs or other visual presentations showing vertebrate animals in surgical techniques, dissections, necropsies, or other lab procedures
- No active internet or e-mail connections as part of displaying or operating the project at the ACSI Science Fair
- No glass or glass objects unless deemed necessary by adult sponsor and event chair to be necessary
- No apparatus deemed unsafe by entrant's adult sponsor and event chair (for example, large vacuum tubes or dangerous ray-generating devices, empty tanks that previously contained combustible liquids or gases, pressurized tanks)