STUDENT HANDBOOK

GILA COUNTY REGIONAL

Science Fair

MARCH 5, 2015 • Bullion Plaza, Miami

Compiled by the
Gila County School Superintendent's Office

2014-2015

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2015 Gila County Regional Science Fair Committee

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Resources

- Gila County Schools website www.gilacountyesa.org
- Arizona Science & Engineering Fair website www.azsef.org
- Society for Science & the Public www.societyforscience.org
- Virtual Science Investigation http://school.discoveryeducation.com/sciencefaircentral
- Science Buddies www.sciencebuddies.org (offers an interest inventory questionnaire to help students choose a science fair project)
- Southern Arizona Science and Engineering Fair website www.sarsef.org
- Arizona Science Center www.azscience.org
- Video Series: How to Do a Science Fair Project www.jpl.nasa.gov/education/sciencefair

Acknowledgements:

In preparing this handbook, the author utilized materials from the Intel International Science and Engineering Fair Rules and Guidelines 2014, the Southern Arizona Science and Engineering Fair website, the Mendocino County Student Handbook for Science Projects, and "How To" guides available online at ScienceBuddies.org.

Student thinks of a question to test for an independent science experiment and proposes idea to teacher/sponsor

Adult Supervisor reviews project and determines if it is safe for the student researcher and for the test subjects. Adult Supervisor consults with school science fair coordinator on next steps – how to register project and get approval.

If the project requires SRC* approval

BEFORE beginning the experiment, go online to www.azsef.org and fill out the SRC approval form and submit request.

If the project does not require SRC* approval

Student conducts independent science research experiment, collects and analyzes data, writes a conclusion and prepares a research summary paper, and display board.

Student participates in school/district science fair

Student places 1st at school/ district fair

School science fair coordinator registers school/district 1st place winners online for the regional science fair. Coordinator acknowledges that student has completed all necessary forms to compete.

Deliver winning projects to the Regional Science Fair on **Wednesday, March 4 between 12 p.m. and 6 p.m. at the Bullion Plaza Gym**.

Attend the **Gila County Regional Science Fair on Thursday, March 5, 2015** at Bullion Plaza Cultural Center and Museum in Miami, AZ. Judging will be held from 8:30 a.m. to 12:00 p.m. Interviews will begin at 10 a.m. Public viewing of the projects will begin at noon. Winners will be announced during the awards presentation at 2 p.m.

First place winners in each division and category will qualify to compete at the state science fair in April in Phoenix. The district/school coordinators are responsible for registering regional winners for the state competition. **The Arizona Science and Engineering Fair will be held April 7-9, 2015.** Please note: winners in the Elementary and Junior Division have a different process than winners in the Senior Division. Visit www.azsef.org for more information and to register.

GILA COUNTY REGIONAL Science Fair

MARCH 5, 2015 • Bullion Plaza, Miami

Sponsored by Dr. Linda O'Dell
Gila County School Superintendent

** Scientific Review Committee*

SCIENCE PROJECT TIMELINE

Here is a timeline to help you complete the steps of your project.

Student Name: ____

Project Title: ____

Date Due	Completed	Steps
________	________	Begin a log book. Write down possible topics and ideas for your project.
________	________	Select a topic and choose your study design.
________	________	Gather background information about the history, significance, facts, and methods of study for your topic.
________	________	Prepare a bibliography of your sources.
________	________	Decide on the problem and the hypothesis.
________	________	Define your independent variable (IV), dependent variable (DV), and constant variable (CV).
________	________	List the materials and write the procedure.
________	________	Collect the materials that you will need (including display board) and do a trial run of your procedure to be sure that it is going to work as planned.
________	________	Prepare a data table for recording results.
________	________	Run at least THREE trials of your procedure and collect data using metric measurements.
________	________	Take photographs or draw pictures being sure NOT to include peoples' faces.
________	________	Construct a graph that shows that the averages of your results and write a summary of your findings.
________	________	Write the conclusion and discuss the scientific worth of your project.
________	________	Write the project report (secondary only).
________	________	Prepare the items for the display and arrange them attractively on the board.

THE SCIENTIFIC METHOD VS. THE ENGINEERING DESIGN PROCESS

Scientific Method

The scientific method is a way to ask and answer scientific questions by making observations and doing experiments. The steps of the scientific method are to:

- Ask a Question
- Do Background Research
- Construct a Hypothesis
- Test Your Hypothesis by Doing an Experiment
- Analyze Your Data and Draw a Conclusion
- Communicate Your Results

It is important for your experiment to be a fair test. A "fair test" occurs when you change only one factor (variable) and keep all other conditions the same.

Engineering Design Process

While scientists study how nature works, engineers create new things, such as products, websites, environments, and experiences.

If your project involves creating or inventing something new, your project might better fit the steps of the Engineering Design Process.

If you are not sure if your project is a scientific or engineering project, you should read "Comparing the Engineering Design Process and the Scientific Method" at www.sciencebuddies.org.

The engineering design process is the set of steps that a designer takes to go from first, identifying a problem or need to, at the end, creating and developing a solution that solves the problem or meets the need. The steps of the engineering design process are to:

- Define the Problem
- Do Background Research
- Specify Requirements
- Brainstorm Solutions
- Choose the Best Solution
- Do Development Work
- Build a Prototype
- Test and Redesign

During the engineering design process, designers frequently jump back and forth between steps. Going back to earlier steps is common. This way of working is called **iteration**, and it is likely that your process will do the same!

While engineers create new things, such as products, websites, environments, and experiences, scientists study how nature works.

Keep in mind that although the steps below are listed in sequential order, you will likely return to previous steps multiple times throughout a project. It is often necessary to revisit stages or steps in order to improve that aspect of a project.

You can see the steps of each process in this chart:

Steps of The Scientific Method	***Steps of the Engineering Design Process***
State your question	Define the problem
Do background research	Do background research
Formulate your hypothesis, identify variables	Specify requirements
Design experiment, establish procedure	Create alternative solutions, choose the best one and develop it
Test your hypothesis by doing an experiment	Build a prototype
Analyze your results and draw conclusions	Test and redesign as necessary
Communicate results	Communicate results

Source: http://www.sciencebuddies.org/engineering-design-process/engineering-design-compare-scientific-method.shtml

Which process should I follow for my project?

In real life, the distinction between science and engineering is not always clear. Scientists often do some engineering work, and engineers frequently apply scientific principles, including the scientific method. Much of what we often call "computer science" is actually engineering—programmers creating new products. Your project may fall in the gray area between science and engineering, and that's OK. Many projects, even if related to engineering, can and should use the scientific method.

However, if the objective of your project is to invent a new product, computer program, experience, or environment, then it makes sense to follow the engineering design process.

DIVISIONS AND CATEGORIES

Science fair projects are judged based on age division and subject category. First place winners in each division and category from participating schools/districts are eligible to compete in the Regional Fair.

Divisions

The Gila County Regional Fair features three divisions of competition:

- Elementary Division – Grades 5-6
- Junior Division – Grades 7-8
- Senior Division – Grades 9-12

All three divisions are eligible for state competition.

Categories

Elementary & Junior Division Categories:

- Animal Sciences
- Behavioral & Social Science
- Cellular & Molecular Biology
- Chemistry
- Computer Science
- Earth and Planetary Science
- Engineering
- Environmental Sciences
- Mathematical Sciences
- Medicine & Health Sciences
- Physics & Astronomy
- Plant Sciences

Senior Division Categories:

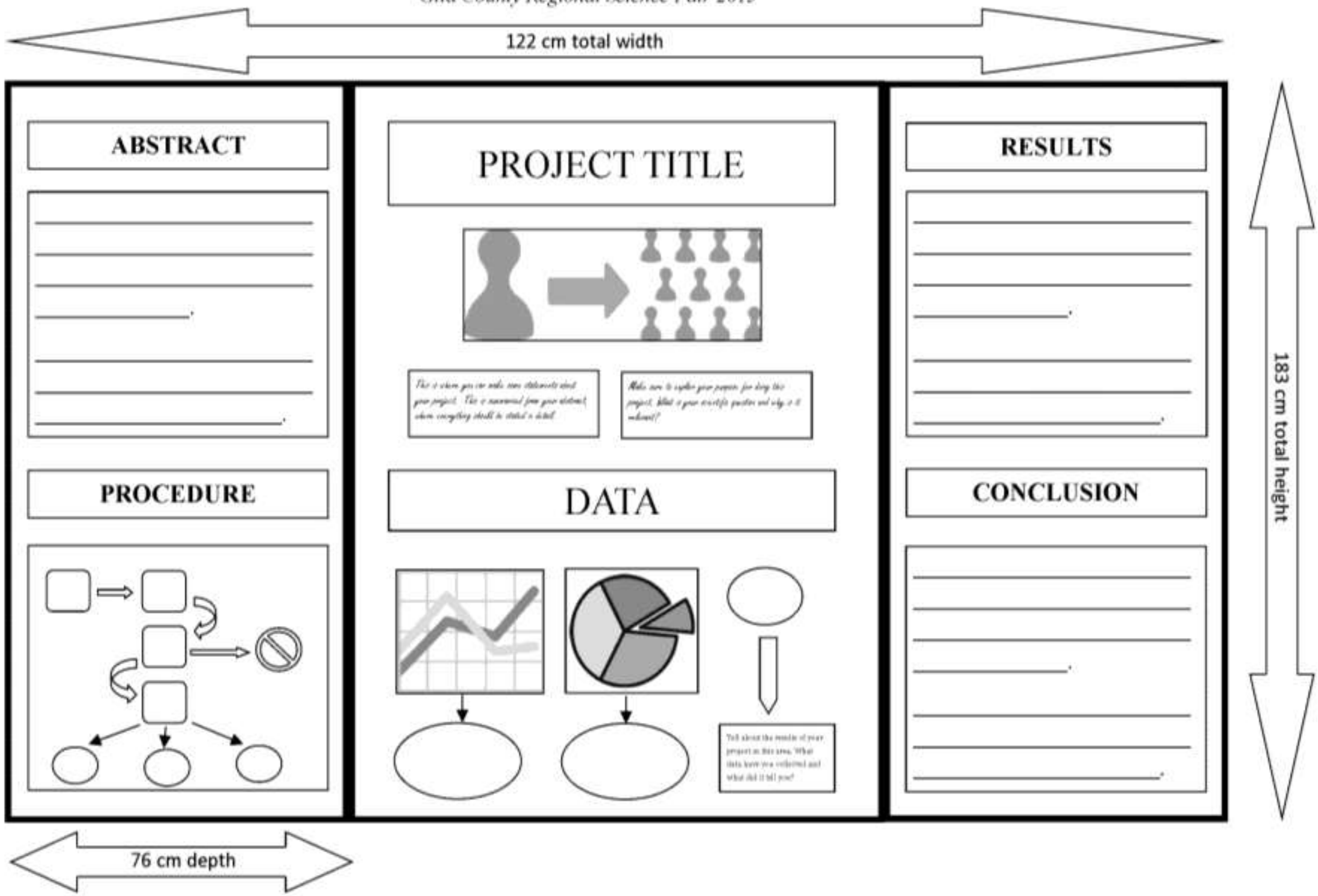
- Animal Sciences
- Behavioral & Social Sciences
- Biochemistry
- Cellular & Molecular Biology
- Chemistry
- Computer Science
- Earth and Planetary Science
- Engineering
- Engineering: Materials & Bioengineering
- Environmental Management
- Environmental Sciences
- Mathematical Sciences
- Medicine & Health Sciences
- Microbiology
- Physics & Astronomy
- Plant Sciences

STUDENT PROJECTS & DISPLAY REGULATIONS

- In compliance with ISEF regulations, the student's project display summarizes the research project and must focus on the student's work for this year's study with only minimal reference to previous research. Longitudinal studies may present only conclusionary data from prior years. (Note: Continuation projects will require a Continuation Project Form to be displayed with the project at the state level.)
- Only one trifold display board is permitted. Project boards may not be layered.
- The project display must be limited to the work conducted by the student(s) for the project. Very minimal reference to work done by a mentor or others may be included only for background information or clarification of what the student's research covered and must clearly indicate that it was not part of the student's work.
- The only items that may be displayed with the project on the tables provided are:
  - ⇒ Student's official abstract
  - ⇒ Student's research logbook
- Maximum size of project:
  - ⇒ Depth (front to back): 30 inches (76 centimeters)
  - ⇒ Width (side to side): 48 inches (122 centimeters)
  - ⇒ Height (top to bottom): 72 inches (183 centimeters)
- Forms required at the project, but not displayed include:
  - ⇒ Student Checklist
  - ⇒ Research Plan and Scientific Research Council (SRC) Approval Form (if applicable)
  - ⇒ A photograph/video release form signed by the research subject (or legal guardian if the subject is under 18 years of age) is required for visual images of humans (other than the student finalist) displayed as part of the project.
- Photographs, visual images, charts, tables, and graphs require credits, if applicable.

SCIENCE FAIR PROJECT DISPLAY BOARD

Gila County Regional Science Fair 2015



TIPS ON WRITING A PROJECT ABSTRACT

A project abstract is a brief paragraph or two (limited to 250 words or 1,800 characters) highlighting and/or summarizing the major points or most important ideas about your project. An abstract allows judges to quickly determine the nature and scope of a project.

The abstract should include the following information:

⇒ Purpose of the experiment (hypothesis)

⇒ Procedure (methods used)

⇒ Data summary and/or analysis

⇒ Conclusions

It may also include any possible research applications. Only minimal reference to previous work may be included.

An abstract should not include:

⇒ Acknowledgements (including naming the research institution and/or mentor with which you were working), or self-promotions and external endorsements

⇒ Work or procedures done by the mentor

Abstracts are limited to a maximum of 250 words and must fit within the predefined area.

A well-written abstract will:

⇒ Emphasize these aspects: purpose, methods, data summary or analysis, and conclusions

⇒ Focus only on the current year's research (continuation projects should only make a brief mention of previous work - no more than a sentence or two)

⇒ Omit details of discussions

⇒ Not include acknowledgements, self-promotion or external endorsements

⇒ Use the past tense when describing what was done (however, where appropriate, use active verbs rather than passive verbs)

⇒ Use short sentences, but vary sentence structure

⇒ Use complete sentences (don't abbreviate by omitting articles or other small words in order to save space)

⇒ Avoid jargon and use appropriate scientific language

⇒ Use concise syntax and correct spelling, grammar and punctuation