



4-H SET Abilities

California 4-H Record Book 4-H Science, Engineering and Technology (SET) Abilities

4-H members may want to include specific science, engineering and technology (SET) abilities (processes) in their Annual Project Reports and 4-H Story. These SET Abilities focus on the processes of doing science, engineering and technology. These are in addition to the Life Skills Wheel (developed by Iowa State University).



Is your 4-H project science, engineering or technology?

ALL projects use some SET abilities, even if the project is not listed as a science project.

Where should SET abilities be listed on the Annual Project Report?

4-H members can document these SET abilities in the “Learning Experiences” boxes on the first page. On the back of the form, members may specifically list things they made, raised, grew or improved.

4-H Science, Engineering and Technology Abilities

Build/Construct	Model/Graph/Use Numbers
Categorize/Order/Classify	Observe
Collaborate	Optimize
Collect Data	Organize/Order/Classify
Communicate/Demonstrate	Plan Investigations
Compare/Contrast	Predict
Design Solutions	Problem Solve
Develop Solutions	Question
Draw/Design	Redesign
Evaluate	Research a Problem
Hypothesize	State a Problem
Invent/Implement Solutions	Summarize
Infer	Test
Interpret/Analyze/Reason	Troubleshoot
Measure	Use Tools

For more information

More information on the 4-H Science, Engineering and Technology (SET) Initiative is available at:
<http://www.ca4h.org/SET/>



4-H SET Abilities

Learning science is not about memorization. When youth are encouraged to use science processes to discover knowledge themselves, youth become engaged and motivated to learn science content.

Both science **content** and **abilities** (processes) are critical to increase science literacy. The National Science Education Standards call for the learning of unifying abilities as these provide youth with powerful ideas to help them understand the natural world. Emphasis has shifted from being solely on “the content to be learned” to “**how** students learn the content” and “**how** the content is taught.”



The 4-H SET program outlines thirty important science processes and refers to them as **4-H SET Abilities**. These thirty 4-H SET Abilities include distinct and measurable behaviors and are critical elements of experiential learning and inquiry. For example – A young person may *state a problem* about water quality (content), *plan an investigation*, *collect data*, *analyze* the data, *graph* results, *summarize*, *communicate to others*, and then work on *implementing a solution*. Through these steps, content is learned by engaging youth in the process of science, engineering and technology.

Thirty 4-H SET Abilities

1.	Build/Construct	Make by putting materials together.
2.	Categorize/Order/Classify	Put objects or events in groups or classes.
3.	Collaborate	Work together; applies both to the work of individuals as well as larger groups.
4.	Collect Data	Record information in an organized fashion about objects and events that illustrate a specific situation.
5.	Communicate/Demonstrate	Methods and for involving various media that transfer information from one person to another.
6.	Compare/Contrast	Examine and evaluate <i>similarities</i> and <i>differences</i> . All measurements are forms of comparing.
7.	Design Solutions	Written plan or <i>design brief</i> , that identifies a problem to be solved, its criteria, and its constraints.
8.	Develop Solutions	Systematic strategy used to develop many possible solutions to solve a problem or satisfy human needs and wants.
9.	Draw/Design	Plan in systematic graphic form; process of originating and developing a plan for a product, structure, system or component.
10.	Evaluate	Technique of examining and judging data presented.
11.	Hypothesize	State of tentative generalization, which is subject to immediate or eventual testing by

		one or more experiments; to explain a relatively large number of events.
12.	Invent/Implement Solutions	Practical application to fulfill a desired purpose.
13.	Infer	Explain an observation in terms of one's previous experience. Leads to predictive explanations.
14.	Interpret/Analyze/Reason	Determine the nature and relationship of the parts of the whole. Find a pattern inherent in a collection of data. This process leads to stating a generalization or drawing conclusions. In an experiment, it is the process by which one establishes the relationship between controlled factors and the outcome.
15.	Measure	Procedure by which one uses an instrument to estimate a quantitative value associated with some characteristic of an object or event.
16.	Model/Graph/Use Numbers	Devise a scheme or structure that will describe specific real objects or events.
17.	Observe	Most basic process of science, in which learners use their senses to obtain information about themselves or the world around them.
18.	Optimize	Make the best or most of a condition.
19.	Organize/Order/Classify	Put into working order; get together and arrange.
20.	Plan Investigations	Use a body of techniques, often referred to as the Scientific Method, for considering <i>phenomena</i> and acquiring <i>knowledge</i> , including the elements of hypothesis development, prediction, and the effects and limits of observation and based on gathering <i>observable, empirical, measurable evidence</i> , subject to the principles of <i>reasoning</i> .
21.	Predict	Projecting future observations on the basis of previously known information.
22.	Problem Solve	Part of the <i>thinking</i> process considered the most complex of all <i>intellectual</i> functions, that includes <i>problem finding</i> and <i>problem shaping</i> .
23.	Question	Raise an uncertainty, doubt, or unsettled issue that may be based on the perception of a discrepancy between what is observed and what is know by the questioner.
24.	Redesign	Plan, draw or sketch again.
25.	Research a Problem	Active, diligent, and systematic process of inquiry aimed at <i>discovering, interpreting</i> and <i>revising facts</i> . Is usually associated with the output of <i>science</i> and the <i>scientific method</i> .
26.	State a Problem	First step in the engineering process focused on assessing/creating the need in order to define the problem to be solved.
27.	Summarize	Make a brief statement giving the main points of substance of a matter.
28.	Test	Verify or falsify an expectation with an observation, often as part of an experiment within the scientific method.
29.	Troubleshoot	Systematic search for the source of a problem so that it can be solved.
30.	Use Tools	Manipulate objects, instruments and materials as a means of furthering a learner's understanding, appreciation and application of scientific knowledge.