

## PROJECT GUIDELINES & SUGGESTIONS

- You can work alone or with a single partner. Groups of 3 are not allowed because the GVRSF does not allow more than 2 students per project.

### 1. EXPERIMENTAL DESIGN:

- An experiment is used to answer a question or solve a problem. It should show how a factor affects your results and allow you to draw conclusions.
- Controls are all factors that could affect your result and must be kept the same for each trial, such as temperature, volume, concentration, time, etc. A variable is the one factor that you change each trial and is the only difference between each trial.
  - All conditions must remain the same throughout your experiment, except for the one condition that you are testing.
  - More than one variable can be tested in an experiment, but only one variable can be changed each trial to reliably determine the effect of this variable. You can change temperature in one trial and volume in another trial, but not both temperature and volume in the same trial.
- To help determine whether your procedure works properly, you should do positive and negative control trials.
  - In a positive control trial, you use the accepted standard for your experiment to provide initial data that you will compare with your other trials.
  - In a negative control trial, you want to see what happens if you do nothing to determine whether there are other factors affecting your results, such as adding water instead of a substance being tested or not adding anything at all.
  - If the positive and negative control trials do not work as expected, then you should consider revising your procedure.
- When testing the effects of adding a substance, then you should try adding different quantities or concentrations rather than all-or-none. You can try gradually adding small quantities or adding larger quantities in each trial to determine whether a minimum quantity (threshold value) is required to work as predicted.
- Try to record numerical measurements (quantitative data) rather than descriptive observations (qualitative data), so that you can graph your results.
  - Graphs are used to convert the raw data from your data table into a visual form that is easier and quicker to understand.
  - A line graph is better than a bar graph for showing trends, making predictions, and determining relationships cause and effect.
- Experiments must be repeatable, so you should redo your trials to confirm your data. A well designed experiment should provide similar results when you redo your trials.
- Take photos of your procedure, equipment, and results. Photos are usually make descriptions or explanations easier to write and clearer.

### EXAMPLE:

A student wants to determine the effectiveness common household materials to help melt ice. She decides to compare table salt against table sugar, baking soda, and all-purpose flour in melting ice cubes at room temperature. She hypothesizes that baking soda will work as well as table salt because baking soda also is a salt.

### Procedure:

- The size of each ice cube and room temperature should be the same for all trials. ← controls
- The substance and amount placed on each ice cube during each trial:

Trial	Substance	Amount of Each Substance Placed on:		
		Ice Cube 1	Ice Cube 2	Ice Cube 3
1	nothing	0.5 teaspoons	1 teaspoon	2 teaspoons
2	table salt	0.5 teaspoons	1 teaspoon	2 teaspoons
3	table sugar	0.5 teaspoons	1 teaspoon	2 teaspoons
4	baking soda	0.5 teaspoons	1 teaspoon	2 teaspoons
5	all-purpose flour	0.5 teaspoons	1 teaspoon	2 teaspoons

← negative control

← positive control

NOTE: The negative control (trial 1) will determine the length of time for ice to melt at room temperature. The positive control (trial 2) shows determine how well table salt works, which people typically use to melt ice on sidewalks.

- Measure how long each ice cube took to completely melt (*or* measure the initial mass of each ice cube and the change in mass after 5 minutes).
- Repeat trials 2-5 to verify results.

### 2. DISPLAY:

- Ensure that your display is sturdy enough that it can be safely transported to the VDSF and GVRSF.
- You may need to make revisions to your display, especially if you continue onto to the GVRSF and CWSF, so it is recommended that you attach your text and diagrams onto display board using tape instead of glue.
- All exhibits, including accessories, must be confined to the table surface or floor space in front of your table.
- Maximum Dimensions: All measurements will be made from the outermost points including framework and appendages.

width (side to side)	depth (front to back)	height (floor to top)
1.2m	0.8m	3.5m (including table)

### 3. SAFETY:

- The safety of all individuals and projects in the exhibit hall must not be jeopardized by any materials, activities, or demonstrations.
- Live organisms, open flames, or hazardous materials cannot be displayed. Please follow all items shown on the *Safety Checklist*.
- Photos are a good substitute for any hazardous equipment or materials. **All hazardous equipment or materials at the VDSF will be removed by the Safety Coordinator.**