MWV Science Fair
Getting Started On My Science Project

A successful science fair project must meet a few criteria.

1. It must be something that is of interest to you
2. The initial question or problem needs to be well thought out and something that can be investigated.
3. You will use either the Scientific Inquiry Process or the Engineering Design Process.

The Scientific Inquiry Process (How to Conduct a Fair Test or Descriptive Study)

What is the Scientific Inquiry Process? The scientific inquiry process seeks to answer a question by conducting an experiment or descriptive study, recording results and observations and drawing conclusions. A Fair Test is a test or experiment where one factor or variable is changed and all other conditions remain the same. *For example, adjusting the height of the ramp to see how far I can make my Hotwheels car jump.* A descriptive study does not seek to change a variable and relies more on direct observation for data collection. *For example, observing to see if different birds prefer different types of birdfeeders.*

1. Ask a question – is it investigable? A well thought out question is the key to any fair test. Ask, what's the problem here? Why is it a problem? How does it affect me or others? How can I find out more? *For example, how does the size of the pot affect the growth of dahlias?*

2. Consider your current knowledge, research similar problems and brainstorm ways to test your question - Ask, what do I already know? Read up on your subject matter. What test can I set up to find out if…? What will happen if I do…? *All plants need room to grow. I could plant dahlias in different sized containers and measure their growth over several weeks. I think the plants in the bigger pots will grow better.*

3. Design and conduct a fair test or experiment to find the answer to your question. Be sure you plan a way to measure and record your results - Set up a procedure to test your question. Ask, how will I set up my test? What variable will I change? How will I measure and record my results? How will I know if any change has occurred? *I will plant 1 dahlia seed in 1 cup, 1 pint and 1 quart size containers filled with potting soil. The pots will sit in a window sill and receive equal amounts of water. I will measure plant height, timing and size of flower blossom.*

4. Collect, record and analyze your data - Take good notes and measurements. Review your notes and data and ask, what happened? Are there any patterns, trends or anything unusual? What do the results mean? Should I modify my hypothesis or consider changes to my experiment design? Have I answered my question or do I need to go back to the drawing board? What should I change? What new questions do I have? *I noticed the bigger pots grew bigger plants with fuller blossoms. Because larger pots contained more soil they required more water to saturate all the soil thus the larger pots had drier soil. I think they will need more water so that each pot has similar soil moisture.*

5. Draw conclusions - Tell what you have learned and observed. Ask, did my results match my prediction? How can I use this new information? What new questions do I have? *Bigger pots grow bigger dahlias. Can I grow an even bigger dahlia if I use a gallon sized container?*

6. Share your results - Communicate what you learned – Make your science fair display. Describe the whole process and be sure to include your initial question, hypothesis and research. Tell how you set up your experiment, measured your results and describe your analysis and conclusions.

The Engineering Design Process (How to Build a Better Mousetrap)

What is the Engineering Design Process? In the engineering design process a problem is defined or a question asked that can be solved by designing a product or system and/or refining its design. It could be described as building a better mousetrap. To build a better mousetrap one needs to mess about with other ideas and materials to come up with a design solution for a specific problem. It involves creative thinking, problem solving, critical thinking and analysis and can be applied by anyone.

1. Define a Problem – What's the problem here? Why is it a problem? How does it affect me or others? How can I fix it? *Planting seeds by hand into seed trays is too slow and cumbersome. How can I speed up the process and make it more efficient?*

2. Consider your current knowledge, research similar problems and brainstorm possible solutions to your problem - Ask, what do I already know? Where can I learn more about my subject? What resources do I have? Can I design or build something to fix the problem? What will happen if…? *I know there are different kinds of hand seeders and vacuum seeders. How do they work? Can I make a jig to collect and evenly space my seeds?*

3. Explore Possibilities (Build A Prototype) - Mess around with materials to develop a solution to your problem and keep records of your efforts. Try working with different materials and designs. Test to see what works best. Ask, what happened? What parts of the design work? What parts of the design don't work? Does my design solve the problem or do I need to go back to the drawing board. *What kinds of materials do I have or can I get? What if I use two foam trays with holes slightly larger than my seeds in the top tray that line up with the cells in my seed tray and offset similar holes in the bottom tray. That way I could shake seeds into the holes of the top tray and slide the bottom tray to line up the holes and drop the seeds in to the cells when they're lined up.*

4. Modify the design based on prototype test results and continue to test it - Ask, what have I observed? What could I change? What new questions do I have? Look at my notes. *My trays worked pretty well but it is really important that the holes in the tray are only slightly larger than the seeds or else too many seeds will drop into the cells. I would need different trays for different sized seeds.*

5. Finalize designs - Record your observations and make drawings and a model of your final design. Analyze and draw conclusions about your final design. Consider what worked and what didn't. Ask, what new questions do I have?

6. Share your results - Communicate what you learned – Make your science fair display. Describe the whole process and be sure to include your initial problem, solution and research. Describe your problem solving process. Tell how you tested your designs, measured your results and describe your analysis and conclusions.

Adapted from Sneider, Cary I, and Brenninkmeyer, Julie (2007). "Achieving Technical Literacy at the Secondary Level: A Case Study from Massachusetts." Professional Development for Engineering and Technology.