Designing Science Fair Experiments

As a former judge for science fairs at the school, regional and state level for grades 2-12, I have seen a wide variety of quality in presentations. In my science education course, I also have students design experiments and present their results to elementary school students in the local school district. I find it important to emphasize the type of projects that students should be conducting for science fairs to these future educators, and the appropriate way in which to present the outcome of science fair projects.

One of the biggest errors I have seen as a judge is the presentation of demonstrations rather than experiments. I made this mistake myself during my 6th grade science fair. I built a model of the solar system with Styrofoam balls, and I spent numerous hours trying to replicate the appearance of each planet. My model was not to scale, and the judges were not very impressed with my science fair project, and looking back now, I do not blame them. My science teacher at the time should have redirected me to design an experiment rather than my meager attempt at replicating the solar system.

So what is the difference between a demonstration and an experiment? A demonstration illustrates and shows proof of a particular science principle, and an experiment is designed to answer a question and provide possible explanations for the outcomes seen. Demonstrations have their place in science, but a science fair should allow students to explore the answers to science based questions that they may have. Most of the time a demonstration can be modified in a way so that it becomes an experiment. Look at the following example: a student wants to build a bridge out of popsicle sticks for the science fair. The bridge would be a demonstration of a particular bridge design. With a little guidance from the teacher, the student could modify the project to test the strength of 2 different bridge designs built with popsicle sticks, or the student could test the strength of the same style of bridge built with 2 different materials, popsicle stick and bamboo skewers.

To hone the creative minds of our future scientist, I challenge all teachers involved with science fairs to allow your students to explore questions that they have about observations of their world. The students I have judged that have been most excited about their projects are the students who developed the questions on their own or with guidance from teachers and/or parents. Often the most creative and interesting experiments are conducted by students who struggle in a traditional classroom setting. I have seen this first hand. When working with a 6th grade classroom on science fair projects, the most creative and interesting project was developed by a girl whose performance was usually sporadic in the classroom. She came up with the question on her own, and she designed the project with very little input from her teacher, her parents or me. She did not win the state competition, but her feedback was very good. Hopefully this demonstrates that students can perform well when provided some guidance to develop experiments rather than demonstrations.

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