

## No stress science fair

Two recurring hurdles seem to reduce the effectiveness of science fairs—finding time in the regular curriculum and excessive parental involvement. The time issue too often manifests itself with the obviously last-minute, overnight project of dubious learning value. The pollution of parental handiwork ruins the student's opportunity to actually acquire new knowledge. And, of course, students lucky enough to have science savvy parents are often penalized for actually doing the displayed work themselves. These problems, however, can be lessened with a few modifications to the science fair system.

Rather than holding the science fair as an extracurricular endeavor, I work it into the regular curriculum over a 10-week period. The science fair is no longer reserved as a culmination event at the end of the school year. Instead, it is much more productive for students to complete independent research projects early in the year and showcase the results in a mid-year science fair. This emphasizes the inquiry theme early on and allows students' to be graded on their progress. Ultimately, the public display represents only a fraction of the entire project and only 10 percent of the grade. Additionally, I strongly encourage students to enlist their parents in the entire process by pointing out that little scientific research is completed without the assistance of other people. The key is to be certain that credit is given to everyone who helped with the project. Indeed, a corner of the science fair display board is reserved for a complete citation of all those who helped and in what areas. Students and parents alike are very comfortable with this public display of "research assistants."

### Implementing the new twists

I start off with a one-hour open house for parents at the beginning of the project that explains the overall goals based on our curriculum standards. Parents are shown a short science fair video. While there are many videos available that suit this purpose, my personal favorite is *Science Projects for Junior High* (\$89) which includes ancillary curriculum materials (see Resources for suggestions). The open house should include example projects and ideas, and discussion of the weekly benchmarks students are expected to meet. Parents are encouraged from the outset to offer help and to seek outside assistance for their students.

After an introduction to the process of science early in the course, I set up the 10-week independent research project with weekly benchmarks and a checklist to record grades

(see Figure 1). Note: Students keep this checklist throughout the project. It helps them focus on the benchmarks, plan ahead, and reduce the stress of wondering what their final score will be. The entire project carries a weight of 1,000 points. I interject mini-lessons on scientific inquiry into my other lessons on a weekly basis. Each week students present their current "due" product, not only for review, but to harvest whatever number of points they've earned. Holding out the academic carrot of bonus points for reaching a deadline early encourages many students to stay focused. Additionally, it is much easier for the teacher to budget time for reviewing small pieces of each project, rather than waiting to evaluate all of the finished projects at the same time.

I validate a good deal of the learning that takes place with a summary test that contains individualized project questions. I create a test template with my computer's word processing software. As I review the separate components of the projects each week, I add a personalized question into each student's growing test file. I don't have to retype the bulk of the questions because the essence of each question is the same. It's only the individualized components that are different. For example, consider this question over the data table. "In your data table, the independent variable is represented by . . . A, B, C, or D." It is fairly simple to insert the correct answer from each student's individual project into this question format. When the final week arrives, I have individualized tests tailored to each student's project. The summary tests are also easy to grade en masse (i.e., the answer to question #1 is always "A" for every student, #2 is "D," and so on). The test template is one of the best tools to give the science fair judges, as it reinforces with the students the important aspects of their projects. Even though each project is unique, the judges appreciate the continuity of this strategy. I try to recruit many judges so that each one has a light load, which also makes any grading form and point awarding system workable.

To ensure that all project displays are created on the same level, they are constructed completely in my classroom on identical three-fold display boards. I buy my display boards from Showboard for \$3.75 each, but other sources have comparable products (see Resources). This takes only two class periods because the students have already produced pre-outlines and sketches of their displays and have brought everything that's going into the display to class with them prior

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FIGURE 1 Student timeline and checklist

Benchmark descriptions	Maximum points possible	Early bird bonus (5 points)	On time (100 percent)	Late (50 percent)	Points verified by teacher
Proposed project outline	20				
Parent and teacher approval form	20				
Safety checklist (signed by parent and student)	20				
Potential resources/reference list	20				
Potential data tables	50				
Probable cover page and table of contents	50				
Detailed list of materials and procedures	50				
Analysis and conclusions, final citation of resources	50				
Written report	300				
Science project log	100				
Display board proposal	20				
Display board completed (in class)	100				
Test over scientific methods and your project	100				
Science fair judge or oral defense score	100				
Point subtotals					
Point total					

to the construction. Successful display of information boils down to a few pertinent guidelines as follows:

- Use a header board across the top of the display to announce the theme of the project with an eye-catching title.
- Arrange the presentation of words, tables, graphs, photos, and drawings from top to bottom on the display board.
- The board is divided into three unequal parts. Use the smaller left wing to introduce the project; the larger middle panel to display the experimental set-up with results at the bottom; and the smaller right wing to draw conclusions.
- Traditional or digital photos printed in color are a must.
- The boards may be embellished with any harmless item that will safely hang on the display as long as it relates to the theme of the project and is not pure glitter and glitz.
- The board must fold flat so it can be transported.

In my classroom I supply all of the standard display board supplies: tape, glue, staples, scissors, pre-purchased

titles, rolls of colored craft paper, felt markers in various colors and sizes, colored pencils, crayons, a 35mm camera and a digital camera, etc. The shelf life of the display boards can be extended for years by paying careful attention to how they are decorated. I insist that every student completely cover the basic board and the title board with craft paper using staples. The students then arrange and attach their displays according to their own designs onto the colored craft paper surface, not directly on the display boards. Creative students have even found ways to attach 3D components to their displays.

By the end of the 10 weeks, all of the components of each project have been reviewed, so there is plenty of time to ensure that the public displays are presented properly. You can use a simple rubric-style form to conduct peer critiques. Each student may choose three other students to critique. I check off on the form last and return it to the student being critiqued, but there is no grade assigned to it. It's optional, but nearly everyone wants to

do it. My favorite time to hold the fair is the end of the first semester. It can be conducted in any area that has enough space to accommodate the displays, for example the library or cafeteria. When the fair is over, students remove their display “covering” and return the clean display board to the classroom for storing. Once returned to their shipping boxes, 130 boards and headers can be stored in five large and two small boxes that I stack on one shelf that is about six feet long.

Because these science projects are academic assignments that earn points weekly, there is logically a value of total points earned. My science fair technique emphasizes the cooperative nature of science, with attention to using “research assistants” and peer critiques. However, the competitive component is retained with an awards ceremony. The need to reward outstanding performance must not be ignored, indeed, it is critical to the scientific community at large. Although my awards pale compared to what Nobel laureates receive, I do offer three awards based on highest cumulative points. If there is a tie I give duplicate awards, usually books and certificates. Note that the written report is valued at 300 points—30 percent of the points possible. Written reports are invariably what separates the winners from the other participants. Students whose projects were weak in some regards usually score accordingly on their summary tests, even if they are capable of “snowing” the judges. Embedded within the point totals are the weekly graded assignments, the summary individualized test, the written report, the judge’s interview, and the public display.

A science fair of this style is still a competition, and the most important qualities of a successful competitor include timeliness, persistence, and quality of work. A scientist who is chronically late or unable to complete tasks will not be successful. The quality of work must ultimately be judged on scientific merit, attention to details, and appropriate creativity. Students and parents alike understand that flashy public displays do not determine who earns the highest awards at the science fair. Instead, it is a celebration of a 10-week-long project with regular benchmarks to keep students personally engaged and focused. There is no need to suffer from stress overload while preparing for the science fair, just take it a little piece at a time.

### Resources

Science Insights videos—[www.sciencevideos.com/default.htm](http://www.sciencevideos.com/default.htm)  
Showboard—[www.showboard.com](http://www.showboard.com)