

Girls in Science

By Pat McNees

Special to The Washington Post

Tuesday, January 6, 2004; Page C09

Would your attitude toward physics have been different if your introduction to it had involved devising a catapult to send the head of a Barbie doll over a castle wall during a mock medieval siege? Girls in a research project funded by the National Science Foundation learned through trial and error that a Barbie doll head is hard to catapult unless you make it heavier -- for example, by inserting lead sinkers into it. They also learned that it was easier to catapult a potato. Then they learned about density and velocity, which were not presented simply as abstractions. It's enough to make you want to go back to school.

Hands-on learning is one key to getting more girls hooked on science -- which is important for overcoming the national shortfall in scientifically literate workers. That point comes up in many contexts in a book I just wrote for the National Science Foundation -- "New Formulas for America's Workforce: Girls in Science and Engineering." In the book I summarize for parents and educators what investigators on 224 projects have learned about how to get more girls and women to study for careers in science, technology and engineering.

Not surprisingly, a lot of the things we do to our children in the name of education discourage them from taking the gateway courses required for many rewarding careers. Parents and teachers expect different things from girls and boys, for example, which affects how they perform and often limits what they learn -- and what they expect from themselves. Some of the best guidelines for working with young girls came from a Girls Inc. project called Teaching Smart:

- Help girls get past the "yuck" factor. Science is messy, so put aside your desire for clean girls and surfaces. Girls who are afraid of getting dirty aren't born that way -- they're made. In after-school science programs, girls all over the nation are being encouraged to get messy, explore, analyze, dissect, hypothesize and make mistakes. (In middle school, when girls begin disappearing from the science track, single-sex science activities help them embrace the messiness and uncertainty of science, away from boys who tease them and hog computers.) As an adult, you can help girls resist the pressure to behave in "feminine" ways. Encourage them to get good and grubby: to dig in a riverbed, change a tire or explore an engine. Let them learn they have a right to be themselves.

- Let girls make big, interesting mistakes. Girls who are overly protected in the lab or on the playground have few chances to assess risks and solve problems on their own. If teachers are doing things right, once-dreaded mistakes become hypotheses. Girls are urged to go back to the drawing board to figure out why their newly assembled electric door alarm doesn't work or why their water filter gets clogged. (Teachers tend to push boys, but not girls, past their initial frustration on such projects.) Supported by adults instead of rescued, girls learn to embrace their curiosity, face their fear and trust their own judgment.

- Assume girls are interested in math, science and technology. Too many girls -- and children of color -- still get the message that math and science aren't for them. Given encouragement and the right setting, girls jump at the chance to dismantle machines, build rockets, care for and study insects and small animals, and solve logic puzzles. Encouraging girls to learn and experiment -- to take risks and learn by doing -- helps

them feel empowered and self-confident enough to try things they otherwise would not try. But many of the adults who help them must first overcome their own acquired resistance to, or dread of, science and technology.

Girls -- indeed, most students -- respond best to hands-on science. A great way to squelch their interest in science is to "demonstrate" it while they watch. Another is to play "guess the right answer," as if all they can do is master a completed body of knowledge (a useless quest as scientific knowledge routinely becomes outdated). In most schools, teachers need a chance to experience hands-on science education before they can figure out how to engage students in it. Hands-on workshops can give them, too, the chance to experiment, be messy, make mistakes and capture the spirit of scientific inquiry. And getting parents involved in hands-on activities (such as making two batches of ice cream, using different amounts of salt, and comparing the rate at which the batches freeze) helps them understand that engaging in science is much more than avoiding wrong answers on a test. Getting caught up in their children's science activities sometimes lights fires and opens doors for the mothers, too.

Girls of all ages like math and science to be useful and relevant to their everyday lives. A college course on how to take apart a computer and put it back together attracted 300 male students and no young women -- until the announcement describing the course changed, to say that the computers they worked on would later be given to needy schools. Then the women signed up.

Similarly, math problems on a computer program called Animal Watch engaged girls' interest because calculations involved saving endangered animal species from extinction. Most girls -- and minority students -- want to know how what they're learning can be applied in real life. Engineering takes on meaning when students have to navigate a campus in a wheelchair (or wearing spectacles smeared with Vaseline, to get a sense of navigating nearly blind) before being asked to design handicapped-accessible facilities.

Not all girls are alike. Some already know they like math and science and just need connections made and barriers reduced. Some have yet to discover that math, science, and technology are for girls. For them, it's important to arrange for exposure to role models they can look up to (the younger, the better), who convey how "cool" it is to do science -- and show them a possible future, in which there is more than one way to use a Barbie doll.

Adapted from the National Science Foundation publication "New Formulas for America's Workforce: Girls in Science and Engineering" by Pat McNees (www.patmcnees.com). The book can be read online in PDF format at www.nsf.gov/pubs/2003/nsf03207 or ordered (free) at www.nsf.gov/home/orderpub.htm. The order number is NSF 03-207 for the book and NSF 03-208 for a CD version. Orders are being taken for the next printing.