A Passion for Objects

How science is fueled by an attachment to things

By SHERRY TURKLE

In the ongoing national conversation about science education in America, there is a new consensus that we have entered a time of crisis in our relationship to the international scientific and engineering community. For generations we have led; now Americans wonder why our students are turning away from science and mathematics — at best content to be the world’s brokers, broadcasters, and lawyers, and at worst simply dropping out — while foreign students press forward on a playing field newly leveled by the resources of the World Wide Web. Leaders in science and technology express dismay.

On this theme, Bill Gates stated flatly, "In the international competition to have the biggest and best supply of knowledge workers, America is falling behind." He went on: "In math and science, our fourth graders are among the top students in the world. By eighth grade, they’re in the middle of the pack. By 12th grade, U.S. students are scoring near the bottom of all industrialized nations."

When the science committee of the House of Representatives asked the National Academies, the nation’s leading scientific advisory group, for 10 recommendations to strengthen America’s scientific competitiveness, the academies offered twice that number. There were recommendations to support early-career scientists and those who plan to become science teachers. There were recommendations to create a new government agency to sponsor energy research and to use tax policy to encourage research and development in corporate settings.

As sensible as these recommendations may be, they deal largely with financial incentives and big institutions. I would like to suggest a different tack.

From my very first days at the Massachusetts Institute of Technology in 1976, I found passion for objects everywhere. I had students and colleagues who spoke about how they were drawn into science by the mesmerizing power of a crystal radio, by the physics of sand castles, by playing with marbles, by childhood explorations of air-conditioning units.

They also spoke of new objects. I came to MIT in the early days of the computer culture. My students were beginning to talk about how they identified with their computers, how they experienced these machines as extensions of themselves. For some, computers were "objects to think with" for thinking about larger questions, questions about determinism and free will, mind and mechanism.

Trained as a humanist and social scientist, I began to ask, What is the role of objects in the creative life of the scientist? What makes certain objects good to think with? What part do objects take in the
development of a young scientific mind?

Thinking about scientists and their objects raises the question of how to best exploit the power of things to improve science education. Neither physical nor digital objects can be taken out of the equation; nor should either be fetishized. Over the past decades, we have seen an ongoing temptation to turn to computers to try to solve our educational crisis. It is natural, in a time of crisis, to avidly pursue the next new thing, but we need to not lose sight of the things that have already worked. Awash as we are in new teaching materials (from smart boards to simulated science laboratories), object-play is not something to which today's teachers are particularly attuned, although as early as third grade, young people interested in science can identify the objects that preoccupy them. Theirs are the minds we want to cultivate, but these students are often isolated, strangely alone with their thoughts.

One reason we don't pay enough attention to things and thinking is that we are distracted by our digital dreams; another is that traditionally, scientists have been reticent to talk about their object passions or, one might say, about passions of any kind. There was a canonical story about the objectivity and dispassion of scientific work, and scientists stuck to it. In 1856 the essayist Walter Bagehot described the young scientist as an aficionado of the object world, yet Bagehot was ready to declare that scientists' involvement with "minerals, vegetables, and animals" spoke to an absence within their constitutions of an "intense and vivid nature." Scientists, he wrote, "are by nature dull and rigid and calm. An aloofness, an abstractedness cleave to their greatness." In their autobiographical writings, scientists reinforced the idea that theirs was a discipline that faced nature with cool composure; lives in science were recounted in ways that separated reason and passion and usually left objects out altogether. But there has always been another story in which scientists' attachments to objects are red-hot. In recent years, this story is starting to be told.

The Nobel laureate Richard Feynman begins his autobiography, Surely You're Joking, Mr. Feynman, with a loving description of the "lamp bank" that he built when he was 10, a collection of sockets, bell wire, and serial and parallel switches, screwed down to a wooden base. Feynman plays with the lamp bank to get different voltages by setting switches up in different combinations, serial or parallel. He joyfully recounts his electronic universe: the radios he bought at rummage sales, his homemade burglar alarms and fuses. The fuses, made from tinfoil, offer spectacle as well as intellectual excitement. Feynman sets them up with light bulbs across them so that he can see when a fuse has been blown. And he puts brown candy wrappers in front of the light bulbs so that a blown fuse translates into a beautiful red spot on his switchboard. "They would gloooooooooow, very pretty — it was great!"

Over time, there have been dramatic changes in the kinds of objects children have had presented to them. Yet in reviewing 25 years of science students' writing on their favored childhood objects, certain trends are apparent. One is an interest in transparency. Through the mid-1980s, MIT students who grew up in the 1960s wrote about radios, vacuum cleaners, wooden blocks, and broken air-conditioners. These are things to take apart and put back together again. Students describe childhoods in which they fix what is broken or at least try to. They write about the frustration of not getting things to work but learning from their furious efforts.

By the end of the 1980s, my students begin to write about growing up with electronic games, lasers, video games, and "home computers," objects that are investigated through the manipulation of program and code. Yet even with the passage from mechanical to electronic, and from analog to digital, students express a desire to get close to the inner workings of their machines. The early personal computers made it relatively easy to do so. Machines such as the TRS-80, the Atari 2600, and the Apple II came bundled with programming languages and, beyond this, gave users access to assembly languages that spoke directly to their hardware. Students write fondly about programming in assembler, of the pleasures of debugging complex programs. Metaphorically speaking, an early personal computer was like an old car...
in your garage. You could still "open up the hood and look inside."

However, by the 1990s, the industry trend was clear: Digital technology was to become increasingly opaque, reshaped as consumer products for a mass market. The new opacity was cast as transparency, redefined as the ability to make something work without knowing how it works. By the 1990s, personal-computer users were not given access to underlying machine processes; computers no longer arrived with programming languages as a standard feature. Beyond this, programming itself was no longer taught in most schools. Even so, young people with a scientific bent continued to approach technology looking for at least a metaphorical understanding of the mechanism behind the magic.

Beyond seeking a way to make any object transparent, young people across generations extol the pleasure of materials, of texture, of what one might call the resistance of the "real." In the early 1990s, the computer scientist Timothy Bickmore's experiments with lasers, "passing the laser through every substance I could think of (Vaseline on slowly rotating glass was one of the best)," recall the physical exuberance of Richard Feynman's candy-wrapped light bulbs of a half-century before. For Selby Cull in 2006, geology becomes real through her childhood experience of baking a chocolate meringue: "Basic ingredients heated, separated, and cooled equals planet. To add an atmospheric glaze, add gases from volcanoes and volatile liquids from comets and wait until they react. Then shock them all with bolts of lightning and stand back. Voilà. Organic compounds. How to bake a planet." Cull's joyful comments describe the moment of scientific exultation, the famed "Eureka" moment of raw delight.

Science is fueled by passion, a passion that often attaches to the world of objects much as the artist attaches to his paints, the poet to his or her words. Putting children in a rich object world is essential to giving science a chance. Children will make intimate connections, connections they need to construct on their own. At a time when science education is in crisis, giving science its best chance means guiding children to objects they can love.

At present, there is some evidence that we discourage object passions. Parents and teachers are implicitly putting down both science and scientists when they use phrases such as "boys and their toys," a devaluing commonplace. It discourages both young men and women from expressing their object enthusiasms until they can shape them into polite forms. One of the things that discourages adults from valuing children's object passions is fear that children will become trapped in objects, that they will come to prefer the company of objects to the company of other children. Indeed, when the world of people is too frightening, children may retreat into the safety of what can be predicted and controlled. This clear vocation should not give objects a bad name. We should ally ourselves with what objects offer: They can make children feel safe, valuable, and part of something larger than themselves.

The pleasures of the scientist are not so different from those of historians who inhabit other times and ways. What scientist and historian have in common is an experience that respects immersion rather than curricular pace. Their shared experience has little in common with lesson plans, accelerated drill and practice, or rapid-fire multiple simulations.

Digital media can be used to invite painstaking exploration, but here, velocity tempts because it is so easily achieved. More recent digital media rarely seem to "want" to be used slowly. Their great and unique virtue is that they are able to present an endless stream of what-ifs — thought experiments that try out possible branching structures of an argument or substitutions in an experimental procedure. At its heart, digital culture is about precision and an infinity of possibility. It is about creating a "second nature" under our control.

Object passions bring us to the same enthusiasm for what-is that computation inspires for the what-ifs.
We now live the tension between these two impulses; we need to cultivate a balance between them. When we fall for science through objects, they ground us. We focus on what kind of sand is best for building castles, on the stubborn complexity of soap bubbles, on the details of light bent by a prism. I believe these moments open us, heart and mind, to fall for the what-is of our planet. In doing so, we may come home to wonder at it, not only as a frontier of science, but as where we live.

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