Albert Einstein strengthened science through his contributions, but he may have inadvertently crippled science education through his example. This notion is supported by an editorial, "Redefining Science Education," published in January by Bruce Alberts, editor in chief of the journal Science.

His main concern is that "many college-educated adults in the United States," including teachers, "fail to understand that science is a way of knowing completely different from mysticism, tradition and faith." Science is based on "evidence that can be logically and independently verified," rather than on personal authority.

Most of the public accepted Einstein's 1915 theory of general relativity based on his authority, rather than on the evidence presented. Few teachers have worked their way through the logic, and fewer still have worked through the equations dominated by tensors and scalars. When teachers explain relativity to their students, they do so as if it were a revealed truth, in this case channeled to Earth by a super-smart scientist.

Most scientists accepted his theory only after his predictions were confirmed by measurements obtained by British scientist Arthur Eddington during a solar eclipse on May 29, 1919. During those few minutes, the sun's rays were bent by an angle of 1.7 arc-seconds, rather than 0.83 arc-seconds, supporting Einstein's predictions based on the warp and woof of space-time, rather than those based on Newton's version of gravity.

Einstein was famous for his "thought experiments." Let's try one today. Imagine high school students visiting an art museum on a trip. Having been inspired by beautiful paintings in a gallery, they decide to become painters. But how does one become one? Is it by studying the results of painting, meaning those flat objects hanging in galleries?

No. It is by gradually developing that skill, first by acquiring the necessary materials. Next is the learning of basic techniques such as sketching and shading simple geometric objects. Then, after developing familiarity with paint as a material, the students must choose what to paint, and have a go at it. From that point on, it is practice, practice and practice.

Now extend this thought experiment to high school students visiting the Connecticut Science Center next year. They decide to become scientists. But how should they go about doing that? By studying the results of science, meaning facts and concepts produced by those who came before?

As with the case of learning painting . . . No! Yet this is what mostly happens in our schools, especially at the college level.

Why? Because it's far easier, cheaper and more politically correct to deliver and test bundles of results than to deliver and test bundles of skills. Unfortunately, transmitting knowledge is only one of four critical goals needed for a good science education, according to a committee of science educators convened recently by the U.S. National Academies.

The three underemphasized goals in its final report are teaching students how to generate and interpret evidence and explanations; how to understand the nature of scientific knowledge and how it develops; and how to participate in the discourse and practice of science.

Why are the three goals so de-emphasized in public schools? First, because few teachers have significant involvement in creativity-driven scientific research beyond schools of education. Second,
the knowledge component, rather than the knowledge-producing component, is much more tangible and directly linked to professions such as medicine and engineering. Third, because the reward system for teachers and administrators is driven by standards-based testing. Fourth, because students feel more inadequate when they can't do something than when they don't know something; Avoiding this reality is a safe strategy.

I conclude with a quote of Einstein's from Isaacson's book: "A society's competitive advantage will come not from how well its schools teach the multiplication and periodic tables, but from how well they stimulate imagination and creativity."