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Considering Science Education

I CONSIDER SCIENCE EDUCATION TO BE CRITICALLY IMPORTANT TO BOTH SCIENCE AND THE world, and I shall frequently address this topic on this page. Let's start with a big-picture view. The scientific enterprise has greatly advanced our understanding of the natural world and has thereby enabled the creation of countless medicines and useful devices. It has also led to behaviors that have improved lives. The public appreciates these practical benefits of science, and science and scientists are generally respected, even by those who are not familiar with how science works or what exactly it has discovered.

But society may less appreciate the advantage of having everyone aquire, as part of their formal education, the ways of thinking and behaving that are central to the practice of successful science: scientific habits of mind. These habits include a skeptical attitude toward dogmatic claims and a strong desire for logic and evidence. As famed astronomer Carl Sagan put it, science is our best "bunk" detector. Individuals and societies clearly need a means to logically test the onslaught of constant clever attempts to manipulate our purchasing and political decisions. They also need to challenge what is irrational, including the intolerance that fuels so many regional and global conflicts.

So how does this relate to science education? Might it be possible to encourage, across the world, scientific habits of mind, so as to create more rational societies everywhere? In principle, a vigorous expansion of science education could provide the world with such an opportunity, but only if scientists, educators, and policy-makers redefine the goals of science education, beginning with college-level teaching. Rather than only conveying what science has discovered about the natural world, as is done now in most countries, a top priority should be to empower all students with the knowledge and practice of how to think like a scientist.

Scientists share a common way of reaching conclusions that is based not only on evidence and logic, but also requires honesty, creativity, and openness to new ideas. The scientific community can thus often work together across cultures, bridging political divides. Such collaborations have mostly focused on the discovery of new knowledge about the natural world. But scientists can also collaborate effectively on developing and promulgating a form of science education for all students that builds scientific habits of mind.

Inquiry-based science curricula for children ages 5 to 13 have been undergoing development and refinement in the United States for more than 50 years. These curricula require that students engage in active investigations, while a teacher serves as a coach to guide them to an understanding of one of many topics. This approach takes advantage of the natural curiosity of young people, and in the hands of a prepared teacher, it can be highly effective in increasing a student's reasoning and problem-solving skills. In addition, because communication is emphasized, inquiry-based science teaching has been shown to increase reading and writing abilities. This approach to science education has been slowly spreading throughout the United States in the past decade, but it requires resources and energy on the part of school districts that are often not available. With strong support from scientists and science academies, a similar type of science education is also being increasingly implemented in France, Sweden, Chile, China, and other countries. In these efforts, catalyzed for the past 8 years by the InterAcademy Panel in Trieste, scientists are sharing resources and helping to form new bridges betweeen nations.

With appropriate modifications, could such an education also help make students more rational and tolerant human beings, thereby reducing the dogmatism that threatens the world today with deadly conflict? In future editorials, I will explore the many potential advantages of inquiry-based science education. I will also discuss the barriers that must be overcome for its widespread implementation across the globe, because we may face no more urgent task if future generations are to inherit a peaceful world.

– Bruce Alberts

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