12-2-2015

Toward a More Scientifically Literate Public

Michael Bass
University of Central Florida

Toward a More Scientifically Literate Public

By Michael Bass
UCF Forum columnist
Wednesday, December 2, 2015

As a society we do a terrible job of educating our children to become scientifically literate. Sure, we have STEM (Science, Technology, Engineering and Mathematics) programs throughout the country, and with some justification we can brag about the successes of students that are in or who have graduated from such learning experiences.

However, in general, these are highly selective programs leaving the vast majority of students with minimal exposure to science or engineering. Many of their exposures range from “I have to take it and I can forget it as soon as the course is over” to thinking that the subjects are painfully dull and have no relevance to their lives. Consequently, in either case, most students graduating from high school and entering college or the work force are what I call scientifically illiterate.

In college, students who are not in the sciences or engineering must take some science classes as part of the general education program requirements. Though dedicated instructors doing their best often teach these classes, the students are only motivated by the “I must take this class to graduate” requirement. The subject not only turns them off, but they very likely forget the material moments after the final is taken.

So, the majority of people in this country who will use the amazing new technologies that are being developed and who will be asked to make decisions on scientific and engineering issues (solar energy, nuclear power, fracking, energy efficiency, genetically modified plants and foods, to name a few) are scientifically illiterate.

Sometime back I was in a group discussing the problem of keeping young children interested in science. One member of the group was a very experienced elementary school educator.

I will never forget her outline of the subject matter that would hold the attention of elementary school children. She said: “Children between ages 5 and 8 will love working on dinosaurs, from 8 to 11 you can keep them interested by space (rockets, satellites, Hubble, distant planets, the Big Bang and so on) but after 11 they will discover sex and you can’t distract them from that.”

The point of this story is that to create a scientifically literate public it is necessary to identify how to get their attention and how to make the material stick with them beyond the final exam.

In the mid-1990s, together with a colleague from the philosophy department, I put together a course for The Burnett Honors College at UCF called the Culture of Science. It dealt with the who, when, where, why and how science was done – and most importantly what effects science had on society and what effects society had on science.

This course proved extraordinarily successful and was given for six semesters instead of the three in the original proposal to the college. I have since given a somewhat modified version of this course for graduate students in the UCF College of Optics & Photonics and other engineering or science departments. Notice that the course does not deal with the *what* of science. That already is taught very well in the existing classes in the various specialties.

Such a course places science and technology in the context of our world and deals with the impact of science. Some examples of this are the discussions I have with the students of such things as the internet or nuclear weapons or the early organized church’s problem with Galileo.

I also discuss pathological science, which is what happens when scientists become emotionally involved with a marginal or dubious phenomenon that if true would violate well-established scientific principles. If they were right, lots of money and prestigious prizes would come their way. This is called pathological science because the scientists are pathologically involved with it and cannot see their errors.

It is important that scientifically literate citizens be able to recognize this flaw. In the early 1990s, scientists in Utah thought they observed nuclear fusion in a quite standard electrolysis experiment. They dubbed it cold fusion, and if it were true it would have solved the world’s energy problems. Of course, it was not true.

I make it a point to discuss scientific ethics about being honest, doing meaningful experiments, reporting all the results and performing careful analyses. The class and I view the play “Copenhagen” to understand and discuss the pressures nuclear scientists experienced during the second World War. We also get into modern-day cosmology and this leads to discussion of the need for a God in the universe.

In my opinion, this type of course should be offered as part of the general-education program for undergraduates to satisfy their science requirements. Such courses dealing with the impacts of science and engineering just might result in more scientifically literate graduates.

Most people don’t have to know what makes an airplane fly but they should know how greatly airplanes have and will change our society. The same can be said for the internet or electric power.

Most people don’t have to know the details but they certainly should know the impacts. Their lifestyles and maybe their lives will depend on such knowledge.

Michael Bass is a professor emeritus of optics at CREOL (Center for Research and Education in Optics and Lasers) in UCF’s College of Optics & Photonics. He can be reached at bass@creol.ucf.edu.