ARE COMPUTERS HURTING EDUCATION?

In the past five years or so, I've become increasingly aware of a gradual decline in the performance of students, especially at the undergraduate level. And I'm not alone. Colleagues in other disciplines—from engineering to music—have made similar observations. Yet, when we look at enrollment sta-

It's my belief that the proliferation of computers, software, and the Internet has had a "dumbing down" effect on today's young men and women.

tistics of engineering students at my institution, indicators such as standardized test scores and class rankings suggest that we are getting better and stronger engineering students. So what's going on?

Recently, I taught a senior level course in vibrations, a class I last taught 10 years ago. The basic content of the course had changed little over time. In contrast to the gradual decline I've seen in courses I teach frequently, the difference in performance between now and 10 years ago was abundantly clear. The amount of material I could cover was less, and students were not grasping the basic concepts as well as before. Although the computer projects were the same as those I assigned 10 years ago and could be done by writing less code—thanks to new software—fewer students submitted their projects on time or did them correctly. At Rutgers, like at most universities today, students have unrestricted access to computers that are loaded with sophisticated software that makes programming easier. Even though these students have much more experience using computers, their programming skills weren't as good. Abstract concepts, such as coordinate transformations, seemed to fly right over their heads.

The experience started me thinking about why today's generation doesn't perform as well as earlier ones, and I believe I have an explanation. It's not that the level of education or the competence of students has changed that much. What is different now is how students think and what their expectations are. I believe this has come about because of computers and the information revolution. In 1983, in K-12 institutions, there was one computer for every 125 students, on average. By 1995, there was a push across the nation to make more—and better—computers available at K-12 schools. I fear that such increased exposure will have a harmful effect unless we also emphasize proper teacher training, quality software, and an education plan that focuses on fundamentals. The most significant recom-

mendations of the ETS study are to increase "efforts to ensure that teachers are properly trained to use computers" and to "focus on using computers to apply higher-order skills..."

What can we do at the college level? As educators, we must be aware of the effects that computers and information technology have had—and continue to have—on society. Today's students require different basic skills. We need to communicate with students in ways that reflects these changes. We need to emphasize that computers are extremely useful tools for accomplishing tasks but are not solutions in themselves.

How can we do this? We can begin by giving students more hands-on visualization. This can be done by increasing the laboratory components of courses and emphasizing the need to conceptualize and formulate problems. We must also adopt textbooks that contain sizable numbers of realistic examples. And we must develop challenging assignments that make use of the fundamentals as well as programming skills. But most important, we have to recognize that added exposure to computers and information technology is a double-edged sword, and treat this new technology in productive ways.

Haim Baruh is an associate professor of mechanical and aerospace engineering at Rutgers University.