Education and national security: will American children be 'laser literate'?

by Carol White

The present array of statistics, all pointing to the educational backwardness of American children, is jolting, but surely can come as no surprise to any parent, educator, or prospective employer of skilled manpower. In fact, the abysmal situation in our schools, particularly in the fields of mathematics and the sciences, has periodically been put before the public since the wide circulation of the 1980 Wirszup report—which showed U.S. education to be far inferior to that in the Soviet Union.

At that time, a number of serious studies were begun to assess the implications of the problem in terms of future manpower needs, particularly in engineering. The same situation seen in our elementary and secondary schools was replicated at the university level, where we found a failure to invest in advanced laboratory equipment, a shortfall of American citizens willing to go for post-graduate engineering degrees, and an accompanying shortage of teaching staff. The shortage of secondary school science and math teachers is far worse.

How bad is it?

The President's National Commission on Excellence in Education shows a 77 percent decline in mathematics teachers in the past 10 years and a 65 percent decline in science teachers. Half of the newly employed science and mathematics teachers are unqualified. Forty-three states report a shortage of mathematics teachers; 42 are short of physics teachers, and 38 lack enough chemistry teachers.

Between 1960 and 1977 the percent of students enrolled in science and mathematics courses in secondary school declined around 50 percent. With the modest expectation of a 40 percent increase between 1978 and 1990 in the demand for scientists and engineers, a shortfall of 200,000 engineers is predicted.

From 1962 on there has been a steady decline in mathematics and verbal scholastic aptitude test performance. In international standardized tests, U.S. students register well below those of other industrialized nations. On 19 academic tests, American students were never first or second and were last seven times. This is not so surprising considering that one-half of all U.S. high school students take no math or science beyond tenth grade. In Japan nearly all college-bound students take three years of science with their three-year secondary school course and four years of math in the same time. In the U.S.S.R. the requirements are far more stringent, including five years of physics, four of chemistry, four of biology, and leading to two years of calculus.

Most other countries keep their children in school for longer hours. A Japanese factory worker will have spent thirty percent more time in the classroom than an American worker; and of course, the American child may be studying driver education or some other elective in lieu of an academic subject. One-sixth of U.S. college graduates major in mathematics, science, or engineering, compared to one-fourth in Japan, one-third in West Germany, and one-half in the U.S.S.R. As a result, the Japanese graduate more engineers in absolute numbers than we do, with about half the population; and per capita they have 2.6 times as many engineers as the United States. For the Soviet Union the figure is 4.1. It becomes clear that this is indeed a national security matter when we learn that the Defense Department is spending millions to rewrite manuals to bring them from the eleventh- to the sixth-grade reading level.

The roots of the problem

One might think that the problems in education are a result of the present depression and cutbacks in spending. And of course curtailment of student loans and grants plays a part in creating a shortage of teachers. Yet depression psychology probably has a two-fold effect. There is less drug use among students and greater seriousness, probably because of the pressure to get a job in a tighter market. This also affects the secondary level where college scholarships are at premium. On the other hand, minority youth reflect the 40 percent rate of youth unemployment in the ghetto with a 40 percent rate of functional illiteracy. Amazingly, despite the depression, the United States spends more on education at every level than any other country in the world—$215 billion—and we get less for it.

There are a number of bills before Congress, mainly addressed to increasing the number of secondary school teachers trained to teach mathematics and science, through an enlarged loan and grant program, through in-service training, and through various devices to provide pay incentives selectively. There are also various proposals to provide tax and other incentives to industry to contribute equipment and personnel to schools and universities. Perhaps the most interesting thing about the collection of bills is the number of them, an indication that education is a hot item this pre-election year. In all there may be some 30 of them before Congress.

In general these bills give lip service to the need to meet the future challenge of technological development as well as to reverse the current downslide. However, the context in which technology is defined is the *post-industrial society*. Therefore, where technological needs are spelled out, it is the computer which is stressed. This is a dangerous mis-emphasis for several reasons. On the one hand, it mis-estimates the actual impending shortfall of skilled manpower and engineers which we are facing; on the other, it suggests dependence upon the computer as a teaching device.

Technology for the future

As a recent LaRouche-Riemann model study shows, the economic impact of President Reagan's March 23 speech, which called for an immediate national mobilization to develop laser beams as a defensive weapons capability, can lead to two million new productive jobs each year. Many of these would be construction jobs for the power industry; but a first priority would be to replace the machine tool industry with laser devices. By the end of the decade, we can assume that at least half of all machinists will be laser operators.

Even before fusion power is commercially viable, we will be converting our steel industry to plasma processing of iron and steel, (in which a 30,000° gas is used to reduce or or scrap metal almost instantaneously). The kind of skills which will be demanded of the typical production worker will include competence in fields which are today assigned to engineers. This will include a sophisticated knowledge of optics and understanding of field theory, as increasingly, plasma processes are organized to take advantage of the non-linear geometries which they develop.

We can expect even more profound changes in the chemical industries, as we develop a range of lasers capable of exciting precisely tuned chemical reactions. When we add to this the incredible diagnostic capabilities opened up by the x-ray laser for medicine as well as for materials testing, it is clear that educational reform must be in the direction of introducing intensive training in science.

Scarce money is not the key issue. We may well question why the American gets so little for his education tax dollar. The fact is that during this century science and mathematics have been taught through the distorting prism of British Newtonianism, and this means that we have a built-in disadvantage compared with Germany or even Japan, both of which look to the German Humboldt educational tradition as a guide to shaping curriculum. (Ironically, the Japanese are introducing the classical curriculum at a time when the Federal Republic of Germany has increasingly phased it out following the Brandt educational reforms.)

The problem in the United States has been exacerbated over the past several decades; but it dates to the turn-of-the-century when Deweyite forces gained control of the schools through the establishment of pseudo-professional education departments. It will be quite a surprise for most Americans to learn that classical Greek was typically taught at the secondary level in the United States even into the early 20th century. The works of the German mathematical genius Gauss were translated into English and circulated in this country almost as quickly as they came off the press, by a group of educators led by Benjamin Franklin's great-grandson Alexander Dallas Bache, the president of Girard College in Pennsylvania. As principal of Central High School in Philadelphia, Bache introduced the German gymnasium curriculum into the public schools.

In fact, a careful reading of Franklin's own scientific writing shows him to be an opponent of Newton's method. Thus, in his writings on electricity he takes a sly dig at Newton when he remarks that he is republishing his original experiments without amendment, even where he now knows himself to have been in error, because he understands that the process by which he came to formulate hypotheses is the most important thing which the reader will learn from reading about his electrical experiments. This was precisely the viewpoint of Kepler earlier who stated that he was reprinting his first major work, *Secrets of the Universe*, unamended so that the student might learn how a scientist comes to make a great discovery. This is the Platonic method, emphasizing hypothesis formation, which governed Humboldt's educational curriculum.

Unfortunately, the Newtonian method, which denies the scientific truth of universals, and therefore, deprecates the significance of hypotheses, is taught today in our schools. Hypotheses are treated as mere arbitrary rules of the game; and science is degraded to the observation of data for the purpose of making plausible assumptions and compiling statistical norms.

It is true that students educated in this manner can nonetheless make major scientific contributions, but they will do so only despite this misdirection.

It is far better to spend $216 billion dollars on any science education rather than expose children to the kind of electives which now fill their school day. Better yet would be a return to a the kind of classical curriculum developed by Wilhelm von Humboldt which produced great scientists such as Bernhard Riemann and the numbers of good scientists who elaborated his discoveries. As is well-known, both the Soviet and the U.S. scientific establishments have been highly dependent upon German emigré scientists, and particularly those educated at Riemann's Göttingen University. Best would be the development now of a curriculum based upon Riemann's major discoveries.

The course of study appropriate to this understanding would emphasize the study of hydrodynamic physical processes, beginning with the groundbreaking work of Leonardo da Vinci, and culminating in secondary school with a thorough understanding of the principles of the laser—both its construction and its use. This implies a thorough grounding in optics, and electromagnetic field theory. It also poses to would-be educators the task of cleaning up that theory to eliminate the assumptions of British empiricism which infect so much of science and turn quantum electrodynamic theory into gibberish.

For mathematics it means cleaning out the new mathematics once and for all—and with it the garbage of algebra. Mathematics is geometry. Anything else is either pernicious ideology or should be taught in the context of its necessary application, for example in a science workshop, as a tool for calibrating experimental devices or constructing models. It is a pathetic delusion, now being circulated in mathematical circles, that we can remedy the evils of the new math by replacing computation with the computer, and dropping some of the worst formal rhetoric associated with logical proof structure, which was introduced with the new math.

New math, like quantum electrodynamic theory, asserts that the world is irrational and all rules are essentially arbitrary. What matters is playing the game by the rules, once these are laid down.

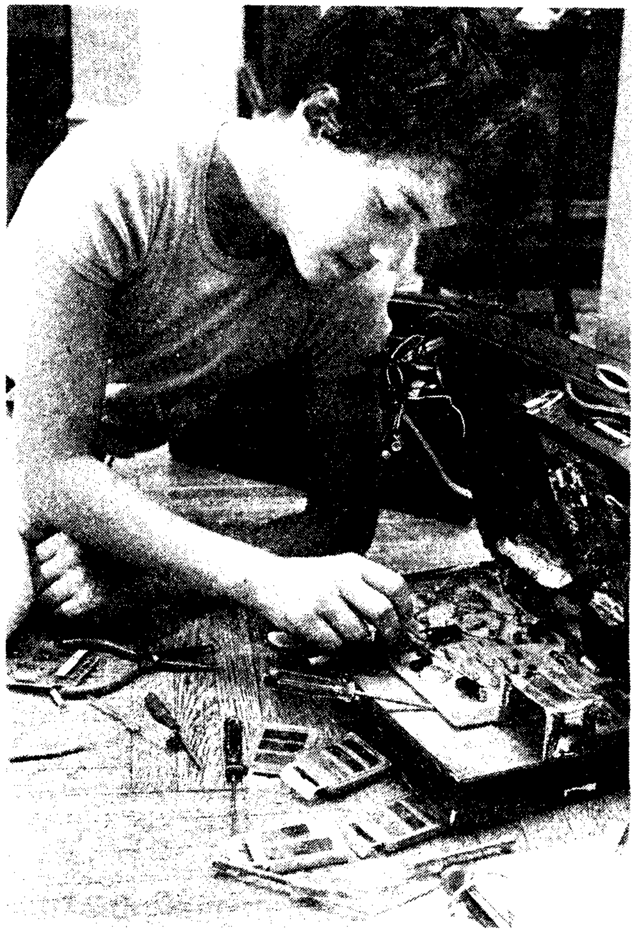
With the computer, the ideological content is masked since the rules of the game become the apparatus of software design, whether this is totally imposed on the student from without, or he or she learns to program the machine.

We must teach our children by allowing them to construct models of greater and greater complexity. We must take them through the LaRouche program for geometry, beginning with folding the circle to establish the construction of the basic regular polygons. We must show them the joy of exploring the potentialities and limitations of the regular solids—the solids relationship to the golden mean, and the limitation of their number to five. Then we must introduce them to the complex-number field as it is expressed by the development of a cone. As the children progress with geometry, they are able to appreciate the scientific accomplishments of Leonardo and to assimilate his method.

They can progress with Kepler to understand the amazing congruence between geometric principles, the physical principles of planet formation, and the direct relationship of these to the well-tempered musical scale.

A national mobilization

The President's Commission described the current situation) in the widely quoted introduction to its report: "If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war." The situation is not merely defined by the weakness of teachers or the impoverishment of the subject matter which they teach. The schools are havens for drug pushers and pedarasts in the liberal environment now rampant in our society. When we couple the evil effects of the rock-drug culture on young people with the added demoralizing influence of the zero-growth movement and environmentalism which rob them of an incentive to become scientists, we realize that a thorough clean-up is necessary.


Philip Ulanowsky/NSIPS

There is a vast difference between "computer literacy" and "laser literacy."

A leap ahead: the lasing principle of energy

A great deal has been written about the present technological backwardness of American industry. How we deal with this is relevant to the problems we face in education. Just one example is the steel industry, which still uses the more than a century old open-hearth technique of steel production in 11 per cent of steel furnaces, while in Japan it has been completely replaced by the basic-oxygen process (BOP). If we consider the energy content of a ton of steel, we find that the BOP is 10 times as productive as the open hearth method.

Obviously, it would be better for the United States to be totally converted to the BOP; however, we cannot afford to merely catch up with the Japanese. For that reason, it is imperative that we leap-frog ahead and begin a major conversion of our existing steel industry directly to the plasma steel-making process. We need to apply the same least-action principle to education.

To maintain and increase our national scientific and engineering eminence we must incorporate Riemann's methods directly into our pedagogy—in mathematics as well as physics. Whether in science or mathematics, all of Riemann's work was devoted to elaborating the principle of perfection as it expressed itself in the physical universe. Thus, his papers on relativistic physics and shock waves provide a method for transforming energy to higher ordered energy densities. The lasing principle offers a unique experimental proof of this method.

While plasma steel processes will be important in the period ahead, the laser will have wide application as a bridge technology to the plasma age. The lasing principle is also an extremely important pedagogical device. The laser illustrates that it is the hydrodynamic, directional coherence of energy which accomplishes work. When we heat a covered pot to boiling and the cover bobs up and down, we may attribute the work of lifting to the random motion of the excited molecules of water; such motion itself is merely an effect of the radient energy emitted by the gas or electric range. Any other view of the situation is pure mystification. What, after all, are the so-called molecules that are otherwise supposed to be hitting each other and rebounding?

The same lasing question comes up when we consider sound waves. Sound waves produce condensation and rarefaction of a medium—but what precisely condenses? Why does it rebound? All of the obvious, so-called common-sense answers merely perpetuate the illusion that matter is made up of Newtonian hard balls that interact; or that matter is imbued with a mysterious capacity for elasticity. A relative sophisicate will venture that the molecule is surrounded by a field, and that when two molecules interact, it is really because of the delicate embrace of their fields.

Until we go beyond the Newtonian-Aristotelian notion that the universe is composed of discrete objects which interact, we will be placing blinders upon the potential brilliance of our youth. We must begin to teach young people from their earliest years that the universe is continuous. What appears to us to be discrete space is merely that projection of the universe which is apparent to us through sense perception. When we apply our reason to knowing the universe, then like Kepler, or Franklin, or Riemann, we directly apprehend the continuity and perfectability of the universe.

If we are to realize the implications of President Reagan's March 23 speech, we will need a national mobilization. Not only will the schools have to be upgraded, but we will need to transform the skill level of a whole section of the existing workforce. While the job seems awesome, there is a precedent in the mobilization which took place during World War II.

The World War II experience

Between 1941 and 1942, three million people were trained. Programs which typically took a year to complete were accomplished in a third of the time. Exemplary was the training of 700 micro-range radar operatives by Dr. Robert Moon, seconded from the Manhattan project to accomplish the task. Not only was he training a cadre in a new technology, but he was training operatives to become their own repairmen—a necessary step under war-time conditions. His course, for high school graduates with a smattering of calculus, took them through partial differential equations on the one hand, and the construction of radar sets on the other. Precisely this is the approach which we need in the schools and at the work sites, as, for example, we train top-flight machinists to operate laser devices.

What happened in Maryland was a case in point. As early as 1929, companies began establishing aircraft-worker courses in Baltimore schools along with in-plant training. Ten thousand employees of the Martin company studied at company expense at Johns Hopkins University, 10,000 at the University of Maryland, and another 10,000 in the Baltimore schools. The courses they took included work in chemistry, aircraft, radio, engineering, and management. At the same time the State Department of Education participated in the Food Production War Training Program, a 36-hour course of study which taught them how to maintain their farm equipment themselves. Tens of thousands of farmers went through this program in Maryland alone.

This country needs a mass mobilization of labor on the scale of World War II to re-establish the vitality of our productive workforce and our schools and universities. The average age today of machine tool workers today is 58. It's about time that we connected the treason in our schools with the treasonous idea that this country cannot afford to reindustrialize. If we are to survive as a nation, now is the time to reverse this unacceptable depreciation of manpower.

Computers are useful tools and can be usefully introduced into classrooms in a limited way. The idea that they are appropriate replacements for hands-on experimenting or modeling is just as dangerous as the equally stupid idea that so-called information is a substitute for production. The idea that curricula should be modeled around the potentialities of the computer is not only absurd but dangerous. Who, after all, would talk about devising a curriculum to exploit the benefits of the ballpoint pen? Let's devise curricula which bridge the next period for young people who will need to assimilate new concepts at an accelerating rate as we enter the plasma age. Let's all become laser literate.