Technology in the Schools: Educators Are Uneasy

Talk of a technological revolution in the public schools has been increasing, and members of the *ancien régime* are uneasy. If the attitude of their Washington representatives is indicative, many people in the field of public education are concerned that industry and government may come to control curriculum content. The uneasiness is not confined to educators, however. Some members of Congress have warned that, unless educators are given a central role in planning the impending revolution, the consequences could be "tragic." U.S. Commissioner of Education Harold Howe, II, though deeply committed to pushing innovation in public education, is watchful lest the government find itself setting performance standards for the new technology.

Computerized classrooms, programmed instruction, "talking typewriters," and other novel devices and methods make up this new technology, which, according to the revolution's prophets, sooner or later will transform the public school as we know it. The transformation could prove to be painful. Development of effective, easily used, and reasonably priced teaching devices is far from complete. Responsible manufacturers are biding their time before trying to introduce the new technology on a large scale by turning their salesmen loose among the country's thousands of school districts. But to expect all firms to show such restraint would be unrealistic. Some school districts already have invested in equipment and materials of dubious educational value.

Industry is devoting increasingly large resources to the R & D effort to perfect the new technology. That a number of producers of "hardware" and "software" (that is, curricula materials) are joining forces has been widely noted as a sign that such major electronic and publishing firms as RCA and Random House, which are now under the same corporate roof, see a vast potential in the new "education market."

The big school-aid program initiated under the Elementary and Secondary Education Act of 1965 promises to support the new market through a heavy and continuing infusion of federal dollars. School officials once too hard-pressed financially to think of buying even the simplest audiovisual equipment are now thumbing enthusiastically through manufacturers' catalogs.

The U.S. Office of Education (OE), besides administering the school-aid programs and thus stimulating demand for new instructional equipment, is stimulating advances in the new technology directly through its program of research support. The 1965 legislation authorized OE to make research contracts with industry as well as with nonprofit institutions. Congress, despite the objections of some major education groups, is expected to honor OE's current request for authority to contract with industry for the training of researchers.

R. Louis Bright, OE's associate commissioner for research, believes that the total annual value of research contracts awarded to industry will never represent more than 10 percent of the total funds available for OE's R & D and demonstration programs. Such funds, totaling $103 million in fiscal 1966, may double over the next few years as the work of the new government-supported regional education laboratories really gets under way.

As this was written, no major contracts had been awarded to industry, though some larger awards are reportedly in the making. In the years just ahead, the value of OE contracts placed with industry probably will not exceed a few million dollars annually. The total will be small both by comparison with the value of contracts placed with nonprofit institutions and by comparison with industry's commitment of its own money to research. Nevertheless, the contracts awarded industry are likely to be important to the firms receiving them, for such research should place those firms at the leading edge of the new technology. Bright says that OE will look to teachers, school administrators, and university scholars to set the specifications for the software that industry develops.

Few professional educators would challenge, in principle, the proposition that the schools must use all those features of modern technology that hold promise of better instruction for their pupils. But—again to judge by the stand taken by their representatives in Washington—a significant number do not want industry and government to collaborate directly in the effort to bring the new technology into the schools.

"The potential danger that we see is federal control of education," said John M. Lumley, director of federal relations for the National Education Association (NEA), in a recent interview with *Science*. His association has nearly a million members and is by far the largest professional body of school teachers, administrators, professors of education, and others in the public education field.

Federal control, Lumley said, could occur in this way: the Office of Education, through contracts with industry for research and the training of researchers, would make a sharp imprint on the new technology's software, which could come into general use in the schools. Lumley and his associates are not comforted by Bright's statement that specifications for the software should be prepared by professional educators. They visualize OE's shaping the specifications just by its choice of education consultants and researchers. These views will seem implausible to most government and industry people concerned with educational technology. However, the Washington officials of the Council of Chief State School Officers and the American Association of School Administrators share Lumley's concern.

Industry's antipoverty-war foray into education, by way of contracts with the Office of Economic Opportunity to run Job Corps camps, seems to be viewed by many educators as an indication of a disturbing trend. Their uneasiness has not been lessened by the vague but frequent suggestions they hear to the effect that the "systems" techniques developed by aerospace contractors to advance defense and space technology should be applied to the problems of public education.

The Administration and most members of Congress who have thought about the matter believe that government policy should seek to commit industry's unique capabilities, along with other available technical and intellectual resources, to the improvement of public education. Some educators are saying, however, that industry has no

competence in the production of the new technology's software (still at a rudimentary stage of development) which cannot be acquired by the universities.

Lumley says that, instead of allowing industry to share the limited federal funds available for research on software, the government should contract for software only with nonprofit institutions, especially universities. The universities, he says, could do the research (with industry's help, when needed) and see that the public schools get the benefit of the results. To adopt this course, he adds, would be to follow the precedent set when federally supported agricultural research was undertaken by the land-grant colleges.

Perhaps because the new educational technology is not yet at hand, NEA's objections to the Office of Education's contracting with industry have thus far been made largely for the record, without any effort to generate an open controversy. The American Education Research Association (AERA), an NEA constituent made up largely of professors of education, has not objected to the proposal to make industry eligible to receive OE contracts. According to Richard A. Dershimer, AERA's executive officer, his board has shown no interest in the issue. On the other hand, Adron Doran, president of Kentucky's Morehead State University and recent chairman of NEA's legislative commission, has denounced OE's request for authority to make researcher-training contracts with industry as "potentially dangerous and costly."

(To this criticism the administration has replied that, because research in educational technology has been carried on principally by private enterprise, industry offers training opportunities not found elsewhere. To discourage industry raids on university faculties, certain safeguards—common in government training contracts—are to be observed. Contracts will not be made for training people who, within the previous year, have worked for the contractor. Contractors must refund money received for any trainee whom they hire within a year after training is completed.)

The National Education Association, though a vigorous supporter of federal aid to education measures, often has been accused of being far more interested in teacher welfare than in educational reform. Its opposition to government support of industry research in educational technology will be shrugged off by some people as predictable and self-serving. It is harder, however, to ignore the warnings of others who think that the road to the new technology has its hazards.

The computer, engaging the student in a dialog, leads her step-by-step to an understanding of the lesson. Computer-assisted instruction can be used for individualized instruction designed to help students overcome their particular weaknesses. The goal is to let each student learn at his own pace until the subject is mastered.

Such a warning came last month from a subcommittee of the Joint Economic Committee of the House and Senate, which had conducted 2 days of hearings in June on technology in education. "It appears that the vital function of programming—preparation of the content of education—is falling too frequently to the hardware manufacturers when it should be handled by educational experts," the subcommittee* reported. "It would be tragic if control of curriculum and the content of courses were to pass by default into the hands of large corporate producers in the hardware or software end of the business. Teaching aids and devices should be developed to meet explicit educational objectives and needs, rather than to broaden markets for particular products.

"It is imperative," the subcommittee concluded, "that educators maintain and safeguard their proper role as formulators of educational policy. . . . A primary concern of public policy [should be] to safeguard this role while promoting the utmost improvement of productivity in our educational programs through the studied application of the new technology."

Commissioner Howe, in a speech in New York last month before the American Management Association, noted that the relationship now developing among industry, government, and education as a concomitant of the new technology poses important questions of public policy. Having promised to "lift a few rocks under which snakes may be hiding," Howe observed that two countervailing forces are at work. "On the one hand, there is the necessity of avoiding any waste of federal funds being allocated to the nation's schools —a necessity that might suggest some set of national 'standards' to help school people appraise the educational value of what industry seeks to sell them," he said.

"On the other hand, we have a clear-cut conviction—as well as legal prescription—against federal interference in local education," Howe added. The question of how to assure effective use of federal funds without encroaching on state and local responsibilities, he said, requires the attention of five categories of people: educators, businessmen, foundation officials, state educational leaders, and those federal officials who are concerned with education.

Howe said several solutions had been suggested. One was to organize an educational consumer's union, which would be run by a nonprofit organiza-

* Members of the subcommittee are representatives Wright Patman of Texas (chairman), Henry S. Reuss of Wisconsin, Martha W. Griffiths of Michigan, and William B. Widnall of New Jersey, and senators William Proxmire of Wisconsin, Herman E. Talmadge of Georgia, Jacob K. Javits of New York, and Len B. Jordan of Idaho.

Harris Calls Conference on Biomedical Policies

At the invitation of Senator Fred Harris (D–Okla.), a 4-day national conference, beginning 24 October, will be held in Oklahoma City to discuss an issue that is causing great concern in the biomedical research community: trends in federal support of basic and applied health research.

A principal aim of the conference will be to resolve some of the uncertainty that has prevailed since President Johnson wondered aloud about the rate of therapeutic payoff from the government's investment in basic biomedical research (*Science*, 8 July). In announcing the conference, Harris, who is chairman of the Senate subcommittee on research, stated: "Considerable public opinion is building up for greater application of basic medical research. . . . This conference will provide the first national forum to discuss this subject in depth in all its aspects—opportunities presented, the money required, and the effect on basic research."

Some 25 leading figures in scientific research and administration have accepted invitations to speak, including William H. Stewart, Surgeon General; James A. Shannon, Director of NIH; Harvey Brooks, dean of engineering and applied physics, Harvard; William D. Carey, assistant director, Bureau of the Budget; Rene Dubos, Rockefeller University; Ivan L. Bennett, Jr., deputy director, Office of Science and Technology; Alvin Weinberg, director, Oak Ridge National Laboratory; and William O. Baker, Bell Telephone Laboratories.

tion and overseen by a standard-setting committee representing the five groups just mentioned. Another suggestion was to establish a committee on educational development similar to the Committee on Economic Development. The committee would draw its members from government, education, and industry but would be independent of all three. Still another proposal, which Howe indicated was unacceptable, was to set up a federal regulatory body. "So far, all such suggestions—having come from off the top of someone's head—remain amorphous," the Commissioner said.

The problem of obtaining competent and disinterested evaluations of the new technology seems to be inseparable from that of having educators join with industry in developing the technology. Indeed, industry and the professional educators may have to collaborate at every step of the way, from establishing curricula objectives to preparing and evaluating the final product. As one former educator now with industry recently observed, the drawing up of curricula objectives and specifications should not be left wholly to the educators. "It comes down to a matter of selecting the brightest and best people available," he said.

Fears that the educators will be left out of the development of the new technology may prove, for several reasons, to have been unjustified. The teachers, administrators, and education professors are the ones who usually decide what equipment and materials will be bought for the classrooms. Probably the surest way to have them accept new products is to give them a part in the products' development and testing. Ignoring them could be disastrous for sales campaigns. "The professional educators are in the driver's seat, and I can't see industry ever getting them out of it," an industry official told *Science*.

A number of potential avenues and mechanisms for collaboration between industry and the educators already exist, and more are being created. The universities, which are getting the bulk of the federal research money, are free to make subcontracts with industry and thus to obtain a voice in what industry should be doing. Moreover, the competence of educators to meet industry on equal terms in matters of the new technology is increasing. Under a program initiated by OE in 1964, ten education research and development centers have been established on college and university campuses.

The center at the University of Pittsburgh, under Robert Glaser, a professor of education and psychology, was one of the first. It has undertaken a number of projects concerned with curriculum design, learning laboratories, computer-assisted instruction, and other subjects related to the new technology. Several experimental devices are being designed and tested in association with the Westinghouse Research and Development Laboratories.

The new OE-sponsored regional educational laboratories should provide another means by which professional educators, from classroom teachers to university scholars, can evaluate new instructional devices and work on the curricula materials that are required. Twelve such laboratories have gone into operation since last year when their establishment was authorized by the Elementary and Secondary Education Act.

The Educational Research Information Center (ERIC) coordinated by OE will facilitate the exchange of research information on new teaching devices and materials. However, ERIC is not regarded by NEA as capable of providing all the services required by those appraising the new technology. An NEA proposal calls for the establishment of a Bureau for Educational Technology and Administration (BETA), which would serve as an information clearinghouse, data bank, and referral center. It would be operated in the public interest by a private, nonprofit corporation. Perhaps ERIC or the proposed BETA system, combined with an independent evaluation body of the kind mentioned by Commissioner Howe, will provide the key to the problem of advising school districts on the value of new teaching devices.

The sheer administrative diversity of American public education is a safeguard against domination of curriculum planning by government or industry. With 50 states, each with its own educational system, and numerous school districts within each state, there are simply too many centers of decision to make it likely that anything approaching a uniform program of instruction will ever be adopted on a national scale. The fact that a growing number of companies will be competing for a share of the new education market is further assurance that a wide variety of teaching devices and methods will be used.

Finally, the watchfulness of the educators and Commissioner Howe's awareness that there may indeed be a few snakes under the rocks make it seem probable that the technological revolution in the schools can be achieved without either industry or government masterminding the curriculum.—LUTHER J. CARTER