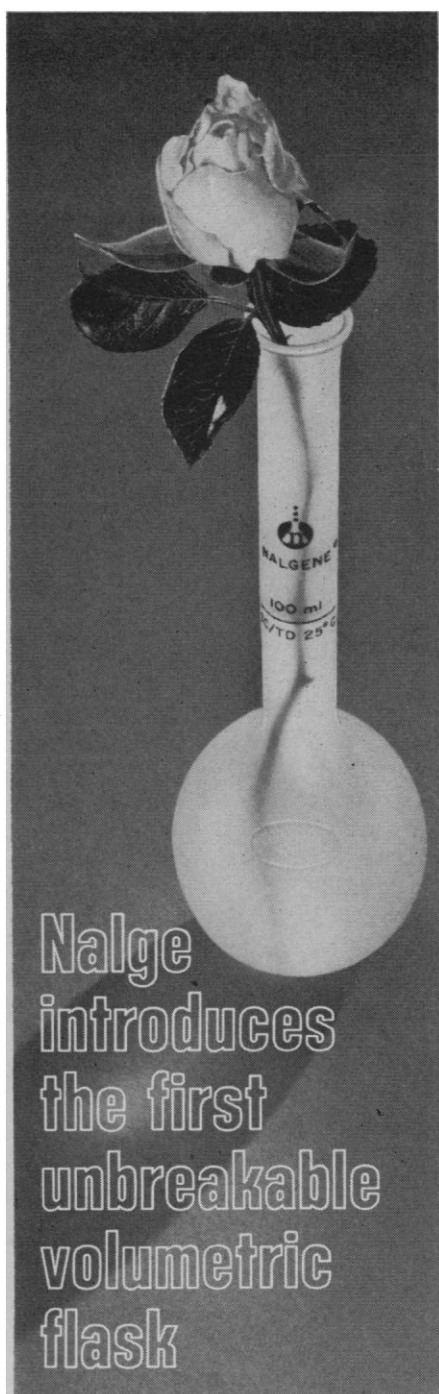




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Learning Environment

As Atkinson and Wilson point out in their article "Computer-assisted instruction" (4 Oct., p. 73), it is premature to evaluate the general effectiveness of many computer-assisted instructional (CAI) systems. The same argument might be advanced for a parent of this 10-year-old offspring—programmed instruction.

Nevertheless, few serious thinkers doubt that programmed instructional techniques can work as well as other techniques, or that they can be useful in the classroom as instructional aids to teachers. Moreover, there appears to be a tendency (at least among programming enthusiasts) to think that the use of more programs in the school, everything else being equal, will improve classroom instruction. And this improvement is expected to be due primarily to some inherent properties of the programs. For Atkinson and Wilson's CAI systems (response sensitive programs), these inherent properties appear in the form of optimal instructional strategies for the individual learner. For linear programmers (using response insensitive programs) these inherent properties appear in the form of the reinforcement schedule of the program. In either case it is assumed that the program is sufficiently motivating to maintain each student's responses to the program until the material is learned.

Nevertheless, forcing students to sit down at a teaching machine until they have completed some section of material would not appear to be much of an improvement over forcing them to learn that material through any other method. In other words, the program can only be as effective as the techniques we use in getting students to use the program.

Unfortunately, advocates of programmed instruction have not stressed total programmed environment as much as they have tried to sell programs as an approach to teaching. But any significant application of programming principles depends upon controlling the *total* environment—not small segments of it. (Is this, perhaps, why, in Atkinson and Wilson's words: ". . . the actual results of programmed learning fell somewhat short of the glowing predictions of its early prophets"?)

The main issues for programmers in applications to classrooms appear to me to be how programmed instruction, operant conditioning techniques, and optimal instructional strategies can

contribute to a better total learning environment. This is not to say that the development of programs, CAI systems, and the like is not an important venture, but only to stress the often overlooked importance of the environment into which such programs and systems are to be placed. Unless programmed instruction is used as part of a programmed environment, its place in history will only be as another technological tool, not as a potential revolutionary way of analyzing (and hopefully improving) classroom instruction.

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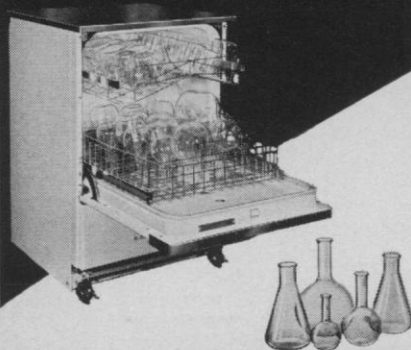
New Aims of Medical Practice

Sometimes, it seems, the bias of *Science* editors shows through. Abelson states casually—as if the proposition were quite axiomatic—that "the basic means of improving medical practice is through research" (meaning research in science) (Editorial, 30 Aug., p. 847). This doubtless was true at one time when medical knowledge was infinitely less developed than at present, and society considerably less complex; today the statement is, at best, a misleading oversimplification. Those specializing in diplomacy, economics, political science, public administration, and education might readily claim—respectively—that the "basic means" for improving medical practice include, more significantly: the maintenance of peace and fruitful international relations; increased national income and more even distribution of that income (particularly the portion of income after military expenditures); the more rational allocation of health functions among governments (federal, state, local), and between governments and private agencies; the more effective administration by governments of public health programs; and finally, probably the *sine qua non*, a more educated understanding by the public of *all* health requirements (including research), leading to fruitful public interest and steady financial support.

The primacy of increased medical knowledge holds only if one considers that knowledge is always more important than the use of knowledge. This seems to be common doctrine of the *Gelehrte* throughout the world. Certain-

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ly it would be dangerous folly to depreciate the crucial role of increased scientific knowledge and research. But the available knowledge on how to demolish the civilized world by hydrogen bombs, and how to destroy mankind by use of the "right" pathogens should at once bury the illusion that the benefits of increased scientific knowledge and research are automatic. Would that it were that simple! The means for the productive use of knowledge must also be on hand.

Actually, the very success of medical research, as compared with research in the relevant social disciplines, diminishes—though by no means eliminates—the *relative* need for further research in this area. At present, the "basic means" for further advances in medical practice lie at least as much in the sciences of society as in the sciences of medicine.

HERBERT S. CONRAD

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Washington, D.C. 20016

Modifying the Ph.D. Program for Foreign Students

Most foreign predoctoral students in the United States come from developing countries. After earning a Ph.D. in science, each can be expected to return to his homeland wanting to contribute to its development and advance himself professionally. There he often encounters problems: the research he wants to do does not match local or national goals or resources; his research and teaching equipment is often damaged on arrival or soon needs repairs for which facilities are not readily available; and he lacks competence in the techniques of program justification, procurement, and survival in an environment where technical literature is relatively scarce.

The student himself, his homeland, and the host country clearly share the responsibility for training him and then using him wisely. In view of this, the Ph.D. program in the U.S. needs to be modified. The foreign predoctoral student must be trained so that he can cope with the problems and emergencies that await him in his homeland. Though the research training should be of no lower quality than that required of the American student, the program should be augmented to include training in certain skills which he will urgently need. I recommend the following

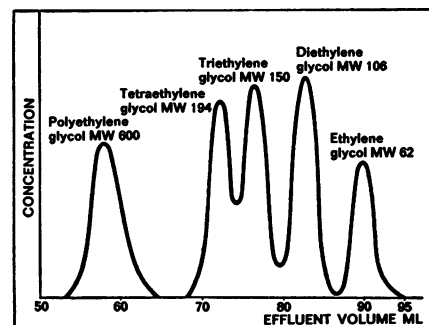
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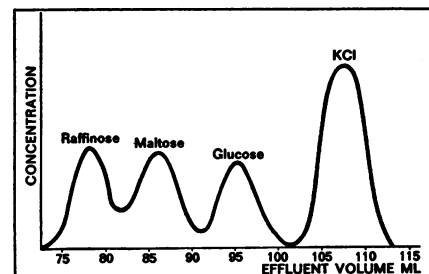


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