6

Technology and Educational Structure

Editor's Note: Boocock, S. S., (2012). Educational technology classics: Technology and educational structure. *Educational Technology, 52*(1), 55-56.

*Most current debate on instructional technology is characterized either by grandiose speculation on the salvation of education through automation (without specification of **what** and **how** technological innovations will actually be introduced in specific classroom situations, and how the changes will be financed), or by jargon-filled hairsplitting over the relative merits of different types of "hardware." The objective of this article is to bring some order to the debate, by pinpointing what seem to be the most important ways in which technological innovations can have impact upon both the content and structure of education, with major emphasis on the latter.*

Content

The potential contribution of instructional technology is to make the subject matter of the curriculum more immediate and relevant to students' own lives and view of the world. Curriculum developers and educators in general have for the most part failed to take into account the real differences in the media experience of the present school population compared with previous generations, in particular the sophistication of virtually all children, even among the so-called "culturally deprived," with respect to television, film, and computer-related technology.

In the area of the humanities and fine arts, most teaching is still in the form of reading and writing, and because these activities have not played a large part in the family and neighborhood lives of many students, they dismiss the subjects themselves as irrelevant. On the other hand, experimental curricula incorporating sophisticated cinema and television materials (i.e., as opposed to traditional "educational" films, which seem, at best, humorous to children daily exposed to the technical perfection of TV commercials) and the handful of experiments in which young people have produced their own films or TV tapes have suggested that children's own media experiences and preferences can be channeled toward the achievement of academic goals.

In the natural and social sciences, a variety of technological innovations can provide more realistic models of real-life processes for analysis in the classroom.

Simulation games are an example of a technological innovation that seems to have particular relevance in this respect for the social sciences. Because a game is a kind of miniature social system, incorporating many of the roles and role expectations, motivations, and behavior patterns characteristic of real-life situations, simulation games can constitute a kind of laboratory for the social sciences on the one hand, surrounding the student with an environment which gives him the **feeling** of what it is like to be in a variety of social situations; on the other hand, allowing him to observe, manipulate, and interpret his own and his classmates' behavior, under relatively controlled conditions, in much the same way that students of the natural sciences can observe, manipulate, and interpret physical phenomena in the laboratory.

The main point with respect to content is that, to make the curriculum meaningful to children, it must have some visible links to the world as they perceive and experience it. This will require much more attention to and imaginative use of models of communication than previously considered necessary.

Structure

The remaining discussion is based upon two general premises: (1) That **the structure of education is as important as its content**—indeed that the effective transmission of any particular information to students is dependent upon their motivation to learn this information and that the necessary motivation is in turn dependent upon a learning environment which makes learning attractive and rewarding. (2) That the importance of specific types of equipment lies less in the details of their mechanical operation than in their **effects upon the structure of the learning situation.**

For example, one of the most intriguing findings in connection with Omar Moore's "responsive environments" is that the major appeal of the "Talking Typewriter" is the **increased social interaction** facilitated—a voice always responds to the child's behavior. In fact, Moore has found that many of the impressive learning results occur just as regularly when the child works at a regular typewriter with a teacher beside him as when he uses the computer-based equipment.

Our experience with simulation games has been similar. While our original belief was that computer games would raise both motivation and learning, field tests showed that not only was it the social restructuring of the classroom (in particular being able to talk with peers and help each other to learn) that appealed to the participants, but that the complexity of the computerized versions of most games confused students, making it more difficult for them to analyze the causal relationships in a given sequence of play and thus to learn the general principles built into the game model. (My purpose here is not to downgrade technology—on the contrary, the theme of this article is a plea for more systematic exploration of its possibilities—but to underscore the claim that we cannot understand its capabilities and liabilities by studying only the purely mechanical features.)

First, it can make the student more active and autonomous with respect to his own learning. In contrast to the conventional classroom situation, in which the teacher lectures to all students or questions one at a time (while the rest of the class wait in varying degrees of attention and anxiety) or students silently read or do written exercises, devices such as teaching machines, language labs, and simulations allow all or most students to be actively and simultaneously involved. In the first two devices, student autonomy lies in the power of the individual student to set his own pace and sometimes to choose what he will study. In a simulation or game, the locus of control lies with the students as a group, in that all participants must agree upon and obey the rules if play is to continue and they can evaluate their own performance by the outcome.

Second, relationships between students and teachers and among students with each other can be both fuller and more informal. In contrast to one-way lecturing by the teacher (or textbook), teachers and students can work together to grasp the "message" of a film or TV program or to master a new piece of equipment or the rules of a new game. At its best, instructional technology can free the teacher from the functions of disciplinarian, judge of the adequacy of students' performance, and dispenser of rewards and punishments, thus reducing the formality, distance, and mutual distrust characteristic of the student–teacher relationship. (It should be noted that while these changes may be one of the most valuable consequences of many technological innovations, the shifting to greater activity for the student with less control by the teacher may be **initially difficult for the teacher.**)

With respect to student–student relationships, technological innovations which allow a high degree of student interaction and cooperation tend to reward rather than punish individual students for superior performances and effective interpersonal communication. For example, the whole group is rewarded by a spectacular play in a team game or for an especially imaginative detail in a student-produced film. A research implication is that we need to give much more attention to the ways in which children learn informally from each other.

My work with simulation games has indicated that by far the most effective way to teach a new game is to have students work out the rules for themselves, to use older or more experienced players to help new ones, and in general to put as many students as possible into a combination teacher–learner role. However, with the exception of a few isolated examples—e.g., the Penn Sate Pyramid Plan, and some experiments in the poverty program in which teenagers, often themselves school failures, have been given responsibility for persuading younger children to stay in school and even for tutoring them—we have little hard data on how children learn outside of formal, involuntary situations.

Third, it can get students into the education act sooner—that is, let them become creators as well as consumers of educational materials. The boredom experienced by many users of programmed instruction may be partly because most of the real learning was done by the programmer, leaving the student with a pre-chewed product for which the excitement was removed along with the “errors.” Again, I must draw largely from my experience with simulation games, since there has been so little serious experimentation in this area.

While it is still an open question what and how much various students learn from participation in a completed simulation game, there is no doubt that those of us involved in the **design** of games have learned a great deal about the subject matter of a given game and about group decision-making processes in general. Thus, some game designers are now experimenting with increasing student participation in the **developmental** phases, by having them validate or revise an existing game or construct one of their own. This kind of activity obviously has relevance to the first and second points above as well as to this one.

Participation by students in the development of learning materials is emphasized here because while few teaching techniques now in common use incorporate it to any marked degree, there is a growing body of evidence showing that this is the kind of activity which is closest to the actual working behavior of scientists, artists, and other creative persons, and that to gain a real understanding and appreciation of any field it is necessary to have some feeling for how new knowledge in this field is produced.

Moreover, it is in this area that instructional technology, imaginatively used, may be most valuable, since by their very nature computers, audio-visual equipment, and the other accoutrements of the new media encourage the sort of “tinkering” that is an important component of the creative process.

Summary and Conclusion

Technological innovations can have impact upon both the content and the structure of education. In connection with the former, they can make the subject matter of the curriculum more realistic and relevant. In connection with the latter, they can restructure the learning environment:

— to allow the student more autonomy with respect to his own learning;

— to change the student–teacher and student–student

relationships in ways conductive to learning; and

— to involve students in the actual development of their own learning materials.

The significance of any particular teaching innovation lies more in the way it affects the structure of the learning situation than in its purely mechanical details. Whether or not the new media will have any real impact upon American schools depends upon whether educators simply try to fit them into the present classroom structure or use them as means of discarding what is obsolete and moving toward more self-directed learning, oriented toward goals that students themselves see as exciting and relevant.

This article appeared originally in the January 1969 issue of this [*Educational Technology*] magazine. The author, **Sarane S. Boocock,** at the time of writing was Professor, Laboratory for Organizational Research, University of Southern California in Los Angeles.