Middle Articles

MEDICAL EDUCATION

Audio Visual Aids in Medical Education

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Two major problems confront medical educators at the present time: firstly, the increased intake of medical students which is now under way, and, secondly, the great expansion in post-graduate medical education. The number of teachers, at present inadequate, can only fall further behind the requirements over the next decade. To cope with these problems we must exploit to the full advances in educational technology which can help to improve the quality of orthodox teaching methods and which can, in the form of self-instructional techniques, replace the teacher altogether.

The term *audio visual aid* is best used for devices which can help conventional teaching methods such as the lecture, clinical demonstration, or the textbook. Many aids—for example, the blackboard and colour transparencies—are already in use, but more modern facilities such as the overhead projector, the audiotape, and the film loop are little used.

The term *audio visual system* is used for teaching methods which can replace the lecturer to a greater or lesser extent—for example, films, audiotapes with slides, teaching programmes presented either by machine or text, and television programmes. These self-instructional techniques can be adapted either for individual or for group tuition.

Three major groups of teaching systems—audiotapes with slides, films, and television will now be considered.

Audiotapes with Slides

Tape-slide programmes have been widely used in undergraduate and postgraduate medical education in Britain largely as a result of the pioneer work of Dr. John and Dr. Valerie Graves, who have developed the Medical Recording Service of the Royal College of General Practitioners. What has not been fully realized in the past is that the tape recording with slides is a completely new medium and not merely the reproduction of a conventional lecture with slides.

Playback systems must be sufficiently simple and reliable for the student's use without supervision. The "C" type audiotape cassette is probably ideal for this purpose, since it does not require to be threaded on to the tape machine. Various types of playback machines are available for tapes or for cassettes. In the Faculty of Medicine of the University of Newcastle upon Tyne the Philips stereo machine has been used. Slide change pulses of about 30 cycles per second are recorded on the second track of the tape and after amplification in a synchronizer are used to trigger the slide change mechanism of an automatic projector—in this case the Kodak Carousel "S" projector. In the University of Glasgow Harden and Wayne

(1968) have described the use of the Frank-Kindermann audio visual tutor machine, which is commercially available, though it is rather expensive. The tapes and cassettes issued by the College of General Practitioners do not include any slide-changing impulse, the listener merely being told the number of the appropriate slide. Though this system can be used with the simplest equipment, Harden *et al.* (1969) have shown that students prefer an automatic system, which also results in more efficient learning, though further studies are required to confirm the generality of this conclusion.

The audiotape system may be used for individual tuition with a small screen and headphones, or for small groups of students. Programme design has been considered by Harden *et al.* (1968), Engel (1969), and by Amos *et al.* (1969), all of whom stress the advantages of this system. When slides are used, as they usually are, it is vital that the visual presentation is in step with the sound—the viewer can tolerate neither a blank screen nor the continuing projection of an irrelevant slide. The student can stop, start, or go back at will; he can look and listen simultaneously; he can be referred to histological sections, diagrams, or short films; and recordings of physiological phenomena can be incorporated into the tape. Techniques adopted from programmed learning may also be applied to the system.

Despite the existing popularity of the audiotape system with slides, careful evaluation of its effectiveness and efficiency is still required, and the most suitable format to be used in different learning situations must be established. Harden *et al.* (1969) have shown that medical students using a tape-slide programme on endocrinology on average did better than students taught by conventional lectures, though obviously many factors such as the novelty of the new teaching method could have contributed to this result. The Department of Audio Visual Communication of the British Medical Association, under its director Mr. Charles Engel, supported by a grant from the Nuffield Foundation, is in the process of evaluating the preparation and use of audiotapes for individual learning at different levels—preclinical and clinical, undergraduate and postgraduate, and in different learning situations—instead of a lecture. The results of these studies should help to establish the use of audiotapes on a firm scientific basis.

Films

Conventional 16-mm. films of varying length and quality are available from the B.M.A. film library and from various pharmaceutical firms. Many of these films are disappointing, frequently they present unacceptable or out-of-date information, and they must always be previewed before presentation to a medical audience. The recent reorganization of the B.M.A.

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film library has led to many films being withdrawn as out of date or unfit for projection.

A short length of film (the short film unit) overcomes many of the disadvantages of the conventional film; it may be used to portray a brief sequence of movement in isolation or with other short film units. Out-of-date units are easily and inexpensively replaced; a unit can be viewed several times and can be integrated as a visual or audio visual aid into a lecture, seminar, or clinical demonstration.

Sixteen-millimetre film may be used for short units, but the film and projector are expensive, and it is difficult to rewind the film rapidly. Standard or super 8-mm. film is cheaper, and several special projectors have been produced which are particularly suitable for operation by the individual student.

Cassettes containing endless loop film are available for insertion into silent film projectors (for example, the Technicolor loop film projector, about £50) or sound film projectors (for example, the American Fairchild Mark IV projector, about £250). The endless loop system can be stopped at any time and the cassette removed, but it cannot be reversed to look at an earlier sequence. A second type of cassette projector uses automatic threading from a master spool on to a receiving spool, with facilities for rapid rewinding. Here it is possible to stop or reverse, but the film cannot be removed before rewinding. One example of a loop film is that recently published by Macmillan and Company on the subject of embryology by Hamilton, Boyd, and Glenister, as five 8-mm. loop films. With each is issued an illustrated booklet of explanatory notes and background information. Nevertheless, the result is somewhat disappointing, possibly because of the choice of subject and its rather artificial presentation—a series of colour transparencies would have done as well. Films of the actual process of ovulation are already available and show the events much more vividly. There can be little doubt, however, that the short film unit is a valuable teaching aid. What is required next is a careful evaluation of the type of material which is best presented in this way and the learning situation in which it is most appropriate.

Television

The use of television in postgraduate and continuing medical education was the subject of a conference at B.M.A. House in October 1968 (Engel and Meyrick, 1969). Television is used in two ways in medical education; firstly, as a closed-circuit system in departmental units and in large university circuits; and, secondly, in open-circuit television broadcasts—largely as postgraduate programmes for general practitioners (Shaw, 1966).

Closed-circuit television is mainly used to offer students an identical "privileged observer's" view of various procedures—for example, anatomical dissections or surgical operations (Engel, 1963)—and several investigations have demonstrated the effectiveness of this teaching method in carefully chosen situations.

Videotape can also be used as an audio visual aid, and when the cost of production and of projectors is reduced it may well replace cine films in many situations. The Electronic video recording and reproduction (E.V.R.) system (Wren-Lewis, 1969) consists of an E.V.R. teleplayer, which plugs into a domestic television set, and an E.V.R. telecartridge for playing prerecorded programmes of sound and vision through the teleplayer. If this system, which is now in production, can be obtained sufficiently cheaply it could find a wide application for individual instruction in the home.

The broadcast television programmes by Scottish and Tyne-Tees Television and the B.B.C.'s "Medicine Today" have reached many doctors in their own homes, but there is still a lot to learn about the effectiveness of the programmes. Some studies of the effectiveness of different ways in which a television

programme can be presented—lecture, interview, panel discussion, or case demonstration—are available, but the results are inconclusive. The problems of evaluation are particularly complex when dealing with a wide postgraduate audience. In the United States open-circuit television has been used to broadcast grand medical rounds to community hospitals on a regular basis. An average of 1,400 physicians watched each weekly broadcast of the Pittsburgh Regional Medicine Television Programme (Moses and Wolfe, 1965).

The television section of the Association for the Study of Medical Education is conducting research on the development of television in postgraduate and continuing medical education and should ultimately be able to identify the needs of general practice best served by television and the forms of presentation which are most effective.

Conclusions

From this necessarily brief review of some types of audio visual aids and systems it is obvious that the application of technology to medical education should prove of immense value, particularly in helping to redress the difficulties of the adverse and deteriorating staff student ratio. Yet these new teaching methods must not be accepted uncritically, for the novelty will soon wear off. Careful and critical research is urgently needed to define the role of these new techniques in the hierarchy of teaching methods. It is for this reason that the experiments in the faculty of medicine in Glasgow, the Royal College of General Practitioners, and the Department of Audio Visual Communication of the B.M.A. are of such crucial and far-reaching importance.

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