Media Systems for Education and Training in the Allied Health Sciences

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Introduction

THE TECHNIQUES involved in education and training are essentially techniques of communication of knowledge, skills and attitudes from one group of persons (teachers) to other groups (students). However complex the system of communication may be, the elements involved can be reduced conceptually to a simple model, the S-M-C-R-E model (modified from Rogers and Shoemaker, 1971) as depicted in Fig. 1. This shows the basic components of the process of communication. The boxes contain words denoting the communication process while below are shown terms relating to the context of education. In each case, the process starts with a source having a message to pass on to a receiver through a channel. Upon receipt of this message, the receiver responds and effects are generated accordingly. A feedback pathway is usually incorporated to allow the source to monitor the success or failure of his communication and also for the receiver to check upon the results of his reception of the message. In educational terms the process would involve a teacher having a unit of instruction to transmit to a student through a delivery system. The student, upon receiving the unit of instruction, exhibits learning outcomes that can be assessed by relevant evaluation procedures. This generates feedback both for the teacher (in terms of how effective his "teaching" has been) and the student (how successful he has been in his "learning")

When this model is applied to the education and training of medical, para-medical and auxilliary health personnel, the link that may be explored further in the light of advances in media technology
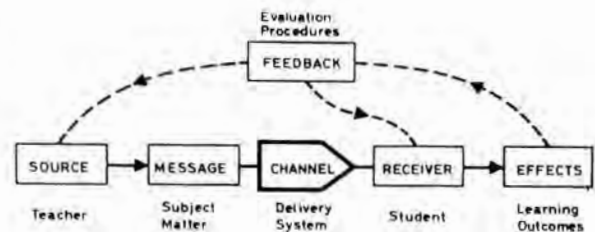
S-M-C-R-E MODEL OF COMMUNICATION

is the *channel* by which the unit of instruction is "transmitted" to the student. In educational terms, this is the delivery system.

The term "media" refers to "any means of presenting stimuli" (Briggs et al. 1966) and "media technology" is the employment of technology (whether graphic, mechanical, electric or electronic) in the creation of formats and devices for the presentation of stimuli. "Media systems" are therefore procedures associated with a single medium or combination of several media with the attendant technological processes that are used for the transmission of stimuli particularly in an educational setting.

Objective

The spoken and printed word, patients, cadavers, lantern slides and models have long been used in education and training in the allied health science field. More recently, the 35 mm slide has become a common means of presenting data or illustrations

and many 16 mm movie films are available for medical teachers who wish to use these either to supplement or to replace the traditional lecture.

Newer media systems have now been created and are available for more effective delivery of subject material to students. In the Malaysian context, some of these are already in use, but others are being tried out only experimentally. Further, the manifold potentialities of some of the systems already in use have still not been fully exploited.

The objective of this paper is to draw the attention of educators in the field of the health sciences in Malaysia to some of these newer media systems.

(a) *An overhead projector (OHP)* (Fig. 2) is a device that throws an image of an 8 inch by 10 inch transparency "over the head" of the teacher on to a screen behind him. This device can be operated by the teacher alone facing the audience, and can be used in a normally lighted room. The OHP comes in several models with varying power in the light source. Newer models employ quartz-iodine lamps which emit a brighter light with less heat production. A portable model is also available in a package slightly larger than a brief-case.
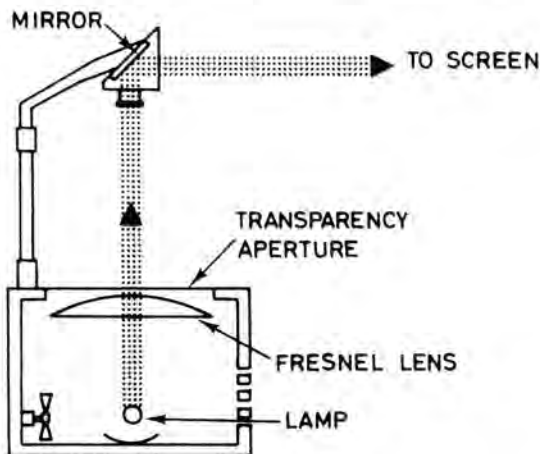
OVERHEAD PROJECTOR (OHP)

The transparencies that are projected by the OHP can be obtained in sets that have been prepared and tested by the manufacturers and a wide range of subjects in the health sciences may be purchased as "teaching packages" complete with worksheets and teacher's guide.

These professionally prepared transparencies are in colour and are usually of high quality. They also incorporated "overlays" (one transparency on top of another) in order to introduce a subject sequentially or to show by superimposition the relation of one factor to another. However, most of these teaching packages have been prepared in a non-Malaysian context and caution has to be exercised when they are used locally.

Transparencies for the OHP can also be prepared locally by drawing on clear acetate sheets or imprinting by means of an infra-red thermocopying machine upon special heat-sensitive sheets of clear acetate from paper sheets with pencilled words or diagrams. Rolls of clear acetate are also available and can be fitted to the OHP for use as a writing surface by the teacher. As more space is required, the used part can be rolled away from the transparency aperture to be replaced by fresh writing surface. Clear acetate sheets are relatively expensive and a cheap and effective substitute may be obtained from discarded X-ray films bleached by immersion in iodine solution.

(b) *Audiotapes* are now available in open-reels, cassettes or cartridges. Lectures or articles from journals can be recorded on audiotape and these can be borrowed by the students and played back at their convenience at home, in the library or even in the motor-car while commuting if cassettes are used. Certain medical journals are already issued in this form, for example, the American College of Cardiology Extended Learning (ACCEL) circulates a "multimedia journal" in cassettes accompanied where necessary with illustrative printed material, for example electrocardiogram tracings.

(c) *Tape-slide presentations* are produced by combining the commentary, narration or lecture on an audiotape with a series of 35 mm slides that serve to illustrate visually the presentation. These presentations may be synchronised – the slides changing by a recorded pulse from the audiotape.

If automatic slide projectors are not available, manual projectors or battery-powered viewers can be substituted for small group or individual viewing. Learning packages can be made available through libraries or circulation. These presentations are quite easily available, for example, the Royal College of General Practitioners in the United Kingdom in conjunction

with the Medical Recording Service Foundation citercusla a large stock of tape-slide packages on a wide range of medical and health subjects. A number of these will shortly be available in the Medical Library of the University of Malaya.

(d) Insome medical schools, *microfiche* have replaced microscope slides as a means of illustrating phoblogic changes in tissues. Microfiche are made of photographically exposed films, 4" by 'a' with a maximum capacity (in this form) of sixty frames, projected for viewing by a reader machine. In Fig. 3, each picture is accompanied by questions with answers given below. Microfiche are not difficult or costly to prepare, although those requiring illustrations and compactly stored and are virtually indestructacte if handled in the proper manner. Reader machines, however, vary in price depending on the degree of resolution obtained and degree of automation required.

(e) *Television* has been used in education for some time. Closed circuit television (CCTV) systems are the most widely used, with the programs being distributed through cables. A possible CCTV system is depicted in Fig. 4. The source of the program may be pre-recorded videotapes, video-cassettes, or live productions from a television studio. Live productions can be simultaneously recorded on videotapes for repeated showings. A film-chain which allows slides or movies to be shown through television can also be linked with the CCTV system and a central control and distribution panel incorporated to direct the programs to the appropriate viewing areas.
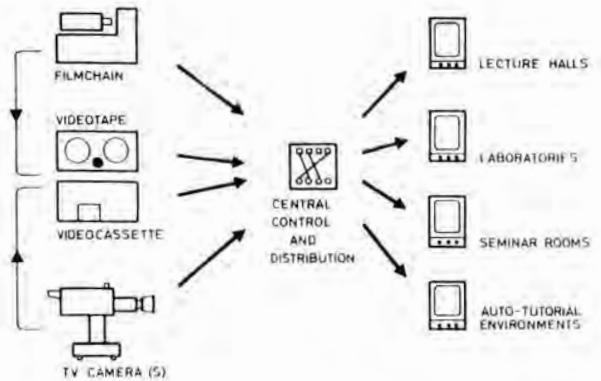
CLOSED CIRCUIT TV PRODUCTION/DISTRIBUTION SYSTEM

CCTV can be used for recording events, experiments, or patient interviews on videotapes for future viewing and discussions, for handling overflows from lecture halls or for providing close-ups of anatomy demonstrations, post mortem examinations or surgical operations for large groups of students. Because video recordings can be sent by post, they serve to extend a teacher in space and audience miles apart can view the same presentation for a fraction of the cost and time spent if the teacher were to travel around giving the same lecture. Various institutions, for example the Network for Continuing Medical Education (NCME) in New York and the British Postgraduate Medical Federation in London, offer videotapes either in reel or cassette form on a rental basis to medical schools. Several NCME programs have been televised by the CCTV system in the Faculty of Medicine.

An important asset of CCTV systems is the capability of instant replay of a recording. An event, such as a teaching session or a psychiatric interview, can be recorded and immediately replayed for discussion. Although CCTV has a lot to offer as a medium in education, it is expensive to set up a system which will exploit its potentiality.

(f) *Super 8 mm films* have been used extensively for educational purposes having the advantage of being cheap to produce. Film loops, each illustrating a single topic such as the technique of venepuncture, lumbar puncture or vaccination, are encased in plastic cartridges which can be repeatedly played without the need to rewind or rethread the projector reducing damage to the film. It is possible to add a

sound track to the film making the loop a complete learning package. Loop-film learning packages have been produced and are currently being used experimentally in the Faculty of Medicine (*Chan*, **1971**).

A more recent development of the Super 8 mm film is the Programmed Individual Presentation (PIP) system described by Wittich and Schuller (1973). The film is placed in a cassette and the narration is recorded on a separate audio cassette on which a separate track controls the speed of the film. The film can be run at normal speed, slowed to show motion in extended time, or stopped at a single frame for longer narration. This system, although allowing flexibility in the design of a learning package, is expensive and requires expertise to produce.
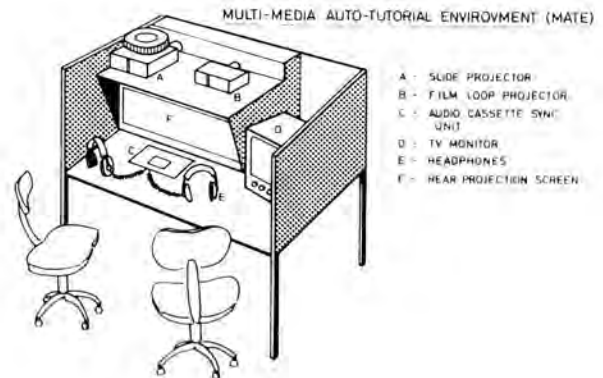
(g) Combination of the above media systems can be used for certain presentations and specially designed for high audiovisual impact on the audience or high affective power. A set-up for a *multi-media multi-screen* presentation is depicted in Fig. 5. This employs three slide projectors and one movie projector which are synchronized by a control (or "sync") unit, with a cassette playback machine supplying the audio component. With this system it is possible to illustrate different aspects of a topic simultaneously or with two slides showing descriptions and the movie illustrating these.

MULTI-MEDIA, MULTI-SCREEN SET-UP
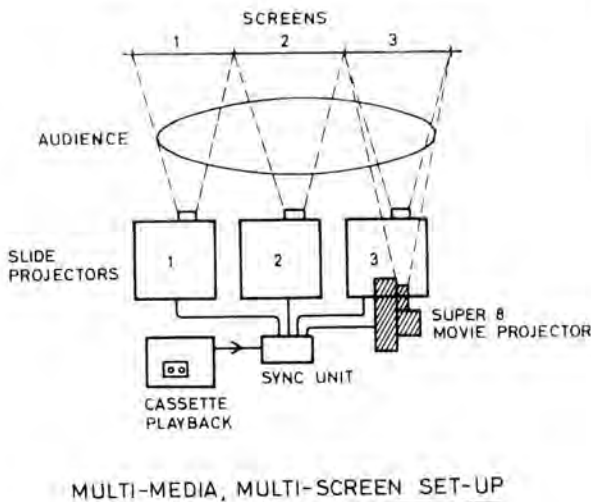
(h) The *multi-media auto-tutorial environment* (MATE) provides the student with playback or monitor equipment for viewing and listening to learning packages. One such design is shown in Fig. 6. The MATE has also been called a "structured learning and teaching environment" (SLATE) or more simply an audiovisual carrell.

Planned as a replacement for or supplement to formal classroom teaching, MATEs have been widely used in medical and nursing schools in the United States and Britain. In the Faculty of Medicine, University of Malaya, MATEs are being used on an experimental basis. However, in order to utilize this multi-media system effectively, there must be a sufficient number of programs or packages produced, purchased or rented for the students. A media production unit should be at hand to develop programs to fulfil "local" needs, and the technical maintenance services must be available to ensure full function at all times.

MULTI-MEDIA AUTO-TUTORIAL ENVIROVMENT (MATE)

A - SLIDE PROJECTOR
B - FILM LOOP PROJECTOR
C - AUDIO CASSETTE SYNC UNIT
D - TV MONITOR
E - HEADPHONES
F - REAR PROJECTION SCREEN

Implications

With the availability of these media systems, the role of the educator in the allied health sciences will probably change from being a "teacher" in the traditional classroom sense to that of a "creator of learning situations" and a "co-ordinator of media systems". In this situation, teaching (i.e. the transmission and dissemination of knowledge, skills and attitudes) will not be aimed only at the level of the average student in the class, but will cater for the learning styles of each individual student by making available learning packages utilizing alternative media systems. This will mean that most students in the class will be able to master the subject matter presented in a way that is most *effective for himself*. "Mastery learning" (Bloom, 1968) will then be achieved and academic wastage in terms of failure or drop-outs should be cut to a minimum.

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