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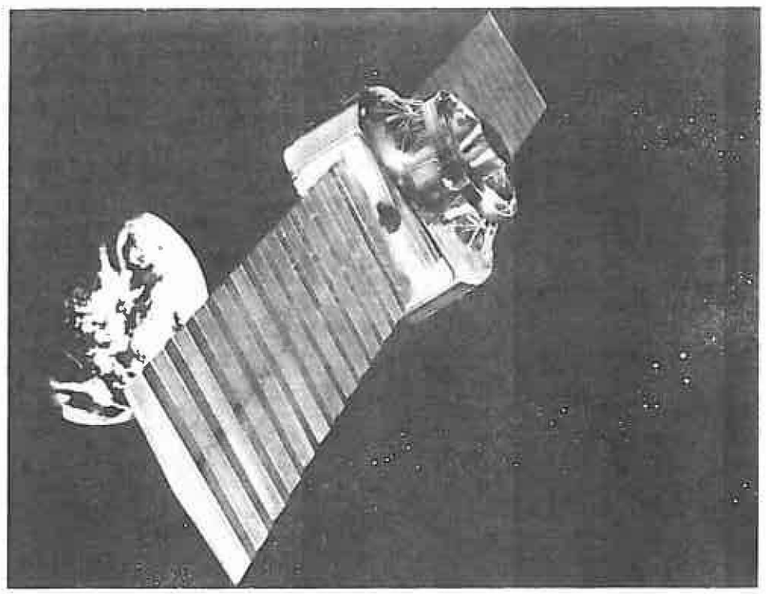
dividualized with respect to the health education needs of the users. We must consider what kinds of things people would want or need on programs. Second, health education applications should be useful to large numbers of people. This being the case, applications would need to be developed that are based on "generic" needs, not so specialized that only a few individuals would benefit from them. Third, health education programs must be developed keeping in mind the variability of health background and experiences of the users. We must recognize that users will be of different ages, educational backgrounds, ethnic identity and health status. Fourth, health education programs should provide more than information needs, they should also be designed to include educational components that could have an impact on attitudes and behaviours.

What kinds of programs could we provide for health education? I think the possibilities are endless and there are many creative minds out there that could provide quality applications. To begin with, however, we could have numerous self-evaluation applications; e.g., computerized dietary analysis with immediate feedback to the user; life-style evaluation, with assessment of health risk factors and feedback re: impact on life expectancy; or mental health application such as life stress analysis. Other possibilities might include a first aid program which could utilize the branching capabilities of the computer to lead the user quickly through decision making to determine rationally what first aid was indicated in, for example, a case of poisoning. Similarly, there could be an important role for programs which could help the user to determine when a physician could be called for a stomach ache, fever, etc. These last two would be especially useful with home terminals. Another useful program might identify potentially hazardous or undesirable interactions of various prescribed and over-the-counter drugs and other substances.

Implications of Technological Innovation

The issues surrounding the extension of the new technologies into the educational field have been addressed by, among others, Bulger (1982), Butler (1981), Dede (1981), Forsythe (1980), and Hurly and Hlynka (1981).

DEPARTMENT OF COMMUNICATIONS



Canada's ANIK B satellite

Christopher Dede (1981) has postulated several effects of technological innovation on education which can be adapted to the health education field as well. A larger proportion of the society will have access to instruction. This means that the potential for impact on the health practices of our society will be tremendously improved.

There will be a high initial capital investment in development and delivery systems followed by an overall reduction in costs in the long term. These savings will be due in part from the substitution of machines for human effort. More people can be reached with a more consistent message using the new technologies — hundreds or thousands at one time as contrasted with the ten to twelve per day who can be reached by public health nurses or health educators at present. Considering the present economic recession and high interest rates, the high start-up costs may delay the utilization of the new technologies, however. The use of such media for health education would require strong political support and it would be quite difficult for politicians to justify the massive costs at a time when there are many other pressing demands.

Finally, to realize potential cost reductions, large numbers of instructional devices must be utilized and curricula will have to be centrally produced. Due to the economics of sale, specialized programs are very expensive while those which have a broad application are much cheaper. This, unfortunately would decrease local control over content.

Erkel (1979) found that unless health care plans are congruent with consumers lifestyles and needs, they will not be implemented. Taking this into consideration then, the centralization of production, while it would decrease costs, could lead to totally ineffective programs. Something produced for the Maritimes or a Toronto audience might be culturally and ethnically inappropriate for a target audience in northern Manitoba since it would depict an environment greatly divergent from that of the target audience. We must also be concerned about the appropriateness of educational level.

Considering the diversity of needs in Canada, it would seem better to have at least regional needs considered. Debbie Bulger (1982) and her colleagues in making a videotape for families of their patient population at the University of Tennessee carefully tailored the videotape to the patient population. Skin tones in the graphics were ambiguous so that white families would see a white mother and baby and black families would see a black mother and baby. Professionals and patients were of both races and all had southern accents. They found that these details made the viewers more comfortable with the information they received.

This experience illustrates the point made by Zimbardo (1977) — that the likelihood that a receiver will accept the conclusions advocated in a given message is in part a function of the source's credibility which, in turn, is in part dependent on source-receiver dependability. Similar conclusions have been made from work done by communications theorists at Yale University. Psychological factors are important in any communication but especially so when technology is used. It is most important to pay attention to the local context and provide human support systems especially in remote areas. It is essential that we balance the need for economy of scale with the needs of various cultural or regional groups.

A further consequence of the new instructional technologies will be the necessity for massive changes in both preservice and inservice training for health educators. They must be prepared to do both low-level maintenance and programming of these systems. This will mean an extensive infra-structure and educational support system. A related issue is the technological literacy of the users. More and more children will be learning about the technologies in school but what about their parents or even older siblings? It will be necessary to provide courses for them perhaps through community evening programs or some other form of continuing education.

An issue not addressed by Dede but certainly of concern is the role of the educator. One argument is that the amplication of human effort through the use of technology enables more people to be served in more places at less cost. On the other hand, there is a great concern that there is a unique quality to a human intensive activity, such as education that cannot and should not be replaced by technique or machines.

Forsythe and Hart (1980) feel that what seems to be overlooked in the argument against technological approaches is that standard classroom teaching practices probably do far more to curb individual uniqueness and learning. Their point is that resources can be used to individualize while human beings can be employed to personalize the learning experience and learning environment.

> "The role of the human interface is as a guide, catalyst, learning helper and motivator as well as expert learner. The content of knowledge will be contained in resources such as books, cmputers, videotapes, audiotapes, television and other people. Knowledge itself is as much the process or skill of acquiring it as it is the content and so any human assistance must be well versed in process as well." (15:369)

As mentioned throughout this paper, there must be skilled people, facilities for production and sufficient money available for the production of high quality software in order to make an education program successful. When introducing any innovation, it is also important to consider the attitudes and values of the target population in reference to the change. Individuals need time and assistance to adjust. In the case of this health education scenario, the problem will be to change the focus from illness to wellness, and the responsibility for wellness from the government or the medical profession to the individual or family.

Conclusions

The current economic situation together with swiftly rising health care costs are putting great pressure on the system. How do we provide for optimum health within our resource base? Another pressure is public expectations. There has been a continuing growth in public awareness in the health care fields, coming in part from the generally increasing levels of education. A public which is knowledgeable both demands and expects more. The existence of a universal medicare system contributes to these expectations in that it is assured that if one requires health care, not only is it available to all but also accessible to all. It is evident that it is more usual for the articulate middle class to take maximum advantage. A caring society may have as its goal educating less vocal groups to a better understanding and use of community

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How it Works: Guided Wave Optics

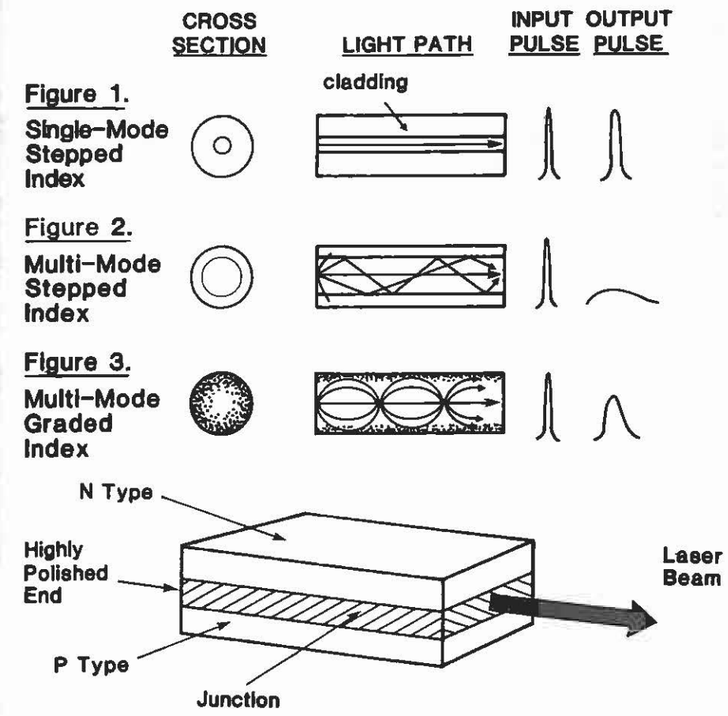

Figure 4. Semiconductor Injection Laser

An optical **fibre is a cylindrical** glass **core of uniform refraction** surrounded by **a concentric layer (the cladding)** which **has a lower index of refraction. Light enters one end and as it** disperses **along the length of the fibre it is** reflected **back** by **the cladding. The core diameter of** single-(mono) **mode fibres (figure 1) is** 7-10 millionths **of a** meter (micrometers). **Multi-mode** graded index fibres (figure 3) **are** currently **in use as** communication **lines because** they **are easier to** join **(the cores are larger** than single-mode fibres) **and light dispersion is not as bad as** with stepped-index **fibres (figure 2).**

Light **signals are** generated **in digital code by semiconductor injection lasers (figure** 4). **An electron moves from the** negative (N-type) **semiconductor material** to the positive (P-type) **material as an electrical current** is **applied. As the electron crosses the junction energy is lost which is emitted as** light.

Technological **advances soon will make it possible to use single-mode fibres. New installation** equipment **will allow technicians to align** the **smaller cores in the field. Newer lasers capable of** generating **light pulses in picoseconds** (trillionths of a **second) will use the greater capacity of single-mode fibres. These fibres can carry** over **100,000 telephone conversations** simultaneously, **and television, videotex or other** broadband **data transmissions at 9600 bits per second.**

— Paul Hurly

DEMODULATOR