and high-capacity telecommunications channels in place, there is tremendous potential for computer assisted learning on videotex.

**Videodisc.** This technology provides a method for storing large quantities of information on a metal coated plastic disc in tracks each having an address, with the information being read by a laser or other light source.

With conventional instructional television, a program begins with the first frame and proceeds in order to the last. On videodisc, however, with its capability for random-access any one of roughly 54,000 frames, this need not be so. The author can design interactive strategies that allow the learner to become directly involved with the program. The American Heart Association has utilized a microcomputer/videodisc system in conjunction with the commonly used simulator manikin "Resusci-Annie" to increase the effectiveness and decrease the training time of cardiopulmonary resuscitation (CPR) courses. A similar simulation system could be quite useful in, for example, teaching a new diagnosed diabetic to administer insulin to himself, or an ostomate to care for his stoma.

Computer simulations by themselves enable users to interact with the computer but can only tell them what they are seeing in a hypothetical case. Coupling a videodisc player with the micro-computer presents verbal information and corresponding visual and audio stimuli simultaneously. The technique allows the user to observe, draw conclusions based on those observations, and respond pr-perly. A branching program can more nearly simulate the thought processes of a "real-life" situation. In this method, students are required to instigate each step without prompting. They must tell the computer when they are ready for an observation, analyse verbal data from the computer as well as visual and audio data from the videodisc, draw conclusions and decide on a plan of action.

Backer (1982) describes a process by which the Massachusetts Institute of Technology utilizes the random-access image storage of the videodisc, to be combined over and over in different ways without repeating the same movie twice. The prototype system which is used for interactive tutorials has three components 1) hardware that supplies the imagery and the means for inputs 2) software that generates the graphics for the viewer functions, handles interactions and controls the imagery and 3) the imagery and sound and the database that represents it. The touch sensitive screen allows the viewer to interact. The system is interruptable and is always responsive to the viewer so that changes can occur at any point. The movie then is continuously interactive and is driven by "simultaneous processing" both by the system and by the viewer whose interests and needs may change as he goes along.

Backer cites several enhancements to the system which are in the planning stages: new interactive controls and alternative graphic formats, e.g., a slow forward/slow reverse function so that any motion sequence can be examined in detail in either direction; image processing techniques will divide images into identified regions that can become active buttons to access further information. This will mean that interaction will no longer be restricted to a certain "menu" but instead information will be "behind" areas of the screen with which it is associated. Videodiscs will also provide other avenues of interaction, including recognition of three dimensional gestures (via spatial tracking sensors) for viewer input and control, as well as voice recognition is specific contexts. These will free viewers from the small monitor format as well as allowing natural interaction when the viewers hands are occupied with equipment in a "hands on" situation.

As Butler (1981) points out, however, there are at present a number of limitations to the use of videodiscs. The cost of producing a master copy is very high and so an agency must be sure of high distribution volume to offset high implementation costs. The fixed videodisc is not well suited for trial and error implementation. Any design or production error that is transferred to the discmaster can turn the initial mastering investment into a total loss. Developing effective interactive video software is difficult and people who can design these materials are scarce. Interdisciplinary expertise in new technologies takes time to develop. In order to take advantage of these media we must develop new instructional design models that allow multidimensional and cluster development of materials, planning for heterogeneous audiences and multiple and continuing format selection. Another problem is that of learning to match the technological quality of commercial television which learners are used to watching. There are some hidden operational costs such as design costs and a breakeven point of 2,000 copies in production. Finally there are several other

MANITOBA TELEPHONE SYSTEM

**Telidon videotex images can be received by modified TV sets, like the one above, or on video monitors with decoders.**

obstacles identified by Butler as follows (although these apply to tape formats as well): the high cost of videodisc players; the high cost of replacing existing equipment; the lack of technical expertise among instructional personnel; the possible incompatibility of playback models or interfaces with other equipment.

**Satellite Technology.** A direct broadcasting satellite system utilizes high powered satellites to transmit television signals which can be received by a low cost "dish" receiver with an antenna one metre or less in diameter. This technology is very important to a system which is to provide equality of access to remote areas, such as is the case in Canada.

India used the ATS6 satellite from 1975 through 1976 on a national scale. Among other programming, health and hygiene discussions as well as family planning were included. Canada has developed a domestic communication satellite network, the Anik series, which could be used to support health education. It is already used, among other things, to provide medical information and services to small communities and remote areas. Most locations using the satellite have a two-way audio voice capability.

The satellites could have important applications for health education as a relay point for videotex, educational television programs, or telesoftware which could be relayed in offpeak time for storage in local terminals. Some of the constraints in utilizing satellites are the high costs of production and launch (which are decreasing with miniaturization and the space shuttle), as well as crowding of the orbits and broadcast bands. A social constraint is the problem of broadcasting to areas where local individuals and/or governments do not want a signal. Much work has to be done on standards and regulations.

## Application to Health Education

What needs to be done in order to make the new technologies a positive extension of health educators? What kinds of programs can be developed that would have an impact on an individual's health? These are not easy questions to answer and several factors must be taken into consideration.

First, health education must be in-

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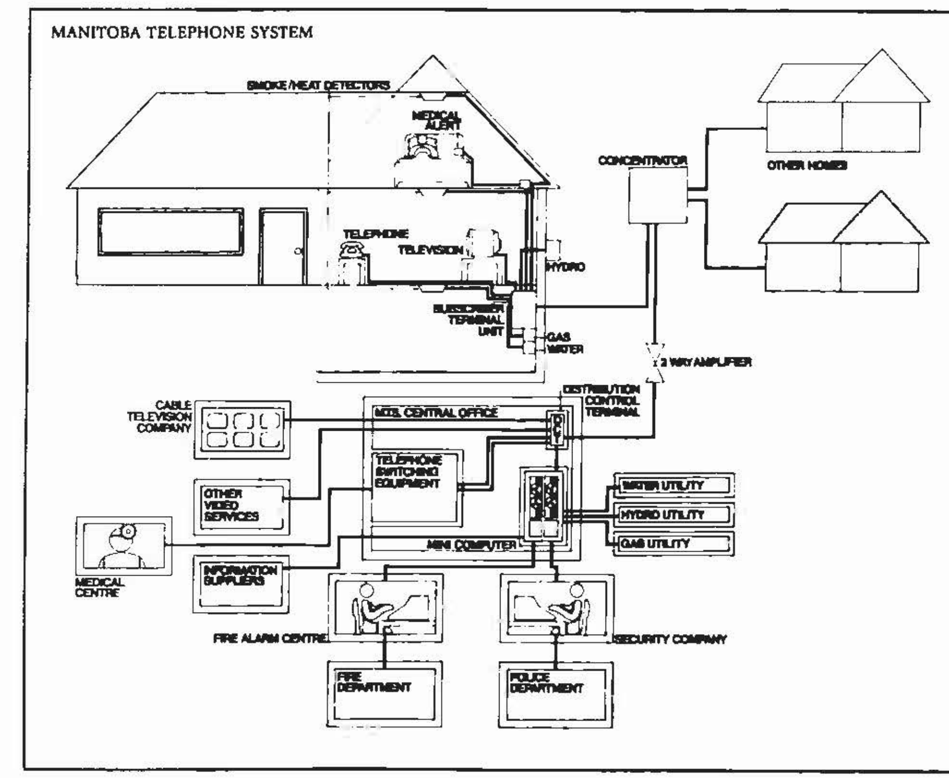
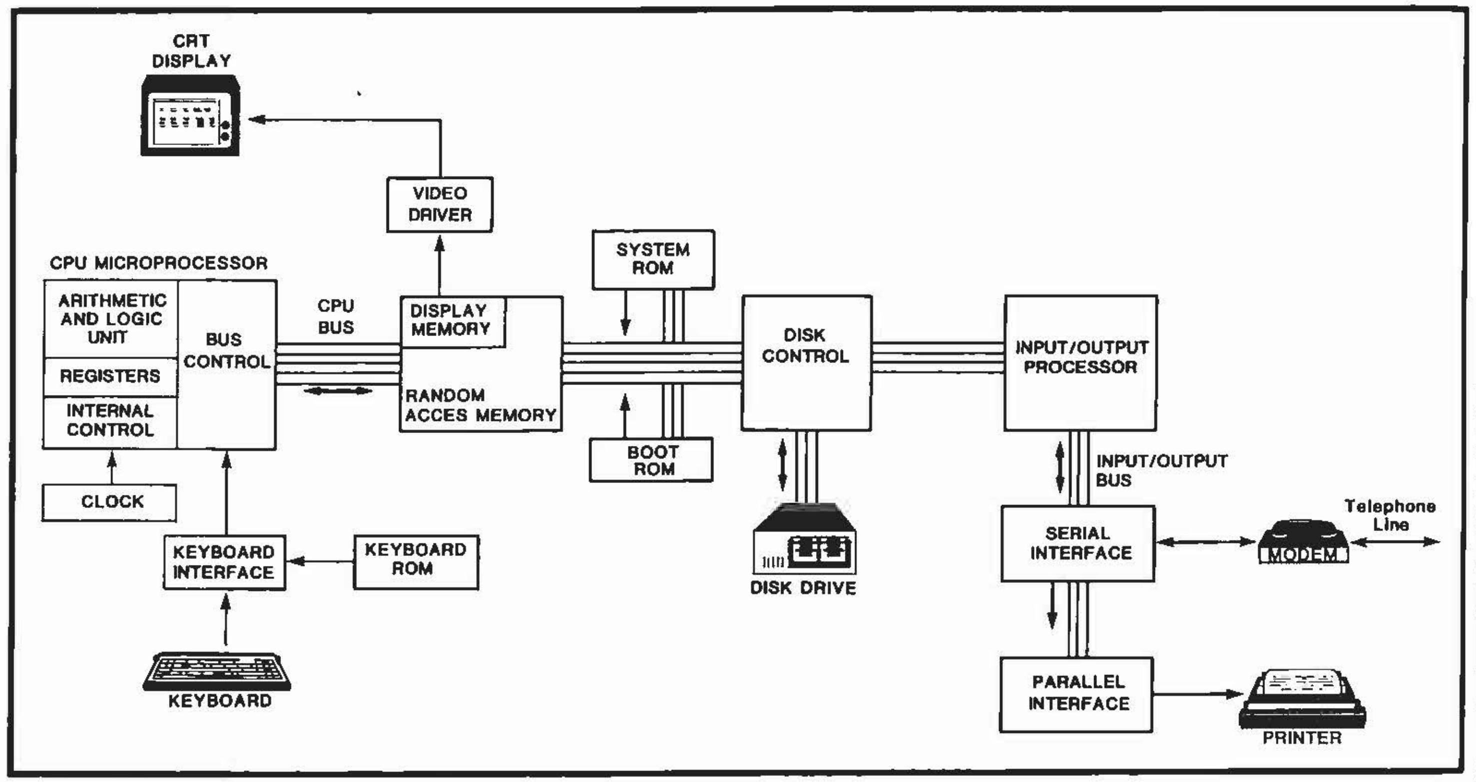



**This schematic diagram of Manitoba's Project Ida shows a wide range of services can be delivered electronically to the home.**

# How it Works: The Microcomputer




This discussion refers to a hypothetical microcomputer.

1. The main information link in a microcomputer is the central processing unit bus (**CPU BUS**). This set of wires carries two types of data: address lines specify where data is going; data lines transport the data.
2. When the computer is turned on the **Boot ROM** (read only memory) sends a simple program to the CPU. The Boot program tells the **CPU** to turn on the disk drive that contains the operating system (**OS**).
3. The OS is a program that manages the computer and its peripheral devices like a traffic cop regulates the flow of vehicles. Some microcomputers place the **OS** in the System ROM. An **OS** may also include utility programs for copying or erasing files.
4. Application programs (e.g. word processing, accounting) read in by a disk drive pass into RAM (random access memory) by direction of the **OS**.
5. The CPU processes data in units called "words". The first microcomputers used 8-bit microprocessors. A new 16-bit version hit the market in December 1982, which processes data in units of 2 8-bit bytes. A 32-bit microprocessor is also now in use.
6. When a key is pressed on the keyboard a processor in the **keyboard** interface determines the position and the code for the key stored in the **keyboard ROM.** The code is placed on the data bus and is passed by the **CPU** to the display memory.
7. Bits in the display memory are turned on or off to correspond with positions on the **CRT** display screen. The **video driver** reads these bits in the order they will appear on the screen, translates these into an on/off electronic impulse and sends them to the electron gun at the back of the **CRT display.**
8. The microcomputer communicates with peripheral devices like printers via input/output ports. Serial and parallel interface ports are required for different devices. Serial ports handle data in a single sequential stream; parallel ports can process several data streams simultaneously.

— Paul Hurly