IMPLEMENTATION OF AN INTERACTIVE VIDEODISC IN AN ELEMENTARY SCHOOL ACTIVE HEALTH PROGRAM

by

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B.G.S. Simon Fraser University, 1980

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE in the Department of Education

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IMPLEMENTATION OF AN INTERACTIVE VIDEODISC IN AN ELEMENTARY SCHOOL ACTIVE HEALTH PROGRAM

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ABSTRACT

The Simon Fraser University videodisc project began in September 1981 and covered three interrelated phases of development. Phase one involved the design of a level two interactive videodisc entitled, How Your Heart and Circulatory System Works. Phase two covered an initial pilot study with a group of seventh grade children. Phase three was the subject of this thesis and involved a formative evaluation of the videodisc with four classes of upper elementary school children.

The first part of this investigation involved the design and construction of a videodisc lab. The second part included two separate inservice programs. One for the four teachers, and one for the children of the four participating classes. Part three involved an observational study of the four classes during a one month instructional unit. At the completion of part three, teachers and students completed a questionnaire concerning the videodisc learning system. Throughout the study each of the 218 student uses of the videodisc system were videotaped, analysed, and compiled. The results of this study confirmed several findings of the initial pilot study as well as provided answers to other important questions concerning the material on the videodisc.

With respect to teaching elementary school teachers how to use the videodisc player and how to program materials, three to five one hour inservice sessions are required to learn the three program modes. Students can learn the basic functions of operating the player and programming material within four one-
half hour sessions. Some machine design problems occurred throughout the study with the mechanical operations of the player and the remote control.

The teacher's evaluation of the videodisc learning system was consistent with previous studies. They stated that they like the multidimensional features of the system, as well, they were pleased with the opportunity to manually or automatically program material.

The student's reactions towards this new learning system were as positive as the teachers'. With respect to what they liked, the videodisc player was given the highest rating. This was followed by the interactive test, the film, and finally still frame material.
ACKNOWLEDGEMENTS

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CHAPTER I
INTRODUCTION

Prior to 1979, the application of audiovisual technology had been limited to recorded sound, still photography, film, or videotape for educational programs with the exception of Computer Assisted Instruction (CAI). These audiovisual materials, although informative and extensively used as learning aids, are linear learning packages. Furthermore, such materials are generally planned for homogenous audiences and emphasize one mode of presentation.

The recent development of videodisc technology, specifically the optical system, presents the educational community with a potential learning system that may revolutionize the existing audiovisual modes of presentation. Until 1979, however, a definitive study that involved the design of a videodisc and used the unique features of this new learning system had not been done.

The most serious problem facing the creation of interactive videodiscs is concerned with videodisc design. Even though the benefits of other audiovisual media are present in interactive videodiscs, all of the instructional design problems of each media are present as well. (Bunderson, 1979). To further complicate this situation, there is a lack of experimental evidence to help videodisc designers develop instructional packages. An indication of the level of development is illustrated by Kearsley's (1981) list of unresolved design issues:
"1. When should motion be used and when should still frames be used?
2. When should information be presented via text and when by narration?
3. Should all information be presented on one screen or should two (one for video and one for computer generation) be used?
4. How should videodiscs be used with other media (e.g., printed texts) and when should other media be incorporated onto videodisc?
5. Should input be via keyboard, keypad, touch, or speech?
6. Should videodisc be used in a classroom (i.e., group) setting or for self-study learning?
7. How important is interchangeability?
8. What kind of procedures and models are needed to guide videodisc design and development?
9. What overall level of quality is appropriate to achieve the desired instructional goals?"

(p.216)

The need for research to evaluate the capabilities of this new videodisc technology has been stressed by Wooley, (1979); Etherington, (1981); and DeBloois (1979). However, by 1979, the only available published research that had been undertaken in a school setting is the formative field test of a Tumbling and Spanish videodisc in Nebraska by Brown and Newman (1980).

In 1981, an interactive videodisc titled "How Your Heart and Circulatory System Works": (Kirchner, Stirling, & Jones 1981) was developed at Simon Fraser University. This videodisc was designed to use the videodisc's interactive ability with a prepared program. The subject material of this disc was the Active Health and the Heart Unit of the Coquitlam School District Active Health Program.¹ The choice of this subject was

¹. The Active Health Program was initiated in Coquitlam School District #43 in 1971 and has since been adopted in numerous school districts throughout Canada and the United States. The program includes the areas of the heart, nutrition, lung, fitness and motor development.
based upon several important considerations. Of primary importance, the Active Health Program was an interesting and highly successful approach to teaching human biological concepts to children in grades five through seven. There was an established curriculum including grade level, content areas, suggested teaching strategies, course materials and evaluative instruments. In addition, the program was interdisciplinary in that it was taught within the curricular areas of Science, Health, and Physical Education. Finally the program stressed cognitive development through problem solving and manipulative tasks. The project team considered these characteristics important features to incorporate into the videodisc learning system.

In January 1981, a pilot study was undertaken with a seventh grade class in School District #43. The purpose of this preliminary study was to determine

1. The length of time required to provide inservice for the classroom teacher and students in the use of the videodisc learning system.
2. The attitude of the students and teacher toward the new learning system.
3. The legibility of the material displayed on a television screen from various locations and distances within a typical classroom.
4. The ability of the students to manually program material using the remote control unit.

The information from this pilot study was used as a criteria for planning the design and execution of this study.
Statement of the Problem

The purpose of this study is to assess the efficacy of interactive videodiscs in an elementary Active Health Program. The following objectives are the focal point of the study:

1. To provide inservice instruction to each participating classroom teacher on the teaching of the Heart Unit of the Active Health Program.
2. To provide inservice instruction relating to utilization of the videodisc learning system.
3. To teach each student, prior to the teaching of the Heart Unit, the basic skills of using the videodisc player and remote control unit (RCU).
4. To observe teacher and student use of the videodisc learning system throughout a unit of instruction.
5. To determine teacher and student reactions and opinions towards the utilization of the videodisc learning system.
6. To evaluate if the user's manual was appropriate for the teacher's and the student's use.

Limitations of the Study

This study had the following limitations:

1. The author may have affected the study as he acted as a participant observer.
2. The video cameras may have affected the behaviour of the students (Borg & Gall, 1979).
3. The study had a volunteer sample of teachers, however, three of these teachers received course credit for the
work done.

4. The teachers and students had not been involved with the Active Health program before this study.

5. Only three videodisc players were available for the study.

Assumptions of the Study

This is a formative study that has attempted to determine whether the videodisc learning system could be used by teachers and students in an elementary school environment. As such it was an attempt to ascertain what problems existed with respect to operating the videodisc player, using automatic and manual programs, and following instructions provided in an experimental manual. The study was also designed to examine the reaction and opinions of teachers and students towards this learning system. Due to the nature of this study the following assumptions were made.

1. That the motivation and interest of the students in the four classes was variable from class to class and that teachers would be trying to adjust their teaching to accommodate this.

2. That the students had different background knowledge concerning the circulatory system and that teachers would try to adjust their teaching to accommodate this.

3. That each teacher would teach according to her style and use different strategies to develop her unit as she thought best fit the students.
4. That the students and teachers would develop a level of knowledge of the circulatory system throughout the study.

5. That the teachers and students would try to use the various aspects of the videodisc system that they had received inservice in.

6. That the students represented a homogenous cross section of nine to thirteen year olds.

7. That the teachers had sufficient knowledge to teach a unit in the Active Health Program.

8. That the teachers had sufficient knowledge to teach a unit at this level using the videodisc system.

9. The children who participated in this study came from a normal population.

10. That the reading ability of the students did not affect the results of the study.

11. That the student use would be determined by teacher unit plans.

Definition of Terms

**Attitudes** - Attitudes are the opinion or reaction of that person as to how they liked or disliked the videodisc, videodisc system, or aspects of the study. (The New American Webster, 1972)

**Automatic Mode** - A pre-recorded program imprinted on the videodisc which allows the user to interact with the audio-visual material stored on the videodisc.
Capacitance Videodisc - A system that uses a stylus to read depressions in a disc. This is similar to the system used to play records.

Coding - The recording of information on instances and frequencies of use of the observed phenomenon. In this case the frequency of use of the videodisc system as recorded on the observation form.

Dump - Eight frames of an optical videodisc on which a program is stored; when these frames are encountered the program is entered into the player microprocessor.

Formative Research - The collection of data during the development of a product with the aim of improving development.

Interactive Videodisc - A videodisc which contains information which the user can interact with or respond to through the remote control unit.

Likert Scale - A five point scale used to indicate and determine opinion and reaction.

Manual Mode - Refers to videodisc usage where the user has direct control in the access and utilization of all material stored on the disc.

Monitor - Refers to students chosen by teachers in the study to operate the controls of the videodisc player.

Observation - A videotape filming of one or more students using the videodisc system.

Observation Form - A form developed to collate frequency and type of use, instances of help needed, and problems encountered in each instance of use of the videodisc (Appendix A).
Open Nature - This term is used to describe a teaching situation in which the teacher was permitted to design her own unit of instruction on the heart and circulatory system and to use the videodisc learning system according to her own style of teaching.

Optical Videodiscs - A videodisc system where an image is recorded on a disc optically, utilizing a laser pickup.

Videodisc - In this study the term videodisc will refer to an optical videodisc which contains 54,000 frames per side.

Videodisc Learning System - In this study this term, refers to a television monitor, a remote control unit, and a Discovision Model 7820 optical videodisc player with a built in microprocessor.

Organization of the Study

This study is reported in six chapters. The first chapter contains an introduction, the objectives of the study, and the limitations of the study. Chapter two includes an overview of videodisc literature with specific emphasis on educational application. Chapter three contains a description of the "How Your Heart and Circulatory System Works" manual and videodisc. A description of the procedures used throughout the investigations is contained in Chapter Four. Chapter Five contains the analysis of the data collected from the video tape observations and teacher and student questionnaires. The last chapter presents the writer's conclusions and recommendations for future studies.
CHAPTER 2
REVIEW OF THE LITERATURE

Interactive technology, has been touted as the educational medium of the 1980's. Of the types of interactive technology, optical videodiscs alone can incorporate print, photographs, motion film, and interactive capabilities in a permanent non-wearing medium. This chapter will review the various types of optical videodisc players and their applications to business, military, and educational institutions.

The review of the literature in this study consisted of a manual library search. Using the key descriptor 'videodisc', the following resources were consulted: Resources in Education, Education Index, Current Index to Journals in Education, Psychological Abstracts, Social Science Citation Index, Dissertation Abstracts International, and the Social Science Index. The Simon Fraser Videodisc Project Team members contributed to a current bibliography and collection of articles, papers, and thesis that concerned the videodisc and the Active Health and the Heart Videodisc. Many additional articles and references were obtained through the project team member's bibliographies and their files of materials which they had collected at conferences and inservices.

Types of Videodisc Systems

Three levels of videodisc complexity have been identified by Daynes (1980). Level one is a videodisc that does not possess memory nor any random access. This type of use would
include movies, recording groups, and all information that can be shown as a film or videotape. The benefits of the Level one system include low replication costs for discs and the permanence of the disc as compared to a 16mm film or videotape (Kemph, 1981); both of which have a fixed lifespan relatively shorter than an optical videodisc. Many claims have been made about videodiscs at this level of sophistication. These include putting the 18 million volumes of the Library of Congress on 100 optical discs (Mole, 1981) and putting the Encyclopedia Britannica on nine long play videodiscs (Wood, 1979). These print storage phenomenon will need to wait for efficient digital storage on optical videodiscs and higher resolution monitor screens such that the small print can be read. A standard television has about 250,000 pixels (picture elements); a page of print in a book needs 500,000 to 1,000,000 resolvable points or pixels for acceptable resolution (Schipma, 1981).

The second level of videodisc sophistication is an educational/industrial model videodisc player with built in microprocessor. The Discovision model 7820 used in this study is an example of this level of videodisc system. With a program memory of 1023 bytes, potential exists for interaction by the user. More sophisticated discs incorporate a technique of having more than one program (dump) on a disc so that the potential memory becomes a function of the number of dumps times 1023. The Simon Fraser University "How Your Heart and Circulatory System Works" contains 3 program dumps. Each
program dump takes up only 8 frames of the videodisc, however, production costs for each additional program dump are relatively high.

When a videodisc is interfaced with a computer the third level of sophistication is reached. This interface system uses the computer as the control terminal thus providing more program capabilities and greater interactivity with the learner. Many theorists have stated that videodiscs should become an integral part of Computer Assisted Instruction by the mid 1980's (Daynes, 1976; Heuston, 1977; Hirschbuhl & Seeman, 1977; Whitney, 1977; Bunderson, 1978).

Military Use of Videodiscs

The military has been a principal developer of interactive videodiscs (Kearsley, 1981). The Training Management Information System (TMIS) videodisc was an early disc created to store skill performance aids and volumes of maintenance manuals. An earlier disc, the Soldier Information Delivery Equipment (SIDE) project was designed for tank turret maintenance. The SIDE project enabled in tank access, using a small terminal, to what would amount to a six foot stack of manuals that would be otherwise impossible to access in the narrow confines of a tank (Business Week, 1980). A disc system utilizing a light pen and sensitized screen was developed by the U.S. Army Signal Center for the repair of satellite communications systems (Kearsley, 1981). This project also made available information on student speed and accuracy during the training period. Two screen systems that present conflict scenarios and give immediate
feedback on responses have been used in officer training with eight more discs planned for this usage. A videodisc for recruiting offices by the Joint Optical Information Service (JOINS) and a functional literacy instruction videodisc for particular job categories is being explored. The Defense Advanced Research Projects Agency (DARPA) has designed discs in karate, training simulators, teleconferencing systems, and a videodisc based Spatial Data Management System (SDMS). This system includes the capability of allowing an individual to simulate a journey through a "locale" (a town, outer space) and see on the screen what you would actually see, including what you would see if you turned in any direction from the spot you were positioned on (HumRRO, 1982). With this you could simulate a walk through a house or a town. A project by DARPA and the Army Research Institute (ARI) is assessing the SDMS system and the nine videodiscs developed for basic skills education (HumRRO, 1983).

The use of interactive videodiscs by the army probably represents the applications with the widest scope and imagination (Kearsley, 1981).

Medical Use of Videodiscs

The American Medical Association (AMA) was quick to recognize the benefits of interactive videodiscs. Videodiscs have been created for information retrieval, diagnostic practice and help, training materials, and patient education. In a review of material, Stewart (1983) lists over 30 videodiscs that have been developed for medical use. The majority
of work has come from three sources. Leveridge is responsible for five videodiscs for the AMA ranging from Diagnosis of Pulmonary Problems to interviewing techniques for physicians with education of medical staff as a focal point. Bolles, from the University of Washington, has developed four discs oriented towards information retrieval and diagnosis such as the Hematology videodisc with over 6,000 slides and the Trauma Training videodisc demonstrating technique. The major producer has been Miles Pharmaceuticals who have made ten videodiscs including Orientation and Operating Instructions and specific videodiscs such as Ileocolic Resection (Stewart, 1983).

One of the most exciting videodiscs for the layman is the Cardiopulmonary Resuscitation (CPR) videodisc developed by David Hon for the AMA Advanced Technology Department (Hon, 1982). This videodisc provides CPR instruction to four people at a time. Two mannikins, an adult and child "Resusci-Annie", contain pressure sensors which give feedback as to whether the student is applying appropriate pressure. Interaction also takes place with a light pen and a sensitized screen. Initial indications are that students learn more quickly and achieve higher standards than can be attained by the use of a live instructor.

**Business and Industry Uses**

The interactive videodisc's potential for business has just begun to surface. Edward E. Sullivan, General Motors corporate merchandising manager has suggested that you can't
improve upon 'the videodisc' method. By 1980 GM had 10,200 videodisc players and 28 one hour discs throughout their dealer network. Their videodiscs were oriented towards sales information for customers and guides for mechanics involved with complex repairs. Ford Motor Company has optical videodiscs in 4200 showrooms and has 73 disc sides for dealer use across North America (Videodisc Projects Directory, Fall 1982). Videodiscs in industry are usually either customer sales and service oriented or designed for employee training. Customer oriented discs have been created by a range of companies such as Combustion Engineering Nuclear Products & Services, American Express, Columbia Savings and Loans, and Simpson Sears (Videodisc Projects Directory, 1982). IBM has been a major user of videodiscs for training customers using centres in 33 cities designed to teach up to 16 people at a time how to use the IBM System/33 and System 34 computer systems (Jacques & Filter, 1981). The training courses range from one to five days in length and can be individualized because of the random access of the videodisc system. In 1981 IBM had 15 videodisc training programs and had six more on the drawing board. A videodisc with scenarios designed to help employees develop judgment skills concerning company sales and marketing problems for TNT Canada has sparked that company to develop a full scale training videodisc system. Some of the other training discs currently developed include such diverse fields as flight simulators, fair employment practices, and assembly and maintenance of nuclear reactor coolant pump seals (Videodisc Project
Government Uses

Some innovative uses have been made of interactive videodiscs for different levels of government. The Lincoln Institute of Land Policy has put every property in the town of Weston, Massachusetts on a videodisc frame and made motion sequences of the central business district (Videodisc Project Directory, Winter 1982). The intention is to eliminate some field work associated with tax assessment, facilitate communication between tax assessors and taxpayers, and aid in training and education.

The New York State Division of Equalization and Assessment has developed a disc to help serve as a tool in real estate appraisal and assessment. Included on the disc are still photographs, maps, and aerials. Individual properties with three separate views of the house would be followed by aerial photographs of the adjacent properties giving neighbourhood overviews (Videodisc Project Directory, Fall 1982).

Pergamon International has developed a computer controlled interactive system called Video "PATSEARCH™" (Urback, 1982). This system allows patent searchers to view patent drawings relative to the bibliographic search. Easy access to 800,000 drawings is provided. Usage of the system is on a lease basis which includes a microcomputer, videodisc player, and printer.

Public Archives of Canada (PAC) has undertaken a pilot project to determine the feasibility of a laser recording technology system (Mole, 1981). They found that a variety of
materials could be stored on the disc providing a permanent non-wearing record of materials that could be easily accessed. Standardization of digital format recording and increased television screen resolution will provide a proper degree of machine readability and stability for this type of use. The primary benefit, other than material access, is the storage capacity of each videodisc which ideally could contain up to 32,500 books (Mole, 1981). It has been estimated that the current active holdings of the PAC could be placed on 19,000 videodiscs; however, 1,000,000 videodisc would probably be necessary to incorporate the total backlog of information.

In an overview of museum research and use of videodiscs Nyerges (1982) lists 14 museums that are involved. This includes the actual production of videodiscs such as the Boston Museum of Fine Arts videodisc of 2,000 slides drawn from their collection and the National Air and Space Museum's videodisc with over 100,000 slides for research use. At this time, it was stated that many museums are playing a waiting game until the costs decline and the technology is further advanced.

Educational Uses of Videodiscs

In 1981, it was reported that there was one micro computer for every 800 students in the U.S. (Holloway 1982). At that time, it was projected that there was one videodisc player for every 225,000 students in the school system. While educators and technologists have applauded the videodisc as the medium of the future, some suggest that interactive videodiscs will not have substantial impact on education in the 1980's (Hiscox,
1982). Further, that the costs of implementation and development aren't cost effective or instructionally warranted. It is also suggested, however, that a slow technical adoption of videodiscs in education would enable model instructional programs to be developed and for mistakes to be made without wholesale condemnation of the systems resulting. Research and development will probably take a long time for videodisc technology due to the turn around time needed to design, develop, field test, and revise a disc compared to the time needed to record programs on other formats (Holloway, 1982). One recurring problem for designers is the ignorance of what instructional variables are effective for audiovisual instruction and the general lack of experience in making programs (Baker, 1977).

Educational Field Tests

One of the first research studies in the usage of videodiscs is the Brown and Newman Formative Field Test Evaluation (1980) of the Nebraska Tumbling and Spanish Videodiscs. The Tumbling videodisc was used by four elementary teachers to see how the discs would be used in an educational setting and to confirm the direction of developing procedures or to provide insight into possible new directions. The Tumbling videodisc was used for one week by each teacher after a general orientation on how to use the equipment. The Spanish videodisc was used in a college class with use of the videodisc system completely voluntary.

With the Tumbling videodisc, instructional usage consisted of students copy skills performed on the television screen.
Some children had to be warned about attempting some of the more difficult activities. In summary, teachers felt that the videodisc was an excellent tool that aided their instruction. It was noted that teachers had to be conscious of the hand-held remote control and point it directly at the player or the remote control would not work consistently.

The students who used the Spanish videodisc had some mechanical difficulties with the videodisc system. Problems included the insensitivity of the remote control unit and difficulties with the program jumping back and forth. The two areas that were rated below the median on the Likert scale in terms of comfort of use was Starting the Player and finding Chapters and Segments. Suggestions for improvement included better beginning directions and troubleshooting information.

A comparative study comparing computer assisted videodisc and videotape training by Fowler took place at the University of Iowa in 1980. This thesis investigated cognitive recall, synthesis, analysis, and transfer. This study encompassed teaching psychology students how to use a movie projector, videodiscs, and videotape. Limitations of the study included possible anxiety students had over hardware operation, and the fact that the topic was not highly motivating to the students.

The students who used computer assisted videodisc training completed the instructional sequence more quickly, achieved higher scores in cognitive recall, and had significantly better attitudes than the students using videotape systems. Although the cost was more expensive for the videodisc system, it was
stated that the development of the videodisc system took six percent fewer hours than the videodisc system. It was said the cost of more than one configuration of videotape systems would be 15% more than an equivalent number of videodisc configurations.

A third study (Johnson, 1982) using the "How Your Heart and Circulatory System Works" videodisc took place with one class of twelve and thirteen year olds. The basis of the study was to determine the nature and type of inservice program that would be required for teachers and elementary school children to learn to operate the videodisc system, how appropriate the videodisc and manual was, and the attitudes of the children and the teacher.

The amount of inservice in this study for the teacher was ten hours of assisted inservice and six hours of individual practice use. In the operation of the system, students were asked to enter a program manually using the remote control unit. When programming with the remote control the only student who made zero mistakes asked the instructor four times where she was as she had lost her place. This study reported that students did not actually read all the information when print frames were presented. The teacher involved felt the mechanics of the programming mode was not used. Attitudes of the students and the teacher were positive towards the system as well as towards the "How Your Heart and Circulatory System Works" videodisc.
Classroom Uses of Videodiscs

The Videodisc-Microcomputer Network Directory (VIM) 1983 is made up of over 45 schools, school districts, and educational institutions where videodisc use is taking place across the United States. Basically, the members of the network share a centralized electronic mail service and an interest in making effective use of software products in education. Sharing a common goal and purpose, the people involved represent a cross section of experience and training. That is to make "effective use of education-related software products, including videodiscs". (VIM Directory, 1983. p.iii). Indications of what the use of videodiscs consist of by looking at descriptions of the sites suggest that much of the use is level one or consists of using the Kidisc. It seems that little curricular instruction is going on.

Major Developers of Educational Videodiscs

One of the largest funders of videodiscs is the U.S. Department of Education. By copying existing films and videotapes they have made twenty videodiscs in the Music Is (Elementary), Infinity Factory (Elementary math), and Villa Alegre (Multicultural Education) series (Withrow, 1982). They also funded the Nebraska Think it Through videodisc for the hearing impaired. The National Science Foundation has funded three interactive college and high school science videodiscs. A biology videodisc called Living Things by WICAT, The Puzzle of the Tacoma Narrows Bridge Collapse by the University of Nebraska and the Utah State Video Computer Learning Project Physics
Videodisc (Videodisc Projects Directory, 1982). Utah State projects have created the Media Centre videodisc teaching library skills to second and fourth graders and the Matching Sizes, Shapes, and Colours videodisc for the Mentally handicapped (Thorkildsen, Bickel, & Williams, 1979).

The National Education Association ABC Video Enterprises Schooldisc project anticipates that a full library of 20 one hour videodiscs will be developed for current events, language skills, science, social studies, and the arts. The first segment on geography was intended for fourth, fifth, and sixth grade. Evaluation of this disc will affect future discs in this project. The geography segment was not intended for self paced instruction (Videodisc Projects Directory, Fall 1982).

The Corporation for Public Broadcasting has made a videodisc from the Mark Twain film, the War Prayer. This interactive videodisc is part of the Mark Twain series on Public Television (Videodisc Projects Directory, Summer 1982). One of the most widely used videodiscs is the Optical Programming Associates (OPA) Kidisc. Although this videodisc is not an educational videodisc, it has achieved widespread use. It consists of 28 activities and was developed to utilize all of the optical videodisc functions (Blizek, 1981).

In summary, educational use and development of videodiscs is in an infancy stage. Many level one discs have been created; however, there are few published research studies on Videodisc technology. Before effective interactive instructional materials can be developed with confidence, the lack of research
Research Investigations of Videodiscs

As repeatedly stated, there is a lack of experimental evidence to help videodisc designers develop instructional packages. The lack of research has been stated in the literature frequently (Woolley, 1979; Etherington, 1981; and Debloois, 1979). A caution was given by Kearsley (1981) suggesting that comparative research comparing different audio visual approaches with the unique features of the videodisc is like comparing apples and oranges.

Coupled with the lack of research and the need for developers to have the courage to take a strong position is the hope for a gradual process of change (Debloois, 1979). Some feel that the large number of glowing articles and reports that fail to mention limitations are developing unrealistic expectations concerning the implementation of videodisc instruction. Four factors cited limiting videodisc systems include costs of the systems, difficulties in evaluating and revising, the inadequate reliability of equipment, and the complexity of the instructional program (Hiscox, 1982). Holloway (1982) suggests that the potential for a backlash from unfulfilled expectations of new technologies is very high. Further, that developers' concerns have been with the development of the player and the potential while the consumer is only interested in the programs the system will bring.

In the area of design, it is felt that development should
and will be slow. (Holloway, 1982). Designers need to learn new methods to incorporate the non-linear and instant access capabilities of the system which will require time and effort, but the benefits will more than compensate for these additional costs (Leveridge, 1979). Hundreds of discs have been copied from existing film and videotape. These represent the first level of videodisc use. The need is for the continued design and development of higher level interactive software with close cooperation between educators and producers. To do this we need more quality interactive software, software that utilizes the interactive potential of videodisc technology (Kemph, 1981). To achieve this designers will have to have courage and take the first step lest we become mired in the old chicken and egg question about lack of hardware in the market place which means we cannot sell software. Unfortunately, lack of software means we have the same problem, ad infinitum (Will & Galloway, 1982).

We are in an exciting time in the development of interactive videodiscs; our available technology as Mueller (1983) suggests, surpasses our ability to take full advantage of it.

Summary

There were no preprogrammed interactive videodiscs available for curricular use when the Simon Fraser Project began. Linear level one videodiscs or interactive videodiscs that needed to be programmed manually before each use (e.g. The Tacoma Narrows Videodisc) were the only available software. Few
agencies seem to have had the time, money, knowledge, and resources to create their own interactive videodiscs. The military is reported to have developed many interactive videodiscs for training but the armed forces do not make their materials available to the public. Many of the videodiscs that are reported to be developed for business training are also not available for public access (Videodisc Project Directory, Fall 1982).

When the Simon Fraser University Project began much of the literature seemed to praise videodiscs and their usage with a 'Gee Whiz' sense of awe and wonder. Many of the calls for research cited seemed to be made in a very general way without specific focuses. The descriptive nature of the literature reflected the state of the art of videodisc development and videodisc research. Without interactive videodiscs that could be evaluated, it was obvious that the literature had to be descriptive in nature.

The six objectives of this study were derived from the work of Fowler (1980), Miller (1980), and Johnson (1983). Johnson found that the inservice requirements for his pilot study involved ten hours for the teacher and several sessions for the students. Even after the student sessions many users experienced difficulty with the videodisc and the videodisc system. The first three objectives of this study are designed to further explore the inservice need found by Johnson in his pilot study. These three objectives were divided into teacher inservice for the videodisc, teacher inservice for the Active
Health Program, and student inservice for the videodisc to present information in a clear manner.

Miller (1980) states that the way teachers will use the videodisc system in the classroom and the way teachers will react to videodiscs is unknown. Fowler (1980) states that user preferences for stills, motion, slow motion, reverse motion, colour, audio, and no audio needs to be evaluated. The fourth and fifth objectives were formulated to try to see how the videodisc was used in an instructional setting, what user's reactions to the system were, and if there were preferences for any aspects of the videodisc and videodisc system.

Our last objective, to evaluate the user's manual was developed to provide the research team with information to help remedy or improve the manual if necessary.

In conclusion, the project team determined the need for a formative research study of the Active Health and the Heart videodisc and the videodisc system at this time. Comparative work at this stage of development would contain too many presuppositions about untried aspects of videodisc design and instructional variables. As Holloway (1982) suggests, we should go to the foundation;

"...our ignorance of how we learn requires many formative field tests. ....put the technology in the classroom, and watch and listen to what happens in a natural setting." (p.137)
CHAPTER 3

PROCEDURE

This chapter will examine the research design of the study and will describe the development and application of the design, the collection of data, the development of questionnaires and coding forms, and the inservice for students and teachers.

Research Design

This study is a formative field test of the Simon Fraser University optical videodisc titled "How Your Heart and Circulatory System Works". After development of the videodisc and an accompanying user's manual, a preliminary pilot study using one class was done to provide initial data concerning inservice requirements, type of use, legibility, and attitudes of the teacher and students (Johnson, 1983). Using Johnson's data, a field test of the "How Your Heart and Circulatory System Works" videodisc was planned.

The decision to use a formative research design was based on calls for research from the literature (Holloway), the newness of the instructional and design variables inherent in the videodisc, and the need to assess which aspects of the disc were most practical and beneficial for instructional use. By definition, formative evaluation has, as a major purpose, the collection of data for the revising and improvement of educational programs (Borg & Gall, 1979). It was realized that a formative design would provide the best vehicle to collect the wide range of data necessary in this stage of development of the Simon
Fraser University Videodisc Project.

Data Collection

In this study, data were required to assess student and teacher reactions towards an extended unit of instruction using videodiscs. Information was also wanted concerning the usability and effectiveness of the accompanying user's manual. Primarily, however, data on the types and amounts of use by students and teachers as well as frequency of use of different aspects of the videodisc was needed. Data was also desired concerning the frequency and types of problems encountered with the videodisc, the videodisc player, and the videodisc program. As the subjects had not used the Active Health Program or videodisc technology an inservice program had to be developed, implemented and evaluated in the areas of Active Health and videodiscs.

To collect data on all of these factors required design and data collection techniques that would account for the unexpected and allow re-examination of the sequence of events.

The most comprehensive all encompassing techniques seemed to be in order. It was decided that videotaping every student use of the videodisc system would meet these needs, allow for the unexpected, and allow for re-examination of the student use. The use of video would also allow for collation of data to be consistent and verifiable. As an extra precaution, the use of a participant observer was also decided upon to allow for the unforeseen and to be prepared for all possibilities. Data
collection methods were as follows:

1. Each use of the videodisc system was videotaped.
2. A journal of each class's use of the system was kept by the observer who noted any problems and difficulties.
3. Copies of the teachers' units, changes made to them, and materials used by each class were recorded.
4. Questionnaires were filled out by students and teachers at the end of the study.
5. The student inservice sessions was followed by a practical test to demonstrate their ability to use the videodisc system. (Appendix F)

Development of Forms and Questionnaires

To record the usage of the system, a form pertaining to the mechanical aspects and the chapter sections of the videodisc player and the "How Your Heart and Circulatory System Work" videodisc was needed. An observational tool (See Appendix A) was devised to assist in organizing the information on the videotapes. From these forms the frequency of use, type of use, and any problems could be easily compared by class. All of the teacher student interaction and any mechanical difficulties were also recorded by category. After a preliminary trial on the first twenty hours of tape, the forms were revised and the two hundred and eighteen uses of the system were coded and categorized in chronological order. A simple check system gave frequency counts on each form.

Using the data and questionnaires from the Johnson study, the research team revised the questionnaires for the teachers
and the students using a Likert scale and open questions to facilitate obtaining the maximum amount of beneficial information (See Appendix B and C). Part of the questionnaires dealt with the teachers' and students' reaction and opinion to the heart unit and the videodisc system. Further questions were concerned with suggested changes and criticisms for each of the aspects of the Simon Fraser University videodisc and manual. Students and teachers were asked to rate the quality of different aspects of the disc and to relate specific problems that they may have had. Open questions concerning user reactions to the videodisc and videodisc system and possible improvements in the total project completed the questionnaires.

Statistical Measures

The formative nature of the study was intended to determine possible types of use by different teachers. This included differences in frequency of use, teaching style, and ways of using the videodisc system. The data from the observations of the teachers' and students' use was to provide information for future videodisc design and development for the Simon Fraser University videodisc project. This necessitated a statistical approach that would present clear information in a descriptive manner. A control group in this study was ruled out due to the open nature of the objectives, the formative design, and the built-in lack of control variables needed to obtain the broadest range of information possible.

Statistical measures were necessary for the student questionnaires, the test the students were given after their in-
service, and the frequency of use data including the problems encountered. The four teacher questionnaires were too few in number to provide anything other than indications of the individual's perceptions.

The open nature of the study and the nature of the data from the frequency of use by the students determined the statistical measures used. With the frequency of use data, percentages and means were used as much as possible for clarity and ease of reading. Student questionnaires were tabulated by computer and subjected to a statistical program; however, due to the built in open approach and the fact that the questionnaires present student perceptions, the decision was made to use raw scores, means, percentages, and standard deviation as appropriate.

Data Interpretation

The data were interpreted in the light of the objectives of the study. The feedback from the inservice for the teachers was regarded as indicators of the quality of the inservice and indicators of whether an appropriate amount of time was spent. Comments by each teacher were examined and categorized according to the teacher's opinions. Student feedback on their inservice was compiled through their demonstration of the ability to use and program the videodisc system in a programming test administered after the inservice sessions (Appendix F). It was expected that the students would be able to enter a simple manual program without any problems. Teacher and student use data was interpreted through examining the frequency of use of diff-
erent parts of the videodisc, the frequency of problems with programming, and the frequency of problems with the videodisc system mechanically. The data on frequencies was compiled and examined to determine how the system was used in the study and what problems occurred. Teacher Units and lessons also provided insight into the ways the system was used and subsequent changes made by the teachers in their units. It was expected that after the inservice program, students and teachers should be able to use the system with few problems or errors. A rate of one problem in every two or three uses was expected in the beginning with almost no problems expected by the end of the study.

Student and teacher reactions to the videodisc and videodisc system were expected to provide information on whether certain sections of the videodisc would be used more than others in future, if choices were given, and whether some parts were popular or not. It was expected that a rating of four or five on the Likert scale (Appendix B) would be a high rating and any lower rating could create a concern by the team about that part of the videodisc. Other data, from questions asking about reactions on the questionnaires, were expected to offer indications of individuals reactions and opinions toward the videodisc and videodisc system. The questionnaires also contained questions concerning the use of the manual by teachers and students. Teacher's reactions were expected to show how the manual was used, how much it was used, and what the problems were that users encountered. Again a rating of four or five was expected to
be a high rating.

Selection of the School

Rochester Elementary School in Coquitlam School District #43 was selected as a desirable school for the study. It is in a predominantly middle class area with some lower middle class students. The principal of the school had developed the initial Active Health and the Heart Program for the school district but had just moved to this school and had not yet implemented an Active Health Program. With the exception of one small group, none of the students had been exposed to a Heart Unit before. None of the teachers had ever used videodiscs, interactive technology, or taught and Active Health and the Heart Unit to students. This lack of experience was considered desirable by the research team for this pilot study to provide feedback that was as unbiased by previous experience as possible.

One member of the research team made an initial presentation to the staff of the school on videodiscs and the potential of their interactive qualities. After the presentation, the staff was asked if any of them would like to volunteer to take part in a study using videodiscs. Of the nine volunteers, four intermediate teachers chose to work on the Active Health and the Heart material. The classes that they taught represented a grade five, a grade six, a grade six and seven split class, and a grade seven class providing an age range of nine to thirteen for the pilot study.
Development of Learning Lab

An empty classroom in Rochester Elementary was designated as the Videodisc Learning Centre. The room was arranged to allow maximum variation in use to suit the individual requirements of each teacher. Movable office partitions were arranged to provide three separate spaces for three complete videodisc systems. (See figure 1) Desks and seating for a complete class, appropriate materials for the Heart Unit such as manometers and stethoscopes were provided as well as charts, pamphlets, and audiovisual aids to assist the teachers.

Each videodisc system was complete with a taped down Remote Control Unit (RCU) complete with connecting cord, a taped down manual (in preparation for the observational recording using a videotape recorder), a videodisc player, and a 20 inch television monitor.

Each unit had a video camera focused on the manual and the control unit so that all student use was video taped providing a sound and film record of the student interactions with the videodisc system.

Teacher Inservice

In March, the first of five one and one half hour inservice sessions was given for the four teachers. The basis of these inservice sessions consisted of the following goals:

1. To provide inservice for the teachers on the existing Active Health and the Heart Unit and have them work through the material.
2. To examine other heart related films, books, pamphlets, and any other aids available which may be appropriate for the study.

3. To use and interact with the materials and units on the heart to help determine which would be best for the students.

4. To become familiar and at ease with the videodisc system in the manual and automatic modes.

5. To explore a variety of teaching strategies to meet the needs of the students in the respective classes (e.g. process oriented approaches, station work, and direct factual approaches to the heart material).

The inservice program consisted of five one and one half hour sessions in the videodisc lab. The teachers spent one half of each session in actual work with the videodisc player and one half on Active Health inservice. A variety of discs were used to work on manual programming as well as using the automatic mode of the "How Your Heart and Circulatory System Works" videodisc.

During the second half of each session, inservice in the Active Health Program was provided. The core of the Active Health and the Heart Program inservice was based upon the following six units: knowledge of the structure and function of the cardiovascular system, heart rate recovery, blood pressure, the heart and exercise, comparative activities, and psychological stress. The videodisc system inservice consisted
of the following areas: mechanical functions of the player, manual programming, use of automatic programming, technical aspects of the discs and programming, and a general review of videodisc system usage.

**Teacher Preparation**

At the end of the inservice program, the research team requested that each teacher plan a suitable unit for their class on Active Health and the Heart incorporating the videodisc as appropriate to begin on April 19, 1982. The research team took care throughout the inservice to model a variety of approaches and styles without showing bias towards the effectiveness of any particular one so that the teacher-made units would reflect each teacher's personal instructional style. Emphasis was placed on each teacher using an appropriate style and approach that he felt was appropriate for his class.

**Student Inservice**

The results of the Johnson study, (1982) clearly indicated a need to teach all students how to use the videodisc player prior to assessing its value as a learning system. During the first three inservice sessions for each class, a member of the project team taught the children how to use the various functions of the remote control unit and to key punch simple programs. Videodiscs such as "The National Kidisc", "Sound of the Dolphins", and "Rock Adventure" were used to teach these skills. The videodisc, "How Your Heart and Circulatory System Works", was not seen by any class during these inservice ses-
sions. It should also be noted that throughout the inservice, each participating teacher was assigned specified free times in the lab to be used at his own discretion. All four teachers used these free periods, the above-mentioned videodiscs, and twelve other titles to practice the operating skills as well as to experiment with the videodisc player as an innovative learning system. The research team administered a test to the children during their fourth inservice session (See Appendix D).

Observation of Videodisc Use

To encompass the greatest amount of information and to acquire the maximum amount of feedback, the decision was made for the collection of data to be made by a participant observer. This would enable the observer to remedy any unforeseen obstacles and to record unforeseen difficulties. The member of the team who provided the teacher inservice but had not worked with the students fulfilled this part of the study to ensure keeping the most neutral status possible with the students. The observer notified teachers that other than starting and stopping the cameras, he would not teach or discipline students in the lab to try to protect his neutral status. If a student had a mechanical problem with the videodisc and the teacher was unable to correct this problem readily the observer would help if appropriate.

At the end of the observation period the questionnaires were administered to the students and teachers. All of the videotapes were watched and the coded information collated.
Then information recorded in other forms such as the teacher units and the observer's journal was evaluated.

In conclusion, the study was focused on obtaining as broad a spectrum of data on videodisc usage as was possible within the constraints of the study. The design was developed to obtain data that would aid the future development of videodiscs by providing insight into some potential ways of using the materials, the teacher/student reactions to the videodisc and videodisc system, the frequencies of use, the preferences of use, and the problem areas. Suggestions for improvement of the system and the videodisc were requested in both teacher and student questionnaires (Appendix B and C) with specific reference to different aspects of the videodisc and videodisc system.
CHAPTER 4
ANALYSIS OF DATA

The data collected in this study has been analyzed in this chapter under four major headings. The initial set of data, provided under Student Inservice, summarizes how proficient students became in operating the videodisc player and remote control unit. The section titled Teacher Inservice presents the reactions and opinions of the teachers towards the inservice sessions they received. Data collected from the 218 videotaped uses are presented in the section titled Observation of Videodisc Use. A summary of the four teachers' reactions to the videodisc learning system and to the Heart videodisc is provided under the third heading titled Teacher Reaction and Opinion. A similar analysis provided under the last heading, Student Reaction and Opinion, details students' opinions and perceptions relating to the videodisc player and to the three types of material contained on the Heart videodisc. The data collected concerning the Active Health and the Heart Videodisc manual is presented under the heading Videodisc Manual.

Student Inservice

The student inservice program was conducted by a member of the project team and involved teaching the children in the four participating classes how to use the videodisc player and how to keypunch simple programs on the Remote Control Unit (RCU). A test was given (Appendix F) to the children during the fourth inservice session on the mechanical operation of the player and
on the program function of the RCU. Each child was asked to
keypunch the fourteen operations shown in Table 1. Forty seven
of the 114 children who took this test performed these opera-
tions without making a mistake. In terms of total responses,
class averages ranged from a low of 77% to a high of 89% correct
responses. If all four classes were given a short inservice on "STEP FWD" and "STEP REV" (See No. 4 and 5 in Table 1), the
performance level of the children would have been significantly
higher. This weakness was noted by the teachers and corrected
prior to the beginning of the observational study phase of this
project.

Observation of Videodisc Use

Prior to the beginning of the observational study, each
teacher planned a heart unit for his or her respective classes.
The project team had no prior knowledge of what parts of the
heart videodisc would be used or how the videodisc system would
be incorporated into each class's Heart Unit. To cope with
this situation, one member of the project team acted as a
participant observer and was present in the videodisc lab whenever it was used by the four classes involved in the study.
Each time a videodisc player was used, the participant observer
ensured that all student contact with the system was videotaped.
The observer also provided limited assistance to the children
with any mechanical operation or with any problems related to
the videodisc system.

Immediately after students used a videodisc player the
<table>
<thead>
<tr>
<th>NO. OPERATION</th>
<th>CLASS A</th>
<th></th>
<th>CLASS B</th>
<th></th>
<th>CLASS C</th>
<th></th>
<th>CLASS D</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FRM DSP</td>
<td>Correct 12</td>
<td>Incorrect 2</td>
<td>Correct 11</td>
<td>Incorrect 3</td>
<td>Correct 10</td>
<td>Incorrect 2</td>
<td>Correct 14</td>
<td>Incorrect 1</td>
</tr>
<tr>
<td>2. SCAN FWD</td>
<td>Correct 12</td>
<td>Incorrect 2</td>
<td>Correct 11</td>
<td>Incorrect 1</td>
<td>Correct 10</td>
<td>Incorrect 13</td>
<td>Correct 14</td>
<td>Incorrect 3</td>
</tr>
<tr>
<td>3. SCAN REV</td>
<td>Correct 12</td>
<td>Incorrect 1</td>
<td>Correct 11</td>
<td>Incorrect 1</td>
<td>Correct 10</td>
<td>Incorrect 9</td>
<td>Correct 14</td>
<td>Incorrect 1</td>
</tr>
<tr>
<td>4. STEP FWD (3 times)</td>
<td>Correct 12</td>
<td>Incorrect 3</td>
<td>Correct 11</td>
<td>Incorrect 11</td>
<td>Correct 10</td>
<td>Incorrect 7</td>
<td>Correct 14</td>
<td>Incorrect 7</td>
</tr>
<tr>
<td>5. STEP REV (3 times)</td>
<td>Correct 12</td>
<td>Incorrect 9</td>
<td>Correct 11</td>
<td>Incorrect 12</td>
<td>Correct 10</td>
<td>Incorrect 4</td>
<td>Correct 14</td>
<td>Incorrect 6</td>
</tr>
<tr>
<td>6. SLOW FWD</td>
<td>Correct 12</td>
<td>Incorrect 4</td>
<td>Correct 11</td>
<td>Incorrect 1</td>
<td>Correct 10</td>
<td></td>
<td>Correct 14</td>
<td>2</td>
</tr>
<tr>
<td>7. SLOW REV</td>
<td>Correct 12</td>
<td>Incorrect 1</td>
<td>Correct 11</td>
<td>Incorrect 1</td>
<td>Correct 10</td>
<td></td>
<td>Correct 14</td>
<td>3</td>
</tr>
<tr>
<td>8. STOP</td>
<td>Correct 12</td>
<td>Incorrect 1</td>
<td>Correct 11</td>
<td>Incorrect 2</td>
<td>Correct 10</td>
<td>Incorrect 3</td>
<td>Correct 14</td>
<td>2</td>
</tr>
<tr>
<td>9. PROGRAM</td>
<td>Correct 12</td>
<td>Incorrect 1</td>
<td>Correct 11</td>
<td>Incorrect 1</td>
<td>Correct 10</td>
<td>Incorrect 1</td>
<td>Correct 14</td>
<td></td>
</tr>
<tr>
<td>10. 1000 SEARCH</td>
<td>Correct 12</td>
<td>Incorrect 1</td>
<td>Correct 11</td>
<td>Incorrect 1</td>
<td>Correct 10</td>
<td></td>
<td>Correct 14</td>
<td></td>
</tr>
<tr>
<td>11. 1100 AUTO STOP</td>
<td>Correct 12</td>
<td></td>
<td>Correct 11</td>
<td></td>
<td>Correct 10</td>
<td></td>
<td>Correct 14</td>
<td></td>
</tr>
<tr>
<td>12. HALT</td>
<td>Correct 12</td>
<td>Incorrect 1</td>
<td>Correct 11</td>
<td></td>
<td>Correct 10</td>
<td>Incorrect 3</td>
<td>Correct 14</td>
<td>1</td>
</tr>
<tr>
<td>13. END</td>
<td>Correct 12</td>
<td></td>
<td>Correct 11</td>
<td></td>
<td>Correct 10</td>
<td></td>
<td>Correct 14</td>
<td></td>
</tr>
<tr>
<td>14. RUN</td>
<td>Correct 12</td>
<td></td>
<td>Correct 11</td>
<td></td>
<td>Correct 10</td>
<td></td>
<td>Correct 14</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL RESPONSES</strong></td>
<td>168 Correct</td>
<td>32 Incorrect</td>
<td>154 Correct</td>
<td>37 Incorrect</td>
<td>140 Correct</td>
<td>42 Incorrect</td>
<td>196 Correct</td>
<td>29 Incorrect</td>
</tr>
<tr>
<td><strong>% RESPONSE</strong></td>
<td>89% Correct</td>
<td>11% Incorrect</td>
<td>81% Correct</td>
<td>19% Incorrect</td>
<td>77% Correct</td>
<td>23% Incorrect</td>
<td>87% Correct</td>
<td>13% Incorrect</td>
</tr>
<tr>
<td><strong>NUMBER OF CHILDREN</strong></td>
<td>28 Correct</td>
<td></td>
<td>27 Correct</td>
<td></td>
<td>30 Correct</td>
<td></td>
<td>29 Correct</td>
<td></td>
</tr>
</tbody>
</table>
camera was turned off and the time of use recorded. During the four week instructional unit, a total of 218 separate uses of the system were recorded by the three videocameras. A subsequent observational analysis of each videotape was conducted to determine the types and frequencies of problems encountered with the automatic and manual programs, operating the player and videodisc, and the frequencies of use of the different parts of the Heart videodisc.

The amount of time each class used the videodisc is shown in Table 2.

**TABLE 2**

<table>
<thead>
<tr>
<th>CLASS</th>
<th>TOTAL USES, BY CLASS</th>
<th>%</th>
<th>AVERAGE NUMBER OF USES BY EACH STUDENT</th>
<th>PREDOMINANT GROUP SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>75</td>
<td>34</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>70</td>
<td>32</td>
<td>7 *</td>
<td>4</td>
</tr>
<tr>
<td>C</td>
<td>44</td>
<td>28</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>29</td>
<td>13</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

* Class monitors used the system for an average of 17 times each; this was excluded from Table 2 as it skewed the results.

Although Class D recorded the fewest total uses of the system, they actually had the most uses per student because of the group size. Class B had seven student monitors who practiced with the videodisc system before the class began their unit on Active Health and the Heart. These student monitors used the system 17 times individually or in groups of two or three accounting for the high number of uses by the class. In Class A, almost all of the use was by groups of two with a few
cases of individuals working by themselves.

The amount of time that each class used the videodisc lab showed a progressive and consistent decline throughout each respective unit of instruction. It was found that during the first half of the study the average viewing time was 20.21 minutes, while during the last half, the average was 14.14 minutes. Table 3 shows a breakdown of the time of use by each class.

**TABLE 3**

COMPARISON OF TIME USAGE BY CLASS

<table>
<thead>
<tr>
<th>CLASS</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 218 uses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean in minutes</td>
<td>19.02</td>
<td>15.44</td>
<td>15.10</td>
<td>19.14</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>10.47</td>
<td>12.85</td>
<td>7.23</td>
<td>7.98</td>
</tr>
<tr>
<td>First 109 uses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean in minutes</td>
<td>22.76</td>
<td>20.29</td>
<td>17.11</td>
<td>20.68</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>11.69</td>
<td>15.64</td>
<td>8.11</td>
<td>10.66</td>
</tr>
<tr>
<td>Last 109 uses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean in minutes</td>
<td>15.28</td>
<td>10.59</td>
<td>13.08</td>
<td>17.59</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>7.55</td>
<td>6.50</td>
<td>5.54</td>
<td>3.55</td>
</tr>
</tbody>
</table>
The differences between means for each class in the first and second half of the study was lower. In addition, the size of the standard deviation was also smaller for all classes in the second half of the study. A study of the observations shows more selective use of the videodisc material by teachers and increased efficiency in the time of use as the instructional unit progressed by students. The differences in variance in time between classes was also attributed to the use of student monitors; some classes had sharply delineated tasks, while other classes allowed students to work on an individual basis. For example, Class D was broken into groups of 10 students per carrel and given specific items to view giving the smallest deviation in the last half of the study. Class A had pairs of students working at their own rate with each student using the controls resulting in a higher deviation. The large deviation in the first half of the study for Class B was attributed to student monitor practice giving a lower deviation in the last half of the study when the monitors worked with the other students. Overall, Class C had the lowest deviation as a result of clearly defined, specific tasks assigned by the teacher.

A breakdown of the 218 observations in Table 4 revealed that teachers helped students 223 times to locate program material or to perform mechanical operations in 100 of the uses of the video-system. The frequency of uses needing help for the total group was 69% during the first half of the study and 24% during the last half of the study. The percentage improvement in the number of uses for the total group needing help
between the first and second half of the study was 45% indicating that it took a number of uses before students were able to function without frequent help. An examination of each class indicated different teaching methods caused the marked difference in the percentage of errors among the four classes. For example, Class A's students used the videodisc in groups of two with each student using the controls (Table 3). Students in Class A were prepared by their teacher in class as to their assignment. Class B used student monitors so that a core group of seven students operated the system before the other students, gaining proficiency resulting in very few instances of help required. Class C was given a set of simple instructions in their class before coming to each respective lab session. This resulted in very few instances of help required by students in the class during the last half of the study. In Class C and Class A each student operated the controls while in groups of two or three children. Class D used the system in groups of ten with an appointed monitor assigned to operate the controls. After four inservice sessions and over one hundred uses of the videodisc system the average number of uses where help was still needed was over one in five.

One of the problem areas experienced by the students related to the operation of the videodisc machine. Even after teacher assistance, there were 50 uses in which mechanical errors in operating the machine were committed by students. The total number of mechanical problems, as shown in Table 5, was 77 with Removing the Disc representing the main problem.
As previously shown in Table 2, Class A had the largest number of uses on the system. Each student in this class used the controls and worked at his or her own rate. Class B registered only four problems which can be attributed to the use of a small group of student monitors. Class A and Class C allowed
TABLE 5
FREQUENCY OF MECHANICAL PROBLEMS BY CLASS

<table>
<thead>
<tr>
<th>MECHANICAL PROBLEMS</th>
<th>CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Starting the Player</td>
<td>14</td>
</tr>
<tr>
<td>Loading the Player</td>
<td>12</td>
</tr>
<tr>
<td>Playing the Disc</td>
<td>8</td>
</tr>
<tr>
<td>Stopping the Disc</td>
<td>3</td>
</tr>
<tr>
<td>Removing the Disc</td>
<td>11</td>
</tr>
<tr>
<td>TOTAL</td>
<td>48</td>
</tr>
</tbody>
</table>

% Uses with Problems 64% 6% 32% 38% 35%

Each student to use the RCU of the videodisc system during the Heart Unit. The main difference between Class A and C, however, was the clearly outlined tasks and briefing the students of Class C received before each use of the videodisc system. Class D used a slightly modified student leader approach, consequently recording fewer errors than Class A. It is also interesting that 60% of the 50 uses where errors were committed occurred between the first and eighty-fifth use. The remaining 40% of the errors were committed in the last 133 uses of the videodisc system. This indicates the increased mechanical proficiency of all classes during the latter part of the study.

A more detailed look at the problems from the observational forms that occurred in each mechanical operation is shown in Table 6. Even though the greatest problem area is shown as Removal of the Disc, the most frequent problem was more specific.
Adding the difficulties with the unlock/lock mechanism in Table 6 from the Loading the Videodisc area with the Removing the Disc area gives a total of 33 problems in this area. In actuality, 43% of the mechanical difficulties in the study were problems with the unlock/lock mechanism of the videodisc player. In some instances, videotapes showed younger users were not strong enough to lift the unlock/lock ring of the videodisc player.

The major overall problem areas throughout the study for the students was in using the RCU and locating material on the videodisc. In the coding of the videotapes, a distinction was made between problems with pressing the button controls on the RCU and difficulties locating the correct part of the program. Difficulty with the button control included pushing a button without result, pushing a button more than once, and pushing more than one button at a time. If a hand obscured the control unit or if students tentatively touched several buttons making it hard to discern which was actually pushed and a problem occurred, this was coded as a Difficulty with Getting to the Correct Part of the Program. All of these difficulties were verified by noting the result of the button pushing on the videotapes. In the total study, there were 251 observed difficulties as shown in Table 7. This represented an average of 2.07 difficulties in the 123 uses with problems. Of these problems, the contact of the key of the RCU was fraught with the most problems. At times the RCU appeared to work even when a hand brushed or touched a key very lightly. In other instan-
<table>
<thead>
<tr>
<th>TABLE 6</th>
<th>SPECIFIC MECHANICAL DIFFICULTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Starting the Player</strong></td>
<td></td>
</tr>
<tr>
<td>Didn't turn on power</td>
<td>8</td>
</tr>
<tr>
<td>Didn't turn on TV</td>
<td>7</td>
</tr>
<tr>
<td>Needed/requested help</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18</td>
</tr>
<tr>
<td><strong>Loading the videodisc</strong></td>
<td></td>
</tr>
<tr>
<td>Forgot to lock disc</td>
<td>4</td>
</tr>
<tr>
<td>Difficulty with lock</td>
<td>11</td>
</tr>
<tr>
<td>Needed/requested help</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>18</td>
</tr>
<tr>
<td><strong>Playing the Disc</strong></td>
<td></td>
</tr>
<tr>
<td>Forgot to press Play</td>
<td>2</td>
</tr>
<tr>
<td>Difficulty with button</td>
<td>6</td>
</tr>
<tr>
<td>Button pressed out of sequence</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12</td>
</tr>
<tr>
<td><strong>Stopping the Disc</strong></td>
<td></td>
</tr>
<tr>
<td>Forgot to press Reject</td>
<td>3</td>
</tr>
<tr>
<td>Forgot to turn off power</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>Removing the Disc</strong></td>
<td></td>
</tr>
<tr>
<td>Difficulty unlocking disc</td>
<td>8</td>
</tr>
<tr>
<td>Didn't know how to unlock</td>
<td>7</td>
</tr>
<tr>
<td>Turned power off too soon</td>
<td>6</td>
</tr>
<tr>
<td>Couldn't turn off power</td>
<td>1</td>
</tr>
<tr>
<td>Left disc</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>25</td>
</tr>
</tbody>
</table>
ces, buttons were clearly and distinctly pushed on all three videodisc systems without the desired effect. One frequent complaint was that the button resistance did not indicate whether you had successfully pushed the button. This problem created frustration when individuals attempted to program the videodisc manually.

**TABLE 7**

**DIFFICULTY IN USING THE VIDEODISC PROGRAM AND CONTROLS**

<table>
<thead>
<tr>
<th>DIFFICULTIES</th>
<th>CLASS</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Difficulty with controls</td>
<td>78</td>
<td>37</td>
<td>12</td>
<td>39</td>
<td>166</td>
<td></td>
</tr>
<tr>
<td>Difficulty with program</td>
<td>54</td>
<td>10</td>
<td>14</td>
<td>7</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>Total Problems</td>
<td>132</td>
<td>47</td>
<td>26</td>
<td>46</td>
<td>251</td>
<td></td>
</tr>
</tbody>
</table>

The combined difficulties with the mechanical operations of the videodisc system and the difficulties with locating program material presents interesting data concerning the way different classes responded to the study. In Table 8, classes B and C had approximately 62% fewer problems per total use. Students in Class A experienced difficulties in 63% of their uses of the videodisc system. Difficulties were experienced in 69% of the uses by Class D. Classes B and C, using individual and monitor approaches, had the fewest difficulties with 44% and 34% respectively. Simple, clearly outlined tasks helped Class C, the youngest class, have the smallest average of .59
TABLE 8

COMPARISONS OF THE DIFFICULTIES WITH PROGRAM AND CONTROLS

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Uses</td>
<td>75</td>
<td>70</td>
<td>44</td>
<td>29</td>
<td>218</td>
</tr>
<tr>
<td>Uses with difficulties</td>
<td>47</td>
<td>31</td>
<td>15</td>
<td>20</td>
<td>123 *</td>
</tr>
<tr>
<td>% Uses with difficulties</td>
<td>63%</td>
<td>44%</td>
<td>34%</td>
<td>69%</td>
<td>56% *</td>
</tr>
</tbody>
</table>

Average No. of
Difficulties total

* Some uses had more than one problem.

difficulties per use throughout the total study. The 17 practice sessions, that the student monitors in Class B had, contributed to their class producing the second lowest average of .67 difficulties per use. It is interesting to note that as the study progressed the other teachers began to give out similar task sheets to Class C's to help delineate and define each child's assignment (See Appendix F).

Frequency of Use of the Remote Control Functions

The data provided in Table 9 summarizes the frequency of use of the remote control functions. The difference between the number of "Play" and "Reject" tallies for each class is due to either the play button not being pressed hard enough to engage the operation or students not pressing the reject button when they finished using the player. In each of the remaining operations, the remote control functions represent "non-class" use by special groups of students. For example, the heavy use by Class B was a group of teacher helpers experimenting with
# TABLE 9

FREQUENCY OFUSE FOR THE REMOTE CONTROL FUNCTIONS

<table>
<thead>
<tr>
<th>OPERATION FUNCTIONS OF R.C.V.</th>
<th>CLASS A</th>
<th>CLASS B</th>
<th>CLASS C</th>
<th>CLASS D</th>
<th>TOTAL NUMBER OF TIMES USED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Observations</td>
<td>No. of Observations</td>
<td>No. of Observations</td>
<td>No. of Observations</td>
<td>No. of Observations</td>
</tr>
<tr>
<td>Play</td>
<td>76</td>
<td>195</td>
<td>70</td>
<td>157</td>
<td>29</td>
</tr>
<tr>
<td>Reject</td>
<td>75</td>
<td>176</td>
<td>70</td>
<td>140</td>
<td>29</td>
</tr>
<tr>
<td>Step fwd.</td>
<td>2</td>
<td>8</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Step rev.</td>
<td>2</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slow motion fwd.</td>
<td>2</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slow motion rev.</td>
<td>2</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Search</td>
<td>2</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scan fwd.</td>
<td>2</td>
<td>10</td>
<td>2</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Scan rev.</td>
<td>3</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stop</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
the manual mode of programming material. Of the 218 uses recorded in this study, only three uses revealed students using any of the manual program functions. Furthermore, this use was actually a program made by one of the teachers to show a series of film segments using the manual mode. A few uses by Class B were a result of the student monitors engaging in free play while they were experimenting with some of the manual aspects of the system. On the basis of this information, the data in Table 9 verifies that only the automatic mode of accessing material was used during the scheduled class times.

Use of the Parts of the Videodisc

A summary of the frequency of use for each chapter of the videodisc is provided in Table 10. Under the Number of Individual Uses column of Chapter 1, there were 54 observations where children viewed the three minute motion picture film segment. The score of 14 in the adjacent column indicated that within the 54 observations, there were 14 situations in which children watched the film two or more times. The score of 223 shown under the Total Frequency column represented 202 uses in which the children viewed a particular film segment only once. The remaining 21 observations were situations where multiple viewing was elected by a particular group of children. An analysis of film use by class indicated all classes used the film segments of Chapter one; three classes used the film of Chapters two, three, and four; two classes used the film portion of Chapter five; and only one class used the film in Chapter six.
<table>
<thead>
<tr>
<th>CONTENTS</th>
<th>CHAPTER 1 Frequency of Use</th>
<th>CHAPTER 2 Frequency of Use</th>
<th>CHAPTER 3 Frequency of Use</th>
<th>CHAPTER 4 Frequency of Use</th>
<th>CHAPTER 5 Frequency of Use</th>
<th>CHAPTER 6 Frequency of Use</th>
<th>TOTAL OF FREQUENCIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Individual Uses</td>
<td>Number of Mult. Uses</td>
<td>Number of Individual Uses</td>
<td>Number of Mult. Uses</td>
<td>Number of Individual Uses</td>
<td>Number of Mult. Uses</td>
<td></td>
</tr>
<tr>
<td>Film Segment</td>
<td>54 14</td>
<td>40 2</td>
<td>33 2</td>
<td>21 1</td>
<td>30 2</td>
<td>15 0</td>
<td>223</td>
</tr>
<tr>
<td>Things Topic to do</td>
<td>1. 11 0</td>
<td>19 0</td>
<td>17 3</td>
<td>31 3</td>
<td>15 0</td>
<td>7 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. 27 3</td>
<td>10 1</td>
<td>10 0</td>
<td>24 2</td>
<td>13 5</td>
<td>6 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. 0 1</td>
<td>30 2</td>
<td>0 23</td>
<td>1 6</td>
<td>0 6</td>
<td>0 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. 32 6</td>
<td>15 1</td>
<td>15 1</td>
<td>16 3</td>
<td>0 0</td>
<td>6 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. 5 2</td>
<td>15 0</td>
<td>10 4</td>
<td>19 1</td>
<td>9 0</td>
<td>7 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. 29 0</td>
<td>3 22</td>
<td>0 3</td>
<td>3 0</td>
<td>5 0</td>
<td>5 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. 20 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. 7 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. 16 0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td></td>
<td>10. 13 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11. 11 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12. 11 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13. 10 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14. 10 0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15. 10 1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>219 14</td>
<td>193 3</td>
<td>181 11</td>
<td>123 11</td>
<td>63 5</td>
<td>61 1</td>
<td>677</td>
</tr>
<tr>
<td>INTERACTIVE TEST</td>
<td>31 5</td>
<td>32 0</td>
<td>10 1</td>
<td>21 2</td>
<td>16 2</td>
<td>11 2</td>
<td>141</td>
</tr>
</tbody>
</table>

* The introductory film segment prior to Chapter 1 was used 2 times.
The total frequency of use of individual topics within the Things to Do section was 677. Of this number, 45 situations were multiple viewings of a particular topic. It was noted that topic four of Chapter four was the only one of the 46 topics that was not used by any class. The use of all other topics ranged from three to 32 times.

Although the total frequency of 141 for the Interactive Test was the lowest total frequency of the three different materials contained on this videodisc, it still represented a substantial use by the participating classes. An examination of each class indicated all but one class used the interactive test. Of the classes who used the test, the majority of uses revealed the test was taken at the conclusion of the respective chapter.

Teacher Reactions and Opinions

Immediately after the four teachers completed their respective heart units, they were asked to complete a questionnaire concerning the heart videodisc and the videodisc learning system. Each question was based on the Likert five point scale to determine teacher reactions and opinions. With respect to the ease of use of the functions and operations of the videodisc system and the Heart videodisc, teachers stated that they felt very comfortable with almost all items. The only area that rated below four on a five point scale was the use of the videodisc manual with students. This received an average rating from the four teachers of 3.7.
In terms of the content of the videodisc and its technical quality, the teachers rated the film material, still frames and the interactive test between good and excellent on a five-point scale. Film material, however, was rated highest, followed by still frame sequences, then the interactive tests. Comments included putting the test questions in the manual, simplifying the menu format of Table of Contents - Chapter - etc., and reducing the amount of print material which some students stated was boring.

In the content area, vocabulary was rated as fair with comments concerning the readability level for younger students and the need for visual reinforcement in print on the screen for such words as erythrocytes.

The teachers rated the instructional value of the film and Things to Do between fair and good. A negative comment on the test suggested the test was too short in duration; positive comments were about the test's nonthreatening nature. The videodisc program, described as versatile and easily adapted, was also rated between good and excellent as was the manual for teacher use.

**Student Reactions and Opinions**

At the completion of the instructional unit each student was asked to complete a questionnaire. The questions attempted to determine the students' reactions and opinions towards the player as well as potential suggestions for the content and arrangement of the videodisc.
At first two questions were concerned with the students' perceptions of their frequency of viewing the videodisc and the frequency of operating the RCU. Question one asked "How many times did you watch the videodisc How Your Heart and Circulatory System Works?". The second question asked "How many times did you use the controls or get to push buttons?". According to Table 11, the number of times children in each class used the videodisc varied from an average of nearly five times for Class A to almost double that for Class C. When you look at the mean scores for question two, Class C's and Class A's use was evenly shared by all students in the class. A standard deviation of 4.5 and a cross check with the actual frequency indicates that Class D's perceptions of the frequency of button use and the actual frequency are different.

Question three asked "How many times did you use the user's manual?". Of the 94 students responding to this question, 71% of the total group stated that they never used the manual. A follow-up to this question revealed that all teachers used the manual to plan for their class. Subsequent discussions with the teachers indicated that they felt that the manual was too complex for their students to use.

Question four asked the students "How easy were the following parts for you?" They replied on a five-point scale ranging from very hard to very easy. The mean scores tabulated in Table 12 indicate that the students responded that they had had little
difficulty with all areas except making programs and using automatic mode.

There were two parts to question five. The first part asked "Did you have any trouble operating the videodisc machine?". Seventy-five percent of the students indicated that they had no trouble operating the machine. When asked to explain where they had trouble, the main problem areas for the twenty-five students who experienced trouble were restricted to loading, unloading, and pressing the wrong button. With respect to the number of responses, four related to loading and unloading, seven concerned pressing the wrong button, and the remaining ten concerned the videodisc rather than the operation of the machine.

<table>
<thead>
<tr>
<th>Question</th>
<th>Class A Mean</th>
<th>Class B Mean</th>
<th>Class C Mean</th>
<th>Class D Mean</th>
<th>Total Group Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1</td>
<td>4.95</td>
<td>7.20</td>
<td>11.70</td>
<td>8.12</td>
<td>7.95</td>
</tr>
<tr>
<td>Question 2</td>
<td>3.50</td>
<td>4.50</td>
<td>2.04</td>
<td>8.12</td>
<td>4.58</td>
</tr>
</tbody>
</table>
TABLE 12

EASE OF USING PLAYER AND RCU

<table>
<thead>
<tr>
<th>Videodisc Player &amp; Remote Control Operation</th>
<th>Average Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class A</td>
</tr>
<tr>
<td>Loading the Player</td>
<td>4.75</td>
</tr>
<tr>
<td>Starting the Player</td>
<td>4.75</td>
</tr>
<tr>
<td>Playing the Disc</td>
<td>4.50</td>
</tr>
<tr>
<td>Removing the Disc</td>
<td>4.79</td>
</tr>
<tr>
<td>Finding Table of Contents</td>
<td>4.54</td>
</tr>
<tr>
<td>Finding Chapter Decision Frames</td>
<td>4.29</td>
</tr>
<tr>
<td>Finding Things to Do</td>
<td>4.54</td>
</tr>
<tr>
<td>Finding Test</td>
<td>4.29</td>
</tr>
<tr>
<td>Using Automatic Mode</td>
<td>4.00</td>
</tr>
<tr>
<td>Making Programs</td>
<td>3.95</td>
</tr>
</tbody>
</table>

* Scores are an average of the five point Likert Scale ranging from Very Hard (1) to Very Easy (5). Refer to Appendix D.
When questioned about what group size teachers had used, the answers spanned one, two, three, four, five, six, and ten. All teachers agreed that small groups were best and suggested two, three, four, or five maximum.

When asked their opinions about the effectiveness of the videodisc as a learning system, the teachers' reaction were consistently positive. Each teacher was impressed with the technical advances such as slow motion, scan, step forward, and freeze framing. Rapid access to material was singled out as a highly desirable feature. The capacity to use automatic or manual modes of operation also allowed the potential to allow for individual differences in abilities and interests. Although the manual mode was not used, the teachers commented that this feature would be used more often in future to design individualized programs.

Each teacher commented that the button controls were very sensitive and might be improved. Other improvements suggested included paper tasks and a simplified manual for student use to augment some of the Things to Do. Two teachers felt they would practice using the system more with the students before beginning this unit again.

Finally, when asked to compare the videodisc with other audiovisual aids, they considered the videodisc to be more versatile and superior in virtually every other way to audiovisual aids such as 16mm film and videotape.
Question six requested children to indicate whether they liked or disliked the videodisc machine and the heart videodisc. On the basis of a five-point scale, as shown in Table 13, student reactions were generally positive towards the player as well as towards the various parts of the heart disc. It is interesting to note the mean score of 4.1 for the test indicated that the majority of children enjoyed taking it. The lowest score, 3.4, for Things to Do is still a positive rating; however, the tallies towards the lower end of this scale indicate a closer examination of how still frame material should be arranged and presented in future videodiscs is needed.

As part of question six, children were asked "Is there anything else you liked or disliked?" The comments that were written reinforced the tallies recorded in Table 13. The majority of positive comments were written about the test, then the film and finally about Things to Do. The most common statement was "I like to press buttons". Almost as many positive comments (six) concerned the use of a game in one of the discs used in the student inservice session. A few negative comments were directed towards not being able to operate the machine and the noise of other children and machines.

Question seven asked "Did you like any part better than others...which parts?". Half of the total group of 47 children said yes. Again this reinforced the answer to the previous question only in more detail. The largest positive response of 31 comments were directed towards the interactive test.
Eight comments stated that the best part was the film sections. Seven children said that they liked all of the material. The rest of the comments concerned pushing buttons and the Kidisc used in the student inservice.

**TABLE 13**

ATTITUDE TO HEART VIDEODISC AND PLAYER

<table>
<thead>
<tr>
<th>VIDEODISC &amp; PLAYER</th>
<th>FREQUENCY OF RATINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 Really Disliked</td>
</tr>
<tr>
<td>The Active Health Disc</td>
<td>3</td>
</tr>
<tr>
<td>Videodisc Machine</td>
<td>0</td>
</tr>
<tr>
<td>The Films</td>
<td>1</td>
</tr>
<tr>
<td>The Things to Do</td>
<td>3</td>
</tr>
<tr>
<td>The Test</td>
<td>1</td>
</tr>
</tbody>
</table>

The eighth question asked "What would you like to see more of in the Heart videot disc?". Sixteen comments indicated that students would like to see live material such as a picture and/or film of a live heart and actual pictures of circulation. Twelve children stated that they would like to see more test items. Five comments indicated a desire to have more film and five suggested there should be less reading and more pictures.
The ninth question allowed children to express their opinion about what they would change if they could on the videodisc. Forty-eight students commented that they would not want to make any changes to the videodisc. Eight students made comments concerning the addition of more tests. Comments about adding a game or games were made by eight of the students. Six students made negative comments about the Things to Do section, mostly concerned with the amount of reading and print. On examination of the videotapes it was found that students did not always read the Things to Do sections that their teacher had assigned to them. * This section was originally designed as a series of hands on activities.

The last question asked "Did you learn a lot from the videodisc?". Of the total responses, 89 said yes, four said no, and one child did not respond. Three of the 89 children who said yes added phrases such as "most of the time", "kind of", and "sort of".

The data from the student questionnaire should be viewed within the context that they are the perceptions of the students. When the questionnaires were checked against the actual frequencies taken from the videotapes, discrepancies were found as evidenced by comparing Table 12, Tables 4, 5 and 8, and the responses to question five in which 75% of the students stated that they had no trouble operating the machine.

* This also occurred in the Johnson study.
Videodisc Manual

The four teachers in the study rated the videodisc manual at 3.7, between fair and good for student use. This was the only thing rated below good in the study by the teachers. Their comments suggested that the manual was too complex for student use and contained too much material. For their own use, teachers rated the manual between good and excellent. Comments included that they found the How to Program section in the first part of the manual helpful even though teachers did not manually program for their classes. Other comments stated that the manual had been useful for lesson planning.
CHAPTER 5
SUMMARY AND CONCLUSION

This is the second study on the Simon Fraser University "How Your Heart and Circulatory System Works" videodisc. The first study, completed by Johnson, (1983), investigated the feasibility of the use of the videodisc and manual in one elementary school classroom. This the Second Simon Fraser study, a formative field test has provided evidence to support the statements made under the accompanying headings.

Student Inservice

Scores from 77% to 89% on the achievement test (See Table 1) given during the fourth session of the student inservice were considered promising in terms of student's ability to use and program the videodisc. The high frequency of mechanical and program problems, (See Tables 5 & 8) especially during the videodisc system use in the first half of the study, indicates proficiency in actual use was still lacking. It is interesting to note that 75% of the students felt that they had not experienced any trouble with the videodisc system. In future studies, bearing problems experienced by the students in mind, three hands on inservice sessions would be considered a minimum before instructional usage with a similiar videodisc system.

Teacher Inservice

Five one and one half hour sessions evenly divided on the use of the videodisc and Active Health Program were planned for teacher inservice. Using data from Johnson's study it was felt
that this should be an optimum amount of inservice especially if it was spaced out over a number of sessions to aid learning. Questionnaire comments by two teachers reflected a need for more hands on time; however, one teacher had felt that the amount of time spent was appropriate and one teacher felt that too much time was spent. All teachers experienced some mechanical and program difficulties with the videodisc system and videodisc in the initial part of their classes use. This and journal notes reflect that the teachers had not mastered the videodisc system in the five inservice sessions. If similar videodisc systems are to be used, five forty-five minute inservice sessions would be considered an appropriate amount of time for teachers to acquire sufficient skills to use the system with their classes.

Notes for Future Study

After the two field tests some guidelines have been suggested. Users need to have hands on experience, hopefully at least three times, to be able to use the videodisc system for more than just videodisc literacy. Even after the four sessions with students and five sessions with teachers, many problems were evident with the "How Your Heart and Circulatory System Works" videodisc and the videodisc player. This inservice need will have to be constantly re-evaluated as videodisc systems become easier or more difficult to use.

Videodisc Lab

It was fortunate to have a room for the study that could be used with individual students, small groups, and whole class
lessons. Examples of some of the uses include students doing heart related station work while others used the discs and whole classes watched the three machines. There was some individual use - the instructional ideal, but time constraints and the number of machines forced the use to be by groups of students. In planning for the future use of the videodisc systems, consideration should be given to the addition of more machines to allow for more individualized use. Another priority would be an improvement of the sound baffling system to prevent the aural distraction of users.

Observation of Videodisc Use

Use of the Videodisc System

During the inservice, great care was taken to allow for all types and styles of teacher use. Each teacher used different group sizes. At the end of the study all felt that five students was a maximum for effective work with two or three students per group considered best. * One group, Class B, used student monitors exclusively, but some students complained about not getting to use the controls. Other uses included varieties of group sizes and button usage by each student in a class. No major difference in attitude towards the videodisc machine was found between classes.

Throughout the observation period users of the videodisc became more selective as verified by teacher comment. The average time of use fell dramatically towards the last half of the

* Ideally, total individualized instruction was considered best; however, the time and number of machines forced compromise.
study (Table 3). Further study could investigate if this is a product of the design of the Simon Fraser University videodisc or if videodisc design should be oriented towards uses that are of a shorter time duration.

The videodisc system was used in a variety of ways and adapted as teachers saw fit; each class was taught with different styles and approaches. This included using the videodisc for reinforcement of previously taught concepts, for initial teaching, for step by step practical applications (blood pressure), and for providing a general overview (watching all the films). Teaching was done in class and followed up in the lab and in some station work in the lab and the adjoining halls and passageways. Some of the approaches used included lecturing, group discussion, hands on work with the materials, and the station work doing paper and practical activities. Most teachers provided a mixture of all of the above, emphasizing one or two aspects as they felt best suited their class. The author is of the opinion that providing an educational medium that allows for variations in type of use in a multi-faceted way will help teachers optimize their instruction as best suits their students needs.

Designers of videodiscs should expand on the multi-faceted potential of the videodisc and design for the widest variety of teacher/student use possible. The dangerous potential exists for the design of software that determines the style and type of use by the user thereby depriving the user of the ability to individualize the material as is appropriate or necessary.
Problems with the Videodisc

Contrary to reports that videodiscs were "virtually indestructable (with reasonable care)" (Woolley, 1979, p.38), we found videodiscs were not as durable as was initially suggested. If dropped on edge, our videodiscs shattered. When one disc was not locked securely during use, it rattled loudly; due to warpage subsequent attempts to use this disc were in vain. In another 'lock' problem, the disc was so badly scratched, it was rendered unusable. Although the optical videodisc has been reported to be unaffected by minor surface dirt, scratches, and fingerprints, we recorded difficulties in five percent of the uses in the study. Whether certain playground dirt or children's fingerprints are exceptions to laser technology, we could not positively ascertain. The typical scenario involved the disc stopping on one frame before the microprocessor engaged the next program dump, usually at the end of the introductory film. After repeated unsuccessful attempts to engage the program on different players the disc would immediately work after it was polished with a cloth. We were not able to duplicate the problem with our own fingerprints and only certain students had this happen more than once, leaving the suspicion with the research team that certain brands of peanut butter may be laser proof. After asking all the students to hold the discs by the edges as one handles a phonograph record, these problems ceased.

Problems with the Videodisc System

As noted in Chapter Four, the greatest problem area con-
cerned the buttons on the Remote Control Unit (Table 7). A redesign of button tension should alleviate a lot of these problems. Two teachers in the study stated that a slight built in click would enable one to know when a button had been engaged. Throughout the study the connecting wire between the RCU and the player was used because of problems experienced without this in the first field test. The other most predominant problem with the machine was the unlock/lock mechanism of the videodisc player (Table 6). Again, as with the RCU, this is a problem to be remedied by manufacturers. The fact that 56% of the uses in the study had a problem with the program or the controls suggests that the system needs improvement before use should be re-evaluated.

Teacher Reactions and Opinions

Teacher ratings were consistently positive throughout their evaluation; however, two areas were noted by all teachers for some improvement. The manual was considered too difficult for the students to use successfully although the teachers found it helpful and used the manual to plan lessons. Every teacher also commented on the button control and stated that it should be improved. Teacher comments praised the versatility and storage capabilities of the videodisc and felt it was better than using film, filmstrips, slides, and videotapes.

Student Reactions and Opinions

Student evaluation of videodiscs and the videodisc system was consistently positive. Two improvements suggested by the
students would be the addition of 'live hearts' and 'live material' in the disc and the use of a game or games as part of the videodisc. The most commented on item was concerning the students' enjoyment of the interactive tests. There were also six negative comments about the 'Things to Do' section of the videodisc, a statement of how they were used as much as a statement of the design. Unfortunately, even though the 'Things to Do' were designed as hands on activities, they were frequently used as reading exercises. The introduction of some interaction or games in this section or, as one student commented, "more pictures and less reading" would improve the 'Things to Do' section.

Videodisc Manual

The manual was not used at all by over 75% of the students in the study. The teachers did not feel that the manual was appropriate for student use. If a manual is desired for the students a new one will have to be designed. For teacher use the manual was found to be helpful for lesson planning and unit planning. The existing manual should be kept for teacher use and a new simplified manual for student use should be developed. An example of the sophistication of material used with the students by the teachers towards the end of the study is contained in Appendix F.

Notes for Future Disc Development

Several points emerged from this study concerning future development of videodiscs. The versatility and interactive
characteristics of the discs were cited as the main benefits by the teachers. The use of more interactive tests and games throughout with different levels of difficulty would be a logical next step in future discs. As the disc is a storage vehicle for information, the inclusion of an alphabetical index cross referenced to frame numbers at the end of the disc would make information access in the manual mode more effective.

The Simon Fraser University videodisc used a book format. Basically, the initial menu showed six sections (chapters) which the user could access. In each of these sections there was a film, a test, a list of Things to Do, and a return to menu. The assumption by the developing team was that this format would be readily understood and easily followed. This was true for adults; however, many students had difficulty in conceiving of this format. For some students a 'map' was drawn to explain this and help them find their way. Simplified instruction sheets were made by the research team (Appendix E) but should have been included on the videodisc, the manual, and perhaps even on the videodisc dust jacket as well as a section on trouble shooting. Designers must remember that many people are not able to use tape recorders and film projectors. With this in mind it seems imperative that the videodiscs and videodisc systems should be as easy and simple to use as possible if wide acceptance is desired.

Even though emphasis was placed on teachers using the manual mode and automatic mode throughout the inservice, the use
of manual programming did not occur during the study. The automatic mode was used exclusively although the teachers stated they would use the manual mode in the future. This will need to be evaluated in the next study as it has many implications for designers. To use the manual mode takes practice, a thorough knowledge of the disc contents, and a fairly large amount of preparation and programming time.

Designers must also remember that most teachers and classes will probably not have the machine access to allow totally individualized use. Our disc contained many hours of use and activities. If it has been used individually by the students we would have required twice the number of machines for a whole year. A designer must design for the greatest potential yet remember that the actual use may be far from the ideal at this stage in videodisc development.

In conclusion, the staff and students at Rochester Elementary felt positive towards the videodisc system and the "How Your Heart and Circulatory System Works" videodisc. The staff felt it was a versatile learning media. Most of the problems that occurred could be remedied by changes in the videodisc player unlock/lock mechanism and the buttons on the Remote Control Unit. The next study should include simplified task sheets, simplified directions for the videodisc system, directions for the proper care of the videodiscs, and a trouble shooting guide. These may be incorporated into a disc as an introduction to the disc so that users could refer back as necessary.

What we need is more quality interactive software; (Kemph,
Future discs could include such things as games that teach the user how to use the disc, troubleshooting tips at likely places, and exits from each part of a menu to return to the main menu. Print material should be used as visual reinforcement but shouldn't be predominant. It is the ability to mix sound, still pictures, films, and print that gives teaching versatility by appealing to different learning styles that makes the videodisc such a powerful teaching tool.

Ideally, teachers should be able to program their own material; however, in our study, dedicated teachers who worked long hours did not have the time required to make their own programs. The principal's statement that "good teachers don't have time to develop curriculum because they already have more than a full time job" may have serious implications for the future design of interactive software. This question begs further study at the earliest possible time.

Ninety four percent of the students involved in our study felt they had learned a lot from the videodisc. Many unsolicited comments were made by students praising their first videodisc encounter. The material from this study will give the future designers and implementors of videodisc systems in school settings some reference points to start from.

Conclusions

1. To provide inservice for the Heart Unit of the Coquitlam Active Health Program, three to four hours spread out over more
than one session seems necessary to cover the material and to deal with the complexity of the subject matter. The author is of the opinion that the inservice sessions should involve active participation in the activities in the unit.

2. To provide teacher inservice for the use of videodisc systems such as the Discovision 7820, three to four hours spread out over more than one session is necessary. Each teacher should also have access to a machine for at least half of the inservice time to allow sufficient practice to achieve the quality of use necessary to use the system with students.

3. To teach a class of students to use the 7820 videodisc system, four sessions of one hour duration with three machines to practice on is not enough time to allow trouble free use for the students. Either more machines or more time to allow for more individual practice should improve the student's ability to use the system without frequent program and mechanical problems.

4. In the observation of use, several conclusions can be made. The manual program mode was not used by teachers or students because it was too difficult and time consuming for both groups. The effective group size for student use was five or less students per videodisc system. Instructional use with the Discovision 7820 was awkward because of the mechanical problems encountered in the study; the button tension and the lock mechanism could be redesigned to alleviate many mechanical problems. Videodiscs should be handled carefully by the edges and treated as one would treat a phonograph record. The surface
of the videodisc should be kept clean and as scratch free as possible. Trouble shooting and instructional material should be made easily accessible to users and could be included on the videodisc. Design of videodiscs should ideally allow the user to pick and choose the type of audiovisual format they feel is best.

5. Student and teacher reaction and opinion were positive towards the videodisc and videodisc system. The students thought the most popular parts of the Active Health and the Heart Videodisc were the interactive tests in each chapter; print materials were the least popular.

6. The Heart Videodisc Manual was too complex and detailed for student use. The manual was appropriate for teacher lesson and unit planning.

Notes for Future Study

The study has determined some of the ways interactive videodiscs can be used. Further studies are needed to investigate the following questions.

1. Can videodisc systems and discs be simplified to enable mechanical and program problem free use?
2. Will teachers use the manual mode or make manual programs if they are given a choice between manual and automatic?
3. Are pre-programmed discs desirable as opposed to discs that must be programmed?
4. Is there an effect on learning if the system is used by small groups rather than individuals?
5. Should the disc be oriented to the more selective time use found in the second part of this study or left open to user discretion?

6. Does videodisc design predetermine the type of use; if so to what degree does this affect acceptance and usage?

7. Are certain formats, such as the chapter format of the Active Health and the Heart videodisc, easier or more effective than other formats?

8. What are the optimal balances of material on an instructional videodisc between film, print, slides, activities, tests, sounds, and combinations of these.

9. Does the mixture of media forms (e.g. sound, print and film) have a beneficial or a negative effect on learning if it can be controlled by the individual through interaction with the media?
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APPENDIX A

ROCHESTER PROJECT '82

Time: Auto. ________ Page ________ Date ________
Man. ________ Tape ________ Student ________
Total ________ Machine ________ Division ________

Mechanics - Starting the Player
- Loading
- Playing the Disc
- Stopping the Disc
- Removing the Disc

Operations - Using Search
- Using Freeze Frame
- Using Slow Motion Forward ____ Rev. ____
- Using Step Forward _________ Rev. ____
- Using Reject
- Using Play

Difficulties - Finding a button (over 3 sec.)
- Pushing incorrect button:
  automatic
  manual
  programming

Teacher ________________________________

Program | Type | Time
--- | --- | ---
Chapter 1 | 2 | 3 | 4 | 5 | 6
Film | 1 | 2 | 3 | 4 | 5 | 6
Things to do | 1 | 2 | 3 | 4 | 5 | 6
Test | 1 | 2 | 3 | 4 | 5 | 6
APPENDIX B

ROCHESTER '82 Division ___

Active Health & The Heart
(Students)

Please answer the following as honestly as possible. This will help in the future development of video-disc.

1. How many times did you watch the videodisc machine with the Heart Videodisc?

___________________________________________________________________________

2. How many of these times did you use the controls or get to push buttons?

___________________________________________________________________________

3. How many times did you use the Manual?

___________________________________________________________________________

4. How easy were the following parts for you?
   (circle the best one)
   Loading the Player.......1  2  3  4  5
   Starting the Player.......1  2  3  4  5
   Playing the Disc.........1  2  3  4  5
   Removing the Disc.......1  2  3  4  5
   Finding:
     Table of Contents.......1  2  3  4  5
     Chapter Decision Frame .1  2  3  4  5
     Things to Do............1  2  3  4  5
     Test......................1  2  3  4  5
     Using Automatic Mode....1  2  3  4  5
     Making Programs.........1  2  3  4  5

5. Did you have any 'trouble' operating the Videodisc machine?
   Yes ________________ No ________________

6. If yes, explain what: ____________________________
APPENDIX B

6. Please circle the best one to show how you like/disliked the following.


The Active Health Heart Disc...1
Videodisc Machine...............1
The Films.........................1
The Things to do.................1
The Test...........................1

Is there anything else you liked or disliked? ________________________________

_______________________________________________________________________

Comments: _______________________________________________________________________

_______________________________________________________________________

7. Did you like any parts better than others? Yes____ No____

Which parts? Why? _________________________________________________________

_______________________________________________________________________

8. What would you liked to have seen more of in the Heart Disc?

_______________________________________________________________________

_______________________________________________________________________

9. What would you change if you could on the Heart Disc?

_______________________________________________________________________

_______________________________________________________________________

10. Did you learn a lot from the Videodisc? Yes____ No____
APPENDIX C

ROCHESTER PROJECT '82

Teachers Questionnaire

Please answer the following using your first reaction.

1. Technical Aspects

How at ease do you feel about using the following functions and operations?

1. Very Uncomfortable  2. Uncomfortable
3. Indifferent          4. Comfortable
5. Very Comfortable

Starting the Player......1  2  3  4  5
Loading the Player.......1  2  3  4  5
Playing the Disc........1  2  3  4  5
Removing the Disc.......1  2  3  4  5

Finding what you want:

Table of Contents.......1  2  3  4  5
Chapter Decision Frame 1  2  3  4  5
Things to do............1  2  3  4  5
Test....................1  2  3  4  5

Using Automatic Mode....1  2  3  4  5
Using Manual Mode.......1  2  3  4  5
Making Programs.........1  2  3  4  5
Using the Manual(yourself)1  2  3  4  5
Using the Manual(your students)......1  2  3  4  5

2. Please rate the disc as follows:


Technically

Film....................1  2  3  4  5
Slides.................1  2  3  4  5
Things to do.........1  2  3  4  5
Print...................1  2  3  4  5
### Test

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### Material Contents

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### Instructional Value (overall)

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### Disc Program

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</table>
APPENDIX C

Instruction Manual

For Teachers ............ 1 2 3 4 5
For Students............... 1 2 3 4 5

Comments: (see last question)

What size group did you use with your class? ______
What size do you think would be most effective? ______
Did you make your own programs for your students?
   Yes ___________    No ___________
If yes, how often? ________________________________
Comment on effectiveness: ________________________________

Did you feel comfortable with videodisc technology:
before the inservice? ________________________________
when you started with the students? ________________________________
now? ________________________________

Inservice Heart Unit

Please comment on length, effectiveness, and quality.
What would you recommend to improve this?

Inservice Video Disc

Please comment on length, effectiveness, and quality.
What would you recommend to improve this?
APPENDIX C

How do you feel about videodiscs; their use and effectiveness for you as a teacher?

__________________________________________________________________________________

__________________________________________________________________________________

How would you improve the Heart Disc/ future discs?

__________________________________________________________________________________

__________________________________________________________________________________

How would you improve the Videodisc Machines?

__________________________________________________________________________________

__________________________________________________________________________________

What changes would you make to your program you did with your students?

__________________________________________________________________________________

__________________________________________________________________________________

What suggestions/recommendations would you make to a teacher starting an Active Health Program using Videodics?

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________

General Comments:

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________

__________________________________________________________________________________
APPENDIX C

In your opinion, how good do you think the videodisc machine is as a learning system compared to other audio-visual materials?

__________________________________________

__________________________________________

Did you use the manual: Yourself? ____________

With your students? _________________

What was useful in the manual? _______________

__________________________________________

__________________________________________

What was not useful in the manual? ______________

__________________________________________

__________________________________________

What changes would you make in the manual? ________
APPENDIX D

STUDENT POSTTEST

VIDEO DISC PLAYER OPERATION

Complete the following on your Remote Control Unit.

(1) FRM DSP
(2) SCAN FWD
(3) SCAN REV
(4) STEP FWD three frames
(5) STEP REV three frames
(6) SLOW FWD
(7) SLOW REV
(8) STOP

(9) PROGRAM
(10) 1000 SEARCH
(11) 1100 AUTO STOP
(12) HALT
(13) END
(14) RUN
PLAYING THE DISC

Using the Player Unit Controls

Press PLAY

Press STOP

Press REJECT

Press COVER OPEN

Pull UNLOCK RING

Other Controls

Audio 1 & 2

The disc can have separate sound tracks or operate with stereo sound. (e.g. Track 1 can be English, Track 2 French).

Autostop

By pressing a frame number then Autostop the player will play until the frame then stops automatically (e.g. the command 2250 Autostop will play the disc until frame 2250 where it will stop).

Frm Dsp

(Frame Display) Pushing this will display the frame number on the screen the display is removed by pushing the button again.
APPENDIX E

Scan (Fwd or Rev forward or reverse). By pushing this button one can scan the disc rapidly to find a specific section.

Search By pressing a frame number then Search the machine will immediately take you to that frame and freeze (press play to continue).

Slow By pressing FWD or REV the machine will play in slow motion. If a frame number and Slow Fwd is pressed (2500 Slow Fwd) the machine will play in slow motion until frame 2500.

Step By pressing STEP, FWD or REV the machine will move forward or reverse one frame.

STARTING THE PLAYER

Press POWER Blue button on left of Player. If the green light doesn't come on return to SETUP and check power cord.

Press COVER OPEN White button extreme left of player unit. Green light should come on and unit won't open during operation.

Place DISC over spindle (side you wish to view up) you may have to lift unlock ring.

Lock DISC onto spindle by squeezing lock tabs.

Close COVER of disc player.
APPENDIX E

Stops player and returns disc to starting position

Displays the frame number on upper left corner of TV screen

Tells player to stop on a given frame number

Tells player to automatically stop on a given frame number

Stops playing videodisc on a particular frame

Starts playing videodisc

A rapid way of moving forward or backward

Shows motion scenes in slow motion. May run forward or backward

Plays one frame at a time - forward or backward

REMOTE CONTROL UNIT
APPENDIX F

CHAPTER 3

Machine on, "PLAY"

1) SELECT CHAPTER "3" - MONITORING YOUR HEART RATE

2) VIEW "FILM" THEN RETURN TO CHAPTER 3 INDEX

3) PRESS "2" - THINGS TO DO

4) SELECT TOPIC # "1" then
    # "2" then
    # "3" then
    # "4" then
    # "5" then
    # "6" then RETURN TO CHAPTER 3 INDEX

5) PRESS "3" - TEST
   DO TEST AND RECORD IN NOTEBOOK
   CLOSE UP MACHINE