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THE TEACHER-INTERACTIVE VIDEODISC INTERFACE:

EXPLICATING THE DYNAMIC

by

Jonathan Everett Oleson

A Dissertation Submitted to the Faculty of the

DEPARTMENT OF EDUCATIONAL ADMINISTRATION

In Partial Fulfillment of the Requirements
For the Degree of

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In the Graduate College

THE UNIVERSITY OF ARIZONA

1995
As members of the Final Examination Committee, we certify that we have read the dissertation prepared by Jonathan Everett Oleson entitled The Teacher-Interactive Videodisc Interface: Explicating the Dynamic and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy.

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Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copy of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

Dissertation Director

Donal M. Sacken
STATEMENT BY AUTHOR

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SIGNED: Jonathan Elliston
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Soli Deo Gloria.
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ABSTRACT

As educators plan for utilization of new technologies which hold promise for improving student learning experiences, they must understand how to assist classroom teachers in efficaciously approaching their use. Twenty nine of a randomly chosen pool of 100 grades 3-12 classroom teachers from a large north central United States school district were exposed as novices to Interactive Videodisc (IVD) and their experience with this relatively new technology examined. Responses to IVD use and background variables were compared in an effort to isolate predictive factors of teachers who are more prone to experience a positive initial interface with IVD. Subjects experienced an IVD multicultural lesson either in a small group or in relative isolation. Qualitative and quantitative data are presented which show teacher/subject responses to IVD as an instructional/learning medium. Although a generally favorable response to IVD was demonstrated, stronger positive experiences were reported by those who initially used IVD with a small group of colleagues than those who worked alone. Comfort level indicators (criterion variables) in novice use of IVD are found to correlate significantly to eight predictor variables through a multiple regression analysis.
CHAPTER I

There seems little question that information processing and transmission technology in the United States is not a passing phenomenon, but an enduring fact. Indeed, its growth in capability and use appears to be expanding at an incredibly fast rate, one that is not likely to slow down for some time. It is thus incumbent upon educators to understand the role of technology in our society (an endeavor filled with numerous, diverse dynamics), to utilize it to our best advantage in educational settings, and to help students best use it.

One of the phenomena associated with the use of information processing technologies, such as the microcomputer, is the response which users and potential users display toward them. There tends to be three segments in the general population: 1) those who respond to proposed use of such technologies with apparent aversion, 2) those who seem to be naturally attracted to them and go on to use them rather effortlessly, and 3) a portion of the populace who fall somewhere in between (Langlee, 1989). Conversations with people
in a wide array of organizations such as education and business would suggest that there are currently large numbers of people who, when confronted with the opportunity or directive to utilize information processing technologies, would move toward one or the other end of the aversion-attraction continuum depending on a number of environmental and implementation variables. Since information processing technologies in schools are expanding in numbers, type, and frequency of use, it is important for the school administrator to be aware that educators are likely to fall into one of the groups delineated above, and that policy development and implementation of technology use must accommodate such diverse groupings. Consideration of, and strategizing a response to, a number of issues could lead ultimately to more successful implementation. What kind of support system do people need whose initial response is to avoid use of the technology? How does one locate those who are naturally inclined to use technology and who are able to bring others into its successful use? At what point does one decide that an individual is too resistant and therefore most appropriately utilized in settings which operate well without the use of an information processing technology?

There is a wide range of technologies currently or ostensibly
useful in K-12 schools. One of the newest, with considerable potential for use in a variety of educational settings, is interactive videodisc (IVD). It combines microcomputer and laser disc technologies so that the user can quickly retrieve and work with a wide range of motion and still pictures, graphics and sound. A single laser disc can store tremendous amounts of such information. Modern compact discs (CD's) are beginning to replace the larger LP record size disc of early IVD technology and can store the equivalent of an entire encyclopedia set. In terms of efficiency, perhaps the greatest value of laser disc technology is the opportunity to very quickly and precisely move to, and retrieve, specific information.

The IVD industry refers to three levels of interactivity. Level I is minimally interactive, and typically would be used in education for efficient storage of films and other audiovisuals. This low level of sophistication captures the baseline features of IVDs: very high resolution of pictures, professional quality sound, and a practically indestructible nature. Levels II and III offer increasingly greater opportunities for the user to interact with information; the nature and level of interactivity is virtually limitless, matched to the creativity utilized in programming courseware. Story boards can be produced during disc programming on an "if-then" basis, for example.
The user can be presented with information for use in decision making. A variety of decision trees can be programmed such that decisions narrow future options in a realistic manner. A particular value to these higher levels of interactivity is that still or motion pictures can simulate real life scenes as though the student were actually there. Problem scenarios can be realistically portrayed and the courseware programmed to permit students to follow the implications of their decisions.

Conceptually, there is great potential for using IVDs in K-12 educational settings. Pollard (1992) notes that the increased supply of IVD programs and the increased push to integrate technology within the public school curriculum, "compels the educational community to examine the components and effects of interactive videodisc technology." (p. 189) Recent, extensive emphasis on expecting the achievement of higher order thinking skills in our nation's students call for varied instructional/learning approaches; Hansen (1990) contends that technologies such as IVD need to become more prevalent as more responsibility is placed on the learner and the role of the teacher shifts to a greater emphasis on facilitation of the student's attainment of these skills. Extensive use of this technology is likely to occur as hardware costs diminish.
and more educators become accustomed to its use. The imminence
of such activity is reflected in a recent Texas Textbook Committee's
unanimous recommendation that the state consider adopting an IVD-
based elementary science curriculum in lieu of the traditional
textbook. (Update, 1990) Preservice colleges of education can help
provide experience with IVD, as well as strategies for instructional
uses. To reap the benefits of such technology, individual school
districts will, in all probability, need to reconceptualize the
teaching/learning process and go well beyond the typical
instructional materials adoptions (traditionally a review only of
textbooks). They will need to encourage staff to explore the
potential of electronic instructional technologies, to provide time to
align the growing body of IVD courseware with traditional
curriculum, and to provide time for teachers to develop skills and
actually program customized use of level I IVD through the
microcomputer software already available to manipulate the content
of commercially prepared interactive videodiscs.

Although there has been greater activity recently in
educational settings, there remains a greater tendency toward IVD
use, and research of that use, in non-educational settings. Bosco's
(1986) purportedly comprehensive meta-analysis of IVD use included
only eight school settings among the 28 reports analyzed. Although there is a growing research literature base from which to study IVD use in educational settings, research findings in other contexts can be extrapolated usefully for understanding IVD applications with teachers in K-12 schools. The United States military has been a major IVD developer in its efforts to seek more efficient and/or more effective training strategies. Hosie (1987) reports that "IV[D] has been selected by the U.S. Department of Defense as its future training delivery medium" (p. 5) (see also Bosco and Wagner (1988) and Ross (1988)). Corporations have also delved into IVD use and, to a lesser degree, research. Hosie (1987) argues that the most immediate corporate use for IVD is in sales and marketing, but major corporations such as Ford, General Motors, and Sears are also using the system for training and sales (see also Bosco and Wagner (1988) and May (1984)).

Some research on uses of IVD in noneducational settings helps to clarify the current state of the art and may well offer insight into use in educational environments. For example, Ross (1988) indicates that "experts claim the computer-based training and interactive video can cut training time in half" (p.18). There are other indications that IVD can lead to more efficient use of time. A
study of engineers by May (1984) used a control group of 48 and a
treatment group of 51. The average time needed to complete the IVD
courses was 23.1 percent to 46.5 percent less than a self-paced
instruction program. As most young people will change jobs about
four times during their vocational lifetimes (Ross, 1988), training
and retraining become a significant factor in business settings.
Helping students become familiar with technologies such as IVD in
K-12 and post-secondary schools can be seen then as a logical
component of the public's expectation of education.

Current School Usage

School usage of this technology is inhibited by budget
problems and what might be perceived as slower response to
innovation brought on by the bureaucratic, legislation-dependent
financing problems often faced by public institutions. Nonetheless,
there are examples of IVD use in K-12 educational settings. Phillipo
and McCarty (1989) report uses in science classes in a variety of
middle school/elementary schools. Doulton (1984) also discusses
secondary science classes in which experiments simulated through
the IVD medium were reported to provide a number of benefits such
as improved standards of laboratory work, a "greater range of
exploration" for talented students and reduction in the time necessary to set up traditional experiments (p.7). Williams (1984) found IVD could augment or replace summer school laboratory sessions at residential summer schools. An Australian developmental project utilized IVD in teaching weather forecasting and geography (Teh and Perry, 1984). Peterson, Hofmeister, and Lubke (1988) found in their study that the Core Concepts Mathematics Program courseware produced by Systems Impact, Inc. (which teaches fractions, decimals, and word problems) increased instructional productivity without requiring a massive reorganization of the classroom and helped teachers increase the level of personalization of their involvement with students. Bank Street College has used the IVD medium to simulate time-leap, realistic travel experience for young learners (see for example "The Voyage of the Mimi"). Pollard (1992) notes studies found positive results from the use of IVD in high school Spanish and elementary fractions classes. (For additional literature on educational applications of IVD, see also Chang (1991), Leonard (1989 and 1992), Ross (1988 and 1991), and Woodward and Gersten (1992).)

Efforts to determine how IVD affects the instruction/learning process will ultimately be needed to best determine its appropriate
use in K-12 classrooms. Smith's (1989) work illustrates how diasaggregated components of the learning process can be researched to develop a necessary IVD-in-education research base. He developed a series of studies to investigate location and duration of forced pauses, type and amount of learner control, type of guided processing to enhance comprehension, and learner perceptions of the material and its presentation. The complexity of the learning dynamic was brought to bear in his discussion of findings. He notes that providing self-pacing through periodic stops in the courseware does not guarantee better learner processing of content; it does, however, permit engaged learners to utilize the pause effectively and forced-pause groups in his study did score higher in all of the five experiments except one (two of the four were not significantly different). Although not determined through Smith's experimental design, the nature of IVD visual and auditory cues or written prompts on accompanying handouts and the nature of the teacher-student-classroom milieu also need to be studied to determine their impact on the effectiveness of pauses.

The degree to which educators are aware of IVD, have access to its use in their classrooms and how they respond to IVD has received some recent investigative attention. A survey of 55
teachers from the Binghamton City School District in New York (Green, 1993) found that only 18 percent of respondents had "ever used a laser video disk to show pictures and/or short video clips" (p. 13). Of the 82 percent who hadn't, 36 percent indicated they didn't know about the technology and 27 percent reported that they either didn't have access to the equipment or to appropriate media (courseware). Janowiak (1990) reports on a more comprehensive survey of 498 (14 percent response rate) elementary and secondary teachers by the National Engineering Consortium (NEC) to determine which educational technologies were used and valued by teachers. In ranking use of 24 technology tools, "video disk/compact disks (interactive)" ranked 20th and received an average use score of 1.44 ("used a great deal" equaled four, "not used" equaled one). Comparing this data to the ranking of the three most used technologies shows disparate use: micro/personal computers averaged 3.77, overhead projector averaged 3.48 and video cassette recorder, 3.36.

That IVD technology has generated considerable interest among classroom teachers is evident, however, in two other variables studied by NEC. The average value assigned to IVD in the survey was 2.98 ("extremely valuable" equaled 4, "not valuable" equalled 1) and IVD was ranked 14th out of the 24 educational technologies
evaluated. The top three technologies based on value paralleled the usage rankings: micro/personal computers (3.86), overhead projectors (3.62), video cassette recorders (3.50). When responding teachers indicated which educational tools were "most promising" for continued usage, video disk/compact disk ranked second only to micro/personal computers with videodiscs rated most promising by 26 percent of respondents and microcomputers accounting for 50 percent; the remaining 22 technologies rankings dropped rapidly. The NEC study also invited comment from respondents about how they viewed IVD; samples included "Once it's widely linked to computers (interaction video) its power will be awesome", "Interactive video and computers---very visual and controlled. Most learners are visual learners" (Janowiak, 1990 p. 14).

An eagerness to explore or actually use IVD was also found in a study of students and professors in a Dallas community college but this study (Olson et al, 1992) also revealed skepticism as to how realistic IVD use might be. Of the 15 faculty in the study, 84 percent thought the humanities IVD system they saw demonstrated looked easy to use, but only 26 percent considered it affordable. While humanities students' and professors' responses to IVD were "overwhelmingly" positive, the interest level and variation in
materials covered were reported to have an important impact on attitudes toward IVD.

Efforts to implement new technologies such as IVD in K-12 schools vary in intensity, scope and nature. One of the most comprehensive efforts, including but not limited to IVD, is occurring in Texas, which adopts texts and curriculum on a statewide basis. There, the Texas Board of Education has submitted a comprehensive proposal to the Texas legislature for anticipated educational technology needs into the year 2000. The proposal requests $16.65 million for the first phase alone (1988-89 through 1991-92) and has been described as a potential model for other states to follow (Goodspeed, 1989). Some of the specific items in their Long Range Plan for Technology call for the establishment of technology preview centers, research on the effects of technology on teaching and learning, training, and a minimum of $50 per student per year for the purchase of hardware, courseware and facility modification. Such a substantial infusion of state money would certainly expand use of IVD and could encourage effective or efficient development of the technology's educative potential.
Potential of IVD

Conceptually, and to a degree as realized in current practice, there is tremendous potential for use of IVD by K-12 educators. It can go beyond the currently developed and widely used microcomputer programs which provides tutored drill and practice assistance, by adding high quality resolution of pictures, moving or still; it can incorporate the virtually perfect reproduction of the sound quality of CD's, currently enjoying rapid growth in the music industry; it adds precision and removes the lag time of access to a retrieval time of "about 3 seconds or less" (Phillipo, 1989, p. 42). In short, it combines the strengths of state-of-the-art visual and audio technologies and thereby can provide for more realistic opportunities to simulate the real world for which K-12 education strives to prepare students. This capacity would permit IVD courseware to simulate dangerous scientific laboratory experiments without danger, or personalized, private learning opportunities on sexuality education, dysfunctional family counseling, and other sensitive issues without interaction with others if a student prefers. With proper courseware development, IVD has the potential of assisting teachers help students develop problem solving and other higher order thinking skills (Hansen, 1990). IVD also permits
rich opportunities for supplemental help for different learning styles in small group or individual learning settings. Peterson, Hofmeister and Lubke (1988) believe teacher time to work individually with students will be more available when IVD is used.

**Dissenting Voices**

There are problems as well as promise for this instructional medium. It is probable that a high degree of human interaction is a necessary component of human development and that use of information technologies can never become so sophisticated as to totally replace a human teacher. Teachers tend to criticize technology when it removes the human element from the learning process (Hasselbring, 1986). Then, there are the more mundane issues of currently high costs of purchasing a new technology hardware, and the fact that the IVD, once pressed, is uneditable. It is, in other words, important to keep the educational value of IVD in perspective.

More serious problems stem from some examinations of the pedagogical value of IVD. Clark (1989) suggests that the "best current answers to many questions [about the use of newer media] are often 'counter-intuitive'." (p. 113) He outlines six major areas
of disagreement raised in discussions as new media are introduced to the teaching profession: 1) Does videodisc promote learning better than the traditional mediums of teachers and books?, 2) Does the visual nature of videodisc promote creative thinking?, 3) Do the more realistic portrayals of IVD improve learning?, 4) Does IVD motivate more than do more traditional media?, 5) Does IVD increase freedom of choice for students? and 6) Does IVD reduce costs for some types of education and students? He concludes that researchers have often not examined these issues carefully enough. For example, while acknowledging that there is dramatic evidence that media, such as television, can increase student learning an average of 20 percent over "more traditional means of teaching" (Clark, 1989, p. 114), the increase may have occurred due to factors which accompany the introduction of such media: curriculum reforms, increased investment of resources in designing lessons, and preparing students for the new media (see also Cuban, 1986). On another issue Clark argues that the visual imagery potential of newer media may make little, if any, difference on the ability of learners to think creatively, especially if they don't happen to be visual learners; analogies and metaphors, he contends, could be more comprehensively included in books with similar results.
What this discussion may ultimately lead to may well be that the dynamics involved in any means/medium used in the complex instruction/learning process may hinge more on content design than on the medium itself. Levin and Meister (1985) suggest that the alleged "generic failure of educational technologies has been due largely to a misplaced obsession with hardware and neglect of the software, other resources, and instructional settings that are necessary to successful implementation" (p. 9). The degree to which a person, initially enamored with a new educational technology, loses interest or becomes disenchanted with it may well be due to the often arduous work necessary to customize education vendor-developed generic courseware to their previously developed lesson plans or for even more energy and time consuming efforts to develop original curriculum plans which utilize the courseware.

**Bringing Teachers and Technology Together**

Perhaps some of these concerns provide background to an apparent reluctance by many in the teaching profession to use technologies such as the microcomputer or IVD, either personally or in their classrooms. Perhaps teachers have intuitively understood that technologies have not met the fanfared expectation of past
introductions and are not likely to do so for IVD or the next iteration of "new technology" either. Cuban (1986) has chronicled the introductions of technologies as far back as the radio and observes that each new generation of heralded instructional machine made some change in the delivery of education, but never approximated the extent anticipated by early advocates. For example, Thomas Edison predicted in 1913 that books will soon be obsolete in the schools (Saettler, 1968). Later, in 1922, Edison said he believed that the "education of the future...will be conducted through the medium of the motion picture...where it should be possible to obtain one hundred percent efficiency" (Cuban, 1986, p.9), as opposed to the two percent average efficiency he credited to the textbooks written in that day. Realizing a person as revered as Edison could be such an inaccurate prophet provides a sobering backdrop to current introductions of the newer generation technologies herein discussed (in fairness to Mr. Edison, his prophesies may well have been more accurate if he'd had the opportunity to administer his own ideas).

The researcher's personal experience in a junior high school setting has generated observations about problems that can occur when technologies such as microcomputers are introduced into school settings. The literature review in chapter two will note a
more generalized existance of such phenomena. A typical scenario evolved when microcomputer labs were introduced into the district's 25 elementary and secondary schools (Langlee, 1989): Labs were used by only a minority of teachers as instructional components of their teaching day. Such use seldom occurred among teachers who were not personally familiar with a microcomputer. Once an avante guard group began to use them for word processing, grade management as well as some commercially prepared software with their students, they often encouraged colleagues to try similar usage; a few did, some experimented and "dropped out" and some expressed no inclination to even try.

Why would such a scenario occur? Does the social isolation attributed to the K-12 teaching profession result in fewer risk takers? Is the opportunity for personal interaction in a lounge or hallway an inadequate support system for the rather significant personal changes called for when initiating a new instructional methodology? If the scenario is as typical as asserted here, these and other questions need to be addressed.

The Role of the School Administrator

Guiding educational systems through the study and potential
implementation of IVD as well as the ongoing assessment and modification of its use is a major undertaking. Policy and purchase decisions must reflect an awareness not only of the instructional potential of IVD, but also the complexity of bringing staff into effective, comfortable use of the medium. Administrators in K-12 settings are traditionally thrust into a key role in managing such a process. Even in situations where site based management redefines their overall role, administrators will be assigned, or need to assume, major responsibility for making pertinent decisions toward implementation of IVD use. Effective implementation of new technology and its incumbent organizational changes requires thoughtful, competent leadership.

Sergiovanni (1989) believes the transactional leadership style, which he describes as largely focusing on extrinsic motives and needs, "has run its course" (p. 215). He goes on to argue the necessity of transformational leadership that emphasize higher-order, more intrinsic needs; key concepts such as esteem, autonomy, self-actualization and empowerment need to be operationalized. An environment (or "culture", Sergiovanni, 1987) which is responsive to, and nurturing of, these human motivators best promotes intelligent planning and efficacy of organizational change. If
Research Questions

1. How do users of instructional technology in educational settings compare interactive videodisc as a learning opportunity relative to other means/media of learning?

   a. What aspects of IVD do users like?

   b. What aspects of IVD do users dislike?

2. Is there a relationship between past use of technologies, such as microcomputers and audio visual equipment, and comfort in using IVD?

3. Does social support provided during a novice's use of IVD increase the level of interest in using IVD on future occasions?

Assumptions

1. If a teacher is comfortable in using IVD technology, he or she is more likely to utilize it as an instructional device.
Efficacious use of new technologies like IVD are to be effectively implemented as an appropriate component of the instruction/learning process, educational leadership must understand the dynamics of the user/technology interface.

**Purpose**

The purpose of this study is to explore adult responses to use of IVD technology. It is expected that the study will shed light on issues that require attention when studying potential use, developing pertinent policy, and planning implementation of IVD instructional courseware into an extant or modified curriculum. Although the study does not purport to be a comprehensive look at such issues as delineated in the research questions below, it is intended as a broad focus that includes specific attention to considerations sometimes overlooked when educational policy makers and educational practitioners plan institutional and individual behavior changes.
2. If a teacher believes that IVD can effectively enhance learning, he or she is more likely to utilize it in instructional methodology.

3. There is a direct relationship between the way a person interfaces with a microcomputer and the way they interface with IVD.

4. As a group, teachers of K-12 students are relatively similar to other adults in their response to microcomputers and IVD technology.

Significance

The significance of this study lies in its objectives: to add specificity as to how persons respond to a very new technology and to provide essential information on how IVD could best be implemented in terms of increasing user success rates. An awareness of the educational potential of IVD has led to an increase in the number of school districts giving serious consideration to IVD utilization as an instructional aid or beginning to actually implement it. This study will isolate and study some of the issues
that will affect the teachers who would be asked to implement classroom use of IVD technology and provide information which would be valuable in planning successful implementation.

Limitations

Issues beyond those included in this research are important to the overall study and implementation of IVD as an instructional strategy, but go beyond the purview of this study. For example, in a broad organizational climate sense, there is much interest in the significance of developing ownership in institutional change by the staff/employees who would be expected to actually use/implement the change (Pierce, 1990). For practical reasons, only a manageable number of issues are dealt with in the research questions, and, although the qualitative and quantitative methodologies will attempt to obtain an understanding of the IVD-user interface, the study will not be able to carefully investigate each aspect that is uncovered. This research hopefully will identify issues which need further study without actually exhaustively examining them. There is also the phenomenon of the whole being greater than (or somehow
different from) the sum of the parts. Always the bane of researchers, the opportunity to really understand the multitude of dynamics occurring in a seemingly simple study never can be compressed into a matrix.

Furthermore, the population of this study is limited to students in a Summer Session I general psychology course taught by Dr. Eugene Grossman at the University of Minnesota-Duluth, between June 12 and July 14, 1989, in the first phase, and to a random sample of grades 3-12 classroom teachers from the Duluth (Minnesota) Public Schools during the spring and early summer of 1990 in the second phase.

**Definitions**

Courseware (Software)-
Programmed hard or floppy discs which establish parameters of programs for use with information processing hardware such as microcomputers and interactive videodisc machines.

Interactive Videodisc -
Information processing technology which incorporates the storage
capabilities of laser discs and the information manipulation capabilities of microcomputers.

Interactive Videodisc Laboratory -
As established in the Phase 1 setting of this study, 12 work stations in a remodeled university classroom. The stations included Digital Equipment Corporation IVIS (Interactive Video Information System) hardware. Phase 2 data was gathered in a seldom used adjunct to a teacher resource center available to all staff in the district in which the research took place.

Interactive -
The capability of users of hardware such as IVD to manipulate the hardware in such a manner as to make choices which effect changes in how courseware content is presented. Such manipulation in the laboratory hardware and courseware used in the study was achieved primarily through touching desired written options on the monitor screen and, to a lesser extent, by pressing keyboard keys.

Hardware -
The input, processing and output equipment or machines utilized to
operate "information age" programs; IVD hardware includes a microcomputer, monitor and laser disc drive capable of reading interactive videodiscs.

Laser Disc (Optical Disc)-
Discs similar in size and shape to long playing records (more recently in compact disc size) which are encoded through a laser beam process on a thin metallic film beneath a layer of glass or plastic. Once processed, they are virtually indestructible and "read" by a laser beam.

Microcomputer -
A small computer, used in homes, schools and businesses, with processing hardware that is based on a microprocessor.
CHAPTER 2

Understanding how teachers respond to IVD, and what factors go into shaping that response, is important primarily in two arenas of interest to the school administrator and other educators. One is functional. Such an understanding will lead to better use of IVD in staff development efforts (determining when the technology is appropriate to use and how to utilize it for more teachers), and in fostering appropriate teacher utilization of this technology in classrooms. But understanding the nature of the teacher-IVO interface can also lay groundwork for a larger purpose. Shaping a more positive attitude among teachers toward IVD, and technology in general, can transfer to benefits for students in the classroom. That is to say, an educational technology will more likely be utilized in the classroom if the teacher has become familiar with its potential and has become comfortable using it on a personal basis. Modeling a willingness to try a new technology to determine how it can be appropriately used should then transfer to a student attitude that it is acceptable, even good, to explore "technology", to determine its potential, to use it appropriately. Technology will remain a dominant aspect of American society; teachers and students must
learn how to participate in its further development and implementation.

Broadly assumed in the research questions of this dissertation is that people respond to technology use from an attitudinal as well as an aptitudinal basis. There appears to be a bipolar response such that the general population can be arranged on a continuum delineating those who have an aversion to technology and those who are attracted to it. A literature search does not offer comprehensive, definitive guidance as to why people approach technology as they do. A number of themes do appear, however. Varying characteristics of individuals appear to be at the core of the explanation. Some, "hackers" for example, are obviously drawn to technologies such as IVD and thrive on their use. In fact, there is a possibility that computer addiction can develop in a manner similar to alcohol, drugs, cigarettes, sex, or work addictions. Professor Jack Dunham, a specialist in psychology and microtechnology at the University of Texas and an observer of the computer culture since 1960, has "no doubt at all" that such addiction occurs. (Lewis, 1988, p. F6) However, there are those at the other end of the technology aversion/attraction spectrum. Numerous scholars (Combs, 1985; Kopke, 1984; Hilty and Turnoff, 1978 and others) have isolated a
wide range of reasons potential users are leery of initiating microcomputer usage. If some individuals are drawn to computers to the point of addiction, why are others repelled to the point of what Licata (1984) calls computerphobia or microphobia?

The literature does not describe very extensively how teachers generally respond to IVD use, much less explicate the more restrictive staff development or K-12 classroom use context. This is not altogether surprising as the introduction of this technology is quite recent. Although there is a growing tendency for business and educational organizations to purchase and use IVD equipment and courseware, K-12 teacher exposure to IVD is not widespread. The following literature review therefore will attempt to cover a variety of issues from educational and non-educational literature, applying the non-educational context information to an educational context to the extent inference is appropriate. The literature review will include 1) the degree and nature of computer wariness, 2) effects on users generated by the hardware itself, 3) the role of limited or negative early experiences with information processing technology, 4) the impact of socialization changes brought about by IVD use, 5) potential origins of attitudes people have toward such technology, 6) how adult learning styles relate to technology use,
and, finally, 7) how the utility of IVD content and use by a teacher may affect their overall attitude and level of satisfaction with IVD. Because IVD is such a new technology, much of the literature reported will involve microcomputers. As IVD hardware incorporates a microcomputer and a monitor that are similar and often identical to those typically used within K-12 educational settings, and as an IVD user communicates with the interactive videodisc by interfacing with the microcomputer keyboard and/or touching the monitor, it is believed that the microcomputer literature will also reveal much about the IVD experience. The review of the literature, then, delves into a variety of microcomputer contexts, searching for information that can be used, to a degree, to make inferences about the probable teacher-IVD interaction. Among the contexts are business, the military, university and health communities, libraries, and K-12 schools.

The Computer Wary

Despite the fact that "technology" has shown its worth in many ways, there continues to be a reluctance on the part of many people to utilize it. This reaction can range from the person who would
wash dishes in a sink, rather than use the automatic dishwasher that came with an apartment, to using a pencil and paper or "the head" instead of a calculator, or to using a 1950's typewriter instead of a word processor or electric typewriter. What motivates people to change, or not to change, in various types of situations is certainly a complex phenomenon. Wilburn (1984) asserts "the human race has never been comfortable with change....We are especially suspicious when we confront technological change." (p. 2) Results of a Combs (1985) survey provide statistical data to illustrate the prevalence of negative feelings toward technology and to bring such information closer to the target population of this research effort. She found that only 24% of the 100 experienced elementary and secondary teachers surveyed felt comfortable in directing student use of the computer.

The Computer Per Se

The frequency and extent of discomfort with computer usage is revealed in a number of ways, some of them unusual and, potentially to some, humorous. The building housing the Computer Literacy Lab on the University of Cincinnati campus was built "deliberately
distant from the Computing Center and any unpleasant associations that location may evoke." (Kopke, 1984, p. 5) Kopke (1984) has, in fact, found that in giving workshops designed to build positive computer attitudes in university students and faculty, it is important to carefully conceal power lines and printer cables under the floor and in channels under the desks "to avoid displaying a tangle of wires which would make the equipment look frighteningly complex." (p. 5) The very power which makes a microcomputer so efficient may also explain why some people are afraid they might "break" it (Shykes, 1995); few people understand what makes a computer function and may assume it is delicate or that they could commit some act which would really "foul it up" and reveal their ignorance (Watt and Stefanov, 1984).

There is evidence to indicate that some negative reactions to microcomputer technology have physiological origins which are very real. For example, a recent study (Dow and Covert, 1990) suggests there also is a potential for changed social interactions resulting from a high-frequency, barely audible squeal which emanates from some video display monitors. The study indicates the pitches are probably not perceived by men, who do not hear as high a frequency range as do women. Although their study will need additional
iterations to clarify findings and to better explore its implications, there seems little doubt that responses to the physical and psychological interface from extended computer use can produce different degrees of stress, irritation, or similar outcomes which may well vary from one user to the next.

**Limited or Negative Experience**

Some resistance to using computers appears to stem from attitudes formed from limited, negative experience and/or stories based on a range of fact to fiction. Sackman (1970) reported a perception among many in his study that computers were unreliable and untrustworthy. Whether this perception is common some 20 years later was not revealed in the literature reviewed. A concern that a user could “break” a computer is another possible explanation for avoiding it. (Hilty and Turnoff, 1978; Shykes, 1995) Consciously or subconsciously held negative attitudes may also stem from bad experiences with the technology. Licata (1984) identifies stressors for some use experiences: destroyed files, idiosyncrasies which must be learned and overcome when using a particular software, inaccessibility, and deadlines. It is probable that no regular
computer user has escaped the trauma of losing data/information with a wrong key stroke or from power failure. Furthermore, a computer will process an error as efficiently, as quickly, as it carries out a command function such as computing pages of numbers; should such a mistake require tedious corrective work in a time pressure situation, a thought may logically surface that the "old way" might be better.

Can such negative experiences "turn off" some users so completely that they become computerphobic? Does such an attitude transfer to technology in general? For the most part, problems such as those just described might better be designated as "learning pains" or opportunity costs which are well worth desirable outcomes such as editing ease, processing speed, storage capacity, ease of retrieval, and other such benefits which accrue to microcomputer uses such as word processing or grade management. To the extent that a teacher needs guidance through negative learning experiences until benefits outweigh liabilities, it would seem logical that school administrators should develop and conduct careful training sessions and provide adequate support systems until school staff become comfortable in the use of the technology being introduced.
Socialization Changes

Another cause of negative attitudes may come more indirectly from changes in the social setting caused by the introduction or extensive use of a technology. Licata's (1984) studies uncovered occurrences of work place socialization problems such as isolation, and loss of team spirit and company loyalty, which appeared when office work became highly computerized. Some of these effects may result from work schedule changes, including increasing options to work from home where office interactions are essentially lost, or from rearrangements in office layouts which change worker proximity to other office personnel. Although this body of work focuses on office work settings, it suggests parallel dynamics could occur in school settings, including classrooms and computer labs. Would use of IVD significantly change how teachers interact with each other in staff development environs? How does IVD use in a classroom affect the teacher-student relationship? To the extent that IVD is used as an individualized instructional/learning tool, the amount of direct student/teacher interactions are reduced and may concomitantly reduce job satisfaction for teachers (Oleson, 1988). The work of Dow and Covert (1990) also suggests that for
some, increased use of microcomputers and their monitors may also cause increased user irritation levels. If the high frequency noise emanating from a monitor, as uncovered in their research, becomes a source of irritation to the user in an office or classroom setting, it could well be a causative factor in creating socialization tensions.

**Origins of Attitudes**

Understanding the origins of attitudes people have toward technology in general, or to a specific technology like microcomputers or IVD, would be helpful. Unfortunately the literature offers no quick assurance that this understanding can be easily accomplished. An article describing the work of the Soviet scholar, Oleg K. Tikhomirov (1984), has an intriguing title, "Psychological Structure of Man Computer Dialogue" but was not readily obtainable to discern the researcher's conclusions. Malde (1981) suggests a broad perspective that may set a framework for categories when he refers to people as predominantly "thing oriented" or "person oriented". Although teachers are commonly assumed to be people oriented, they certainly represent both categories. Are teachers as a group more prone to "technology
aversion" or "technology attraction" than other populations? If so, can an approach to introducing teachers to IVD be developed which either mitigates, or takes advantage of, their tendency?

A number of psychological factors are undoubtedly involved in forming attitudes of persons toward technologies like microcomputers or IVD. However, directly applicable literature is scarce. Licata (1984) has unearthed a number of plausible possibilities. In studying white collar use of management information systems, she extracted a number of factors which may suggest psychological explanations (a number of them paralleling earlier findings of Bruner, 1966; see next section) as to why people resist changes such as technology: 1) loss of control, 2) feelings of inadequacy (anxiety about abilities to use new technology), 3) fear of the unknown, 4) fear of the computer itself, 5) psychological habits, 6) isolation, and 7) a lack of identification with the change. A reflective look at this list suggests that some potential causes of resistance are probably more malleable than others in that some lend themselves more to adjustment initiated by outside intervention than do others. Being able to identify the degree to which any of Licata's list affects teacher response to technologies
such as the microcomputer and IVD would help guide their use in classroom and other educational situations.

Adult Learning

Other clues as to how teachers might respond to IVD and similar technology may be embedded in how the adult learns. Some of Bruner's (1966) classical studies about intrinsic motives are instructive. Those most pertinent to this discussion involve social interaction, degree of challenge, degree of control over learning situations, and the extent to which the task is perceived as intriguing. The first observation suggests the importance of social interaction, that people learn more when working together. As some use of technology often moves a person's major focus toward a machine, it can move one's focus away from people and thereby change the nature and quality of workplace social interactions. Bruner's work also posits the motivating value of having an obtainable challenge. The technology user's mind set and aptitude toward technology become major variables here: those who typically are eager to try out new ideas and devices, and who readily figure out "how things work", are prone to have an advantage over those
who are skeptical of new ideas and who seldom figure out how things work without another's assistance.

Another germane factor brought out by Bruner is that people enjoy exploring intriguing things, especially if they have some control over them; the "gee whiz" nature of rapidly developing information processing technologies seems to generate considerable awe and curiosity among the general population. Bruner's observation about the human need to have some control over one's environment poses a positive probability about the effect that IVD would likely have on teachers: the higher degree of interactivity associated with IVD, relative to other technologies typically associated with K-12 educational institutions, would suggest that teachers would respond better to this technology than those with little or no interactivity. As Copland (1992) notes, media is more effective when the learner has an opportunity to interact since people learn more when they participate than when they are passive. Hanson (1990) contends that "much of the most important learning takes place in social contexts and that therefore collaboration may be a more productive learning mode than individualization" (p. 20).

Some scholarly effort has attempted to apply knowledge about adult learning style directly to IVD. Pyatte (1987) believes adult
learners have special characteristics and learning preferences that will likely have an impact on how teachers respond to IVD. In his view, adults like to be actively involved, prefer a non-threatening climate, and respond well to learning experiences which are problem centered, practically based, and which tie in to their personal experiences. The capabilities of IVD, used in a staff development application for example, match well with each of these observations. The interactivity of IVD, if programed at level three, requires a high degree of user involvement. Although IVD's can be configured with a microcomputer to record user responses on a floppy disk, this technology certainly facilitates individual use in private settings if deemed appropriate. Thus, the non-threatening aspect can readily be built into IVD use. The remaining three components of Pyatte's recipe for effective adult learning environments vary according to the design and quality of IVD courseware programming. In other words, courseware can be created to require user solution development to posed problems (problem centered) which relate to typical classroom situations (practical/personal).

The issue of IVD courseware content, whether in staff development use or K-12 classroom use, has the potential of
affecting teacher satisfaction levels primarily in an indirect manner. The content design of the courseware used would have a positive or negative effect, by association, on how an individual responds to the technology as a medium. That is to say, a person is likely to overlook some detractors of technology use, and in fact, may not perceive them, if the strength of attractors such as good content are powerful enough. Quality of content design, then, becomes another variable intervening in the formation of attitudes and ultimately in how a teacher would respond to IVD technology.

**Utility**

Perhaps the most important criteria by which a teacher will evaluate IVD is its ultimate utility. In this sense, their satisfaction with IVD especially turns on how effectively it helps a teacher teach and a student learn in a classroom setting, or on how effectively it helps the teacher learn in a staff development setting. In the context of IVD use, utility evolves around three issues: availability and dependability of hardware, courseware content, and response to a range of student learning styles.

Availability of hardware is a simple, practical question. If the
IVD machinery is distant to the classroom, arrangements necessary to bring the students to that location may be deemed excessively complicated (Langlee, 1989). If the courseware is designed for one student, or a very small group of students, and/or there are inadequate numbers of hardware stations, arranging for supervision or activities for those not using the IVD may be considered too cumbersome. The teacher must also perceive the technology to be dependable before showing a willingness to actually use it. In fact, Gross and Murphy (1966) assert that "not until technical equipment in education becomes as foolproof, teacherproof, and childproof as common household appliances will teachers use it" (p. 103).

Courseware content is similarly a straightforward issue. The content of available discs must be aligned with district curriculum expectations; if they do not align to a high degree, they may be well done but unusable. Cuban (1986) contends that the amount of time and energy necessary to preview available software to determine fit with instructional objectives, student interest and student comprehension levels is a primary explanation for the infrequent use of past electronic instructional technologies. Taken to greater depth, the issues raised by Bruner (1966) must also be taken into account. Several generalizations from his work are applicable: the
level of challenge must be appropriate to student ability levels and amounts of socialization must blend student needs to interact with other students with the opportunity for a reasonably productive academic outcome.

The current emphasis in the Outcome Based Education literature (see, e.g., Valdez, 1990) on making "learning" a priority over "teaching" implies greater pressure upon teachers to provide learning experiences that engage the student in a manner in which IVD courseware can readily be designed. This extra pressure placed on teachers is further compounded with pressure to respond to a growing body of knowledge about the array of learning styles embedded within a classroom of students. In short, the teacher may be forced to move toward providing more individualized learning experiences. Should this pressure materialize in great enough amounts, teachers may well find IVD a necessary component of instructional methodology---and find state legislatures and local boards of education willing to finance them.

At some point, knowledge about the range of ways teachers do (or would) respond to IVD can be utilized by hardware and courseware designers to strive for optimum outcomes in staff development and classroom use. It was Stewart's (1981)
observation some fifteen years ago that "interactive computer systems are becoming commonplace...what limits the successful implementation of this equipment is not so much the technology but rather how it can be made acceptable and usable." (p. 1) Developments in the ensuing years may well transfer his point to the newer, yet similar, IVD technology. A common thread in the literature reviewed is that making technology more acceptable to users, and broadening the base of users, is an ongoing need.

A major associated problem concerns how new users are taught to use information processing hardware. Malde's (1986) findings, in the context of a government agency using computer management of information in England, was that 60 percent of the users interviewed had received no systematic initiation in the use of the system and that the "full facilities to be derived from the system [had] not been made apparent to 52 percent". (p. 84) It is probable that the lack of "systematic initiation" refers to 1) training which is incomplete, not well thought out, and, perhaps, not ordered into the optimum sequence of learning steps, and 2) an incomplete, ineffective, or non-existent follow-up support system. Coupling this assumption to the scope of variables discussed earlier could well offer a comprehensive picture as to why a large portion
of the population does not feel comfortable with computer related technology.

Keeping in mind the nature of the issues discussed above, it can be predicted that a variety of outcomes could result among most IVD users, especially during initial and early use, which would lead to varying levels of stress. There is a fairly new and rapidly growing (Blau, 1981) body of literature in the organizational behavior and human performance domain which addresses the phenomenon of stress in the workplace. An intriguing subset of this area of study provides provocative background for administrators who wish to determine the best approach when introducing IVD so as to enhance employee acceptance and obtain higher degrees of use of IVD. There is strong evidence to suggest that social support can reduce the impact of the stressful experiences which are likely to accrue, for at least some individuals, when IVD use is launched in a school district.

Grasping the concept of how social support interacts with stress requires a general understanding of the direction in which this body of research has developed. Blau (1981) notes that the concept of stress has been seen as a situational condition and a general state as well as a term for a broad area of study. He works
from a definition of stress as "a perceived substantial imbalance between demand and response capability, under conditions where failure to meet demands has important perceived consequences." (p. 280) A similar definition suggests stress results when "one appraises a situation as threatening or otherwise demanding and does not have an appropriate coping response" (Cohen and Wills, 1985).

There are a range of potential sources of stress, many of which apply to situations where individuals are asked to use a technology such as IVD with which they're not familiar: 1) task speed or load demands, 2) role conflict or ambiguity, 3) physical environment noise or temperature and 4) interpersonal discord in the social environment. (Blau, 1981) Each of these factors could well attend the introduction of IVD technology into a school environment. Little consistency is found by Seers et al. (1983) in efforts to determine the existence of stress, but these scholars indicate some studies have looked at general job satisfaction. Others have used cumulative stress measures (typical are self-report indicators of life events such as death in the family and job change) rather than measurement of discrete stressors (Cohen and Wills, 1985). The work of Cohen and Wills has looked at the literature from the
perspective of health outcomes of stress and report that symptoms measured from epidemiology screening instruments, self-report scales and evidence of psychosomatic symptoms are validated in the research and generally yield similar results; rather than looking at severe health problems such as depression, their work has attempted to index the general dimension of demoralization.

Social support meanwhile, can be conceptualized in a broad sense as helpful activities in a context where ease of communications exists (Seers et al, 1983). It is seen as "an interpersonal transaction involving one or more of the following features: emotional concern, instrumental aid, information, and appraisal" (Etzion, 1984, p. 616; see also Cohen and Wills, 1985, p. 345). Kaufman and Beehr (1986) describe social support as being of two types: emotional (demonstrations of empathy and caring) and tangible help with stressors. Support can come from supervisors, co-workers and non-work sources such as spouses, family and friends (Kaufman and Beehr, 1986; see also Seers et al, 1983). Cohen and Wills (1985) have reviewed the support/stress research and have found the studies tend to look at social support structures (existence of relationships) or functions (the extent relationships perform certain functions) either in a global or specific manner.
Efforts to link social support and job related stress in some causal manner have been somewhat elusive. The extensive Cohen and Wills (1985) effort to determine the process whereby social support affects stress responses has done much to clarify the plethora of issues surrounding the question. They conclude from their review of the literature that correlational studies, animal research and social-psychology analogue experiments, and prospective surveys have shown that social support is linked to psychological and physical health outcomes and suggest further that social support is a causal contributor to well-being, a state from which stressful conditions have been found to produce fewer negative outcomes. The mechanisms through which this happens, they declare, haven't been clarified.

Much of the social support-stress literature is grounded in the person-environment (P-E) fit research. Blau (1981) reports the French P-E fit job stress model to be the most "well-developed" (p. 280). One fit in this model examines the extent to which a person's skills and abilities match up with job demands; another fit examines the extent to which the job environment provides for the individual's needs.

Some of the theoretical groundwork for establishing the
person-environment (P-E) fit was developed by Lewin (1938) and Murray (1938). Lewin postulated that behavior is a function of a person-environment interaction; Murray developed a model based upon the role job environments play in frustrating or gratifying human needs. A caveat is posed by Blau (1981) when he warns that their conceptualization of job stress may have been too broad to provide generally valid applications. As has been noted, however, many of the studies emanating from the P-E conceptualization have narrowed the focus and validated more specific stress-outcome examinations to specific settings.

Research in the area of social support/workplace stress has been diverse in conceptualization and methodology, in large part because pioneering investigations were not theoretically designed (Cohen and Wills, 1985). Etzion (1984) found that social support moderates the impact of stress on vocational burnout by helping highly stressed individuals cope. She has found that social support apparently doesn't modify stress "when the agenda of stress is hidden" (p. 620). Blau (1981) found work related social support was negatively related to job stress, but off-job social support had no relation to job dissatisfaction. In a study of teachers in their workplace, Russell et al. (1987) found that there appears to be a
"clear correspondence between the nature of the stressor and the source (i.e., supervisor) and type of support (i.e., bolstering the teacher's self-esteem) that had stress moderating effects" (p. 273). One study obtained a counter-intuitive finding that social support made stronger relationship between stressors and strains, not weaker (Kaufmann and Beehr, 1986). These researchers offer several explanations which might negate the finding, however: the support-stress match may vary among individuals, co-workers may moderate how individuals perceive ostensibly stressful sources, and the reported causal linkage in their study may have been faulty.

An intriguing thread found in several sources suggests that social support varies in a number of ways for men and for women. Cohen and Will (1985) cite two studies which suggest that family support is more beneficial for women than for men (Billings and Moos, 1982; Holahan and Moos, 1981). Women seem to receive more benefit from a confidant than men (Cohen and Wills, 1985). Etzion's (1984) findings suggest that social support in the workplace may be helpful in combating stress and reducing burnout for men but not for women. Etzion's study looked at managers, tellers, consultants, nurses, teachers and social workers of men with a mean age of 39 years and a mean seniority of 13.9 years, and of women with a mean
age of 32 years and a mean seniority of 8.2 years. In general, her study found that work stress was moderated primarily by supportive relationships in the work environment for men, but primarily by life sources (family and friends) for women. Whether the job roles were evenly distributed across gender or a potential source of confoundment, and whether age and length of seniority variability in the study had an influence on the findings is not reported in the source used.

Whether social support affects the novice user of a new technology like IVD may ultimately experience the crucible of reality more in terms of how than if. In the words of Unger and Powell (1980) "the key question is not whether social networks provide support, but when and under what conditions...social networks [are] a means of support" (p. 570). How to carry research probes into this area leads to a variety of scholarly recommendations. Seers et al. (1983) believe researchers in this area need to look for particular interaction effects between social support and stress, and that the interaction of social support as a coping mechanism is likely to be a function of the level of stress. Etzion (1984) has found that the extent and way support is enhanced, and how work group, as opposed to community cohesion, develops
varies across country, ethnic group, and rural/urban settings. And, as noted earlier, a number of studies have found that there are gender differences in how the social support process functions (Etzion, 1984; Cohen and Wills, 1985; Deaux, 1976; and Donelson, 1975)

A number of factors are likely to produce stress in novice/neophyte users of IVD. There is a probability that some teachers will not have the aptitude or, for other reasons, be ill-prepared to readily utilize IVD when asked to do so. The stress literature describes this situation as a classic example of how an imbalance between demands and abilities clash to produce stress. The situation is also an example of how social support might ameliorate the stress. To the extent that administrators can provide social support for teachers as they initiate use of IVD, the stress/social support research can provide direction toward more effective implementation of this technology's use in staff development and in the classroom.

Conclusion

This review of the literature has certainly raised far more questions than could be managed in a single research project. The
dearth of research information on IVD across the topics discussed to this point means that a portion of the task must be singled out as a beginning effort to address the focus of the identified research questions. The key to effectively conducting a research effort is to realize what can adequately be managed without losing sight of other variables which are either tangentially important or directly related but purported to be distinct enough to be excluded from the research focus.

This dissertation is intended to be helpful to district and school administrators in K-12 settings. Since the likelihood of an administrator becoming familiar with a great deal of detail about any of the plethora of dynamics which occur within a typical district is virtually nil, an effort has been made to examine several variables in the single study in order to provide a practical collage of data which stems from a common research context. Opportunity costs accrue when making such a decision: breadth of findings are exchanged for precision; immediate utilization of findings is exchanged for the need to coordinate more detailed findings with the right blend of additional research located through a time consuming and potentially unfruitful search. In short, research decisions have been made in light of undesirable options.
CHAPTER 3

The review of the literature reveals a number of themes and issues which seem central to effectively implementing teachers' IVD use, whether in instructional procedures for classrooms or for staff development. Dynamics from each issue seem to have an important bearing in promoting the effective introduction and extended utilization of such information processing technologies as microcomputers and IVD. One is the degree of social support, perhaps intertwined in some manner with technical support, which is provided; as noted in the previous chapter, the need for support may well vary from person to person according to a number of variables. Social change brought about because of the introduction of such technologies also appears to have some effect; some people seem more affected than others when the use of the technology reduces, or changes the nature of, social interactions. A third issue concerns the degree to which previous experience with microcomputers affects one's willingness to use, and be comfortable in using, IVD. Another issue is whether personality factors relate to the level of comfort a person feels when introduced to such
technologies. Although the literature obtained in the search did not directly discuss this issue, it may well explain why some in the population seem naturally prone to embrace such technologies, while others seem aversive to it.

To research each of these themes/issues would require a mammoth effort, or more appropriately perhaps, a series of efforts which would attempt to approach an issue at a time and then synthesize results as a concluding activity. Because the presumed variables probably interact, such an effort would risk missing some of the interactivity while studying a particular focus. The effort would be further confounded by the evolving nature of the technology (development of new interface mechanics and instructional design strategies in courseware programming in particular) and the dynamic nature of user sophistication (greater numbers of the population becoming familiar with technologies which preface and in some manner affect their response to IVD). In short, a dilemma presents itself: one has to begin somewhere, yet realize that the validity of a piecemeal effort will be, to some degree, suspect.

The research methodology used in this study reflects a belief that quantitative and qualitative research designs can complement each other. Determining an appropriate design, however, requires an
excursion into a long standing debate about the comparative virtues and limitations of qualitative and quantitative methodologies. Some have found the debate problematic. Soltis (1984) is one who has been bothered by the fact that he "has been unable to place the many and vastly different languages and logics that people call educational research into a coherent conceptual framework" (p. 5). Research methodology stemming from the rational-positivist paradigm, which has dominated traditional educational research, has undergone considerable internal and external scrutiny and criticism in recent years. Meanwhile, a relative newcomer, phenomenology, and its qualitative methodology, has come under equal scrutiny and criticism, largely through lenses that refract observation in the positivistic tradition (Oleson, 1989). The result has been that guidance in how to conduct research has become obfuscated through charges and countercharges between practitioners of the quantitative methodology and advocates of the qualitative methodology.

Numerous scholars (Soltis, 1984; Kidder and Fine, 1987; Rist, 1977) have elevated the debate from factional volleys about the comparative merit of quantitative and qualitative research epistemologies and methodologies to a discussion of the relative
worth of both. They find it important to expend energy toward determining how positivist and phenomenological ways of viewing the world can complement each other, rather than narrowly defending one viewpoint. Portrayed with a broad brush, there appears to be an emerging feeling that the two perspectives can complement each other, that qualitative research can contribute a richness to the description of reality and help to generate theory, and that quantitative research can add precision to researched understandings and produce probabilistic predictions allowing research knowledge to be generalized to other specific or general populations.

Kidder and Fine (1987) discuss the call for "synthesis, collaboration, and cooperation [between them].... but want to preserve the significant difference between the two" (p.59). They go on to assert that the quantitative emphasis on deductive processes and the qualitative emphasis on inductive processes actually fit on a continuum from which a researcher of a specific question must find an appropriate mix of methodology. The different epistemological orientations can peacefully coexist according to Rist (1977). He asserts that detente is rapidly evolving for two reasons: 1) "there is a general recognition among some researchers and even more
practitioners that no one methodology can answer all questions and provide insights on all issues" and 2) "the internal order and logic of each approach is sufficiently articulated that it is difficult, if not impossible, to foresee the time they would merge under some broader, more eclectic research orientation" (p. 42).

Although the debate has been conducted across numerous disciplines and contexts, it is perhaps nowhere stronger than within the social sciences, where those from the phenomenological perspective have challenged the appropriateness of researchers exclusively using quantitative research approaches for a domain in which ascribing meaning to events purportedly dominates. Central to this debate is the question, How does one find truth toward "extending and generalizing basic understandings"? Are answers best found through refined understanding of, and research designs from, the development of the epistomology of the positivist paradigm, through the same efforts of the epistomology of phenomenology, or through a combination of the two?

The research methodology used in this study reflects a belief that qualitative and quantitative research designs can complement each other. The design of this research effort is intended to approach the general research question of user satisfaction with IVD
through quantitative and qualitative methods. Two of the research questions were approached primarily through quantitative methodology: Is there a relationship between past use of technologies, such as microcomputers and audio visual equipment, and interest and comfort in using IVD? And, how do users of instructional technology compare interactive videodisc as a learning opportunity to other means/mediums of learning? Qualitative data collected during this initial phase of the research was expected to add a breadth of information and potentially generate hypotheses for further study. Qualitatively, this research effort attempted to elicit an understanding of issues that the participants perceive as affecting their satisfaction with IVD use. It was expected that information generated from this part of the design will suggest hypotheses for further study.

Research Design - Pilot

One value of utilizing both quantitative and qualitative methodology is that information obtained from the strategies of one can be used to augment or reinforce information obtained from the other. This process can add to the overall validity of the research.
The intent of this study's design is to employ as many information gathering devices as potentially needed and then to extract as much information as analysis of the resulting data indicates in a reiterative process. Although described as distinct, the information gathering techniques are an attempt to gather similar types of information from different angles, in essence the triangulation scholars like Bower (1986) and Kidder and Fine (1987) advocate.

Participants - Pilot

Although it would be desirable to conduct the entire research exclusively with participants who were teachers, the logistics of bringing a suitable number to a setting which included IVD work stations was, during the initial phase of the research, untenable. A class of General Psychology students at the University of Minnesota-Duluth was accessible for the initial phase of the study. A Subject Background Questionnaire (SBQ, Appendix A) was developed to determine demographic and educational technology familiarity backgrounds of the participants; it also gathered information about participant current or planned occupations, with the expectation that some generalization to the K-12 teaching population of specific interest could be made: some would be, or plan to become, teachers;
all currently were students in a university setting; and most would have relatively recently participated in a K-12 setting. Individually as well as in the aggregate, such experiences should engender a high degree of knowledge and understanding of the dynamics of teaching.

**Instruments - Pilot**

An instrument was developed to obtain the demographic information necessary to categorize the participants for research purposes and to assess their history of information processing and instructional technology use. This instrument (the SBQ) was field tested with students in a University of Arizona graduate education class, Research on Teaching in the fall of 1988, to determine whether questions were clearly stated and produced the information desired. It had been prefaced in that use with an oral request to point out any questions with unclear wording and to describe the clarity problem. Minor revisions to wording were then made to refine the instrument.

Because the collection of data during the IVD laboratory experience of the Pilot was crucial to this research, two methods were utilized to capture as much information as possible for later scrutiny. A video camera was mounted in one corner of the room to
record visual, and to a lesser extent due to insensitivity of the microphone, sound data of the experience. Secondly, field notes were taken to the extent possible. Limitations in the amount of field notes were unavoidable due to the multiple roles played by the researcher, (i.e., to distribute handouts, respond to questions which might arise, and to respond to any needs that the environment and activity required). The researcher's skill at taking field notes had been enhanced by previous experience in a qualitative research effort during a course at the University of Arizona (Oleson, 1988a). Participants were given the option of being included in a laboratory experience where the videocamera was not included.

Following each participant's use of the IVD, s/he was given a questionnaire, the User Satisfaction Inventory (USI), which was designed to assess their satisfaction with the experience. This instrument (Appendix B) was obtained from Reeves and Lent (1982) and had been used in a presentation at the 1982 AERA Annual Meeting. It is described by its developers as a portion of questions in a sequence of military-related computer based instruction lessons researched by Reeves and Lent.
Operationalization of Pilot

Although course-level research, readings of research, and conversations with others who have conducted research indicate that a researcher must be prepared to make instantaneous decisions to adapt a research project in response to unexpected occurrences, the following was developed as an expected agenda.

Because a description of what participant-volunteers are asked to do has the potential of confounding the results, a script (Appendix C) was prepared to guide the researcher's first exposure to the participants. This presentation described the nature of the research and the demands which were being made on those choosing to participate. It was made at the end of one of their class sessions. Although some spontaneous adjustment occurred in the actual delivery, the script provides a general picture of how the introduction of the research to the participants might affect the research outcomes.

The laboratory experience was scheduled to occur as quickly as possible following the introduction and call for volunteers in the class session. The first lab experience was scheduled on the afternoon when the volunteers were identified and for two
succeeding afternoons until each participant had obtained the experience. The primary reason for restricting the time lag was to reduce the amount of cross-participant interaction as much as possible. Furthermore, it was presumed that time restrictions would reduce the opportunity for the volunteers who first experienced the IVD to discuss it with those who had not, which could potentially affect, in ways not observable to the researcher, how the latter participants approached the experience. A secondary reason was strictly practical, the short duration of summer school sessions limited access to the participants. Based on time slots available for the research, the participants were given an opportunity to sign up as their schedules or preferences dictated. It was anticipated that any friendship relationships which existed in the class were likely to result in their signing up for the same time slot. Rather than seeing this as a variable which would confound findings, it was viewed as a potential opportunity to observe aspects of the socialization issue discussed in chapter two.

Research Design

The second phase of the study capitalized on the opportunity,
created when funding to operate the IVD lab at the university was drastically reduced, to bring the IVD hardware to a school district setting. The opportunity was seized to examine, in more detail, components of the social support dynamic.

**Participants**

To enhance the external validity of the findings, 100 potential participants were randomly selected from a list of the 1,015 classroom teachers employed by the Duluth (Minnesota) Public Schools. A letter was written to these individuals (Appendix D) describing the research as an effort to obtain information as to how teachers responded to the use of IVD and requesting their assistance in conducting the research. From the 100, 15 responded that they could not, or would not, be willing to participate. The 39 who were willing to participate were then assigned to one of two groups: those who would utilize IVD in small groups of three and those who would use IVD Alone. Conflicts arose for some of those who responded that they would participate; 29 ultimately were part of the experiment. Thus, the final participants were self-selecting from a randomly selected sample of Duluth, Minnesota, teachers which is not an entirely representative population of America's
teachers. How these aspects of the study affected outcomes of the research is not explicitly known.

**Instruments**

The SBQ and USI utilized in Phase I were also incorporated in Phase II, in the event comparisons across the two participant groups would become desirable. Since the refined focus was to examine the effects social support might have when participants were placed in a potentially stressful situation, two questions were added to the USI to obtain a self-analysis the opportunity to meet informally, and then work with, two other participants.

**Operationalization**

To construct a social support/non-social support dichotomy, two participant groups were created in the experimental design: one in which three persons were scheduled to use the IVD as a small group ("Group" treatment), the other in which individuals worked along ("Alone" treatment). Because technical support in how to use the IVD hardware is obviously a form of social support, referring to one group as non-social support is technically inaccurate. To moderate the social effects of technical support in both groups, it
was designed to be a constant, where the researcher was available to offer assistance only when requested and only to the extent needed.

Five half-hour sessions were scheduled when two groups of three individuals each per session would be exposed to an introduction to the same videotape utilized in Phase I. Separate sessions were scheduled to conduct the Alone treatment. For the sake of expediency during the Alone treatment, three persons were scheduled in each of five half-hour sessions, but the IVD hardware was placed in three of the corners in a large (28' x 28') room to reduce the likelihood that social interaction would occur. Each session was videotaped to capture qualitative information.
CHAPTER 4

A research design which gathers information from both the quantitative and qualitative methodologies generates both statistical rigor and contextual richness. The computer software CRISP provided an exhaustive analysis of the quantitative data derived from this research. Capturing on videotape much of the social interaction among subjects who directly represent the population that the research is designed to describe created an opportunity to comprehensively and methodically obtain valid results.

Because the researcher believes that operationalizing qualitative and quantitative data interactively can more completely describe the interface of the user and the technology, the results of the research will be discussed in a manner that illustrates how the two methodologies complement each other. The data pertaining to Research Question 1 (RQ 1) derive from three survey questions. Research Question 2 (RQ 2) data are obtained from a multiple regression analysis. Understanding the social implications associated with the novice's response to this technology (RQ 3) is
derived from both a multiple regression analysis and application of Bales Interaction Process Analysis.

Research Question 1

"How do users of instructional technology in educational settings compare interactive videodisc as a learning opportunity relative to other means/media of learning? What aspects of IVD do users like? What aspects of IVD do users dislike?"

(NOTE: The analysis of topics in RQ 1 is derived from participant response data to USI Items 3, 19 and 20.)

As Cuban (1986) has noted, a portion of K-12 educators will be naturally and immediately attracted to new technologies if they see potential usage in their classrooms. As delineated in earlier chapters, the literature suggests that how teachers in general respond to new technologies upon introduction and over the ensuing years of usage seems dependent on a variety of dynamic variables. The purpose of posing RQ 1 was to obtain a panoramic view of how classroom teachers initially might respond to a new technology such as IVD relative to their existing feelings about traditionally used media and means of learning. RQ 1 served then as an exploratory effort to determine an appropriate focus to direct ensuing, more refined research efforts.
Question 3 in the USI seeks a synthetic response to RQ 1 by asking subjects if they "would rather learn [the selected material] in a regular class than with the interactive videodisc system." The data resulting from this question suggest that, based upon the randomly selected classroom teachers in a large Northern Minnesota school district, the initial response to IVD is generally favorable across a broad spectrum of grade 4-12 teachers. Of the 29 subjects, 13 said "no" in response to the statement, "I would rather learn this material in a regular classroom than with the interactive videodisc system" and only seven said they would prefer the regular class. The remaining nine were unsure.

A cross tabulation was done to discern if responses to the above question varied according to age or gender. The percentage of subjects who prefer to learn the selected material via IVD was consistent through the eight age categories (18-25, 26-30, 31-35...60+) delineated as choice options in the SBQ. Women were more likely to state a preference for IVD learning as indicated in the Table 4.1 below. The disparity between females and males invites further examination in future research. It would be helpful at a minimum to interview males and females to inquire about their perceptions of how IVD can be used in the classroom.
Table 4.1

<table>
<thead>
<tr>
<th>Preference for Learning Material Via IVD or Regular Classroom (by Gender in Percent)</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVD</td>
<td>35.3</td>
<td>58.3</td>
</tr>
<tr>
<td>Not Sure</td>
<td>41.2</td>
<td>16.7</td>
</tr>
<tr>
<td>Regular Classroom</td>
<td>23.5</td>
<td>25.0</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

and how they describe the “regular classroom” to see if the variance on this question is rooted in these potential sources. It would also of value to explore why such a high percentage of males were not sure.

The exploratory nature of RQ 1 is apparent in the research design’s attempt to gather data through two open-ended questions. When given the opportunity to say whatever they would like, a person may draw upon whatever factors are personally relevant before deciding what to write. Given the context of being introduced to a new technology, it is logical to presume most, if not all subjects, would reflect on how IVD compares to other technologies used in their teaching.

Two of the open-ended questions in the USI provide a direct indication of how the subjects compare IVD to traditional learning means/media. Question 19 asked “What do you most like about
using this technology?"; number 20 asked "What do you most dislike about using [the IVD technology]?". A content analysis of responses to the two questions provides valuable insights into how the 29 participants from a large Northern Minnesota school district feel about IVD technology relative to other media and means of learning. (For a complete listing of verbatim responses written by each participant for each question, see Appendix E.)

In general, the responses to the two questions suggest very favorable feelings toward IVD. Responses to the question "What did you most like about using this technology?" tended to fall into three main categories. Table 4.2 below lists participant responses as placed in each of the researcher-created categories. Ten of the participants indicated that they liked the individually paced nature of their experience with IVD. Although most responses simply referred to self-pacing, a number of subjects clarified their feelings in more detail. One participant said the technology "individualizes learning"; another wrote "the approach seemed to be a personal one-on-one relationship". Several indicated specifically that they liked the opportunity to go back and forth in the program. One participant appreciated that it was "self-controlled, back or forth"; another said it "allows for individual pacing [and I] can go
back and repeat info.” An elementary teacher used wording that may capitulate the feelings of those who liked the self-pacing aspect of the IVD technology: “I was able to work at my own pace. I was constantly given the choice to review any material I wanted to review”.

Table 4.2

Features Most Liked About IVD
by Participant Identification Number

Responses to USI Question 19 ("What did you most like about using this technology?")

Category I: Individually paced

562 Keeps you focused on material. Work at own pace....
5133 Variety of data. Working at your own pace.
5134 Individualizes learning.
5224 ...the ability to work at my own pace...
5226 It could be selfpaced. It could be reviewed.
5282 ...ability to go at my own pace....
6201 I was able to work at my own pace. I was constantly given the choice to review any material I wanted to review. I liked the variety of sometimes just listening to material and sometimes having to read my own material....
7111 Self controlled. Back or forth.
7112 1) Allows for individual pacing. 2) Can go back and repeat info....

Category II: High quality of visual and sound reproduction

571 It was wonderful. The pictures were so real. It seemed very real....It would be a wonderful tool for learning languages.
572 ...Almost like being in the classroom.
5131 Pictures!
...the video output of the photographs was really good.
I enjoyed the graphics.
...nice photographs....

Category III: Easy to use.
...easy to operate.
...easy to use....
Easy access to lots of material in short amount of time....
...easy to use.
...easy to follow and use
It's easy....
The information is at my fingertips.
...the ease of using it....
Simple

The high quality of visual and sound reproduction in laser disc technologies such as IVD generated the second response category. Six subjects in this research extolled this feature; they liked the sense of reality created by the technology. One enthusiastic participant wrote "It was wonderful. The pictures were so real. It seemed very real....It would be a wonderful tool for learning languages". Another reported enjoying "the graphics [and] music". A math teacher "found it quite fascinating. The video output of the photographs was really good". A teacher close to retirement age said he found it "almost like being in the classroom".
Data compiled in the third category of responses from USI question 19 reveal that this study's participants did not generally experience the apprehension reported in some of the literature. Chapter one documented a number of fears and concerns people sometimes associate with microcomputers. It is especially interesting to note that, in an open-ended response opportunity, none of the participants reported apprehension. In fact, the opposite seemed more true. Nine chose to point out that they found the IVD easy to use. Eight almost uniformly phrased their response as simply "easy to use," and the other summed up his feeling with "simple". Perhaps most significantly, as will be explored more fully in presenting responses to question 20, only two reported discomfort about their interaction with the hardware and one of these indicated the intimidation only occurred "at first".

Juxtaposed to the apprehension toward interfacing with microcomputers documented in the literature, the findings of this study become particularly interesting---these subjects were, in general, comfortable with the interface.

In addition to these three categories of positive responses to IVD, seven subjects wrote that they liked the opportunity to experience IVD because it was new. For some, intrigue with a new
technology dominated their answers: "Chance to hear and see things not readily available in a traditional classroom. Opportunity to 'experiment' with material"; "I enjoy experiencing 'what's new' in educational technology". For others, key phrases capture a similar response: "new---interesting", "fascinating", "the exposure to it", "it's novel". It is not clear whether these responses would be the same to any experience with a novel technology with potential K-12 classroom use. Although noteworthy, the interest created by novelty would be similar whenever subjects are exposed to new technologies, and if so, as is deemed likely, it would be a temporary perception, probably lasting until experiencing the next "new technology". Because of this, the data are not interpreted here as a positive response to IVD per se despite the positive tone of the responses. Although not the focus of this research effort, delving further into this phenomenon at some future point in time may further illustrate Cuban's findings (1986) that some educators are naturally drawn to novel technologies when they are initially introduced.

It is important to acknowledge that when interpreting user satisfaction with interactive technologies, interfacing with the hardware is not an isolated experience. Experiencing the technology
as hardware is essentially and virtually inextricably connected to experiencing the technology as courseware; the nature and quality of the programmed material used on IVD will affect, at least in a subtle, perhaps subconscious manner, how the user responds to the hardware. Conversely, the user's response to his or her interface with the technological hardware will have an effect on how they perceive the content and dynamics of the courseware. The literature search for this dissertation did not unearth a research design for use with either microcomputer or IVD which would isolate the effects of hardware and courseware, nor was this level of sophistication designed into this research. Interpretation of the study's data therefore needs to be sensitive to this caveat. For the purposes of this research, inability to separate the causal consequences of the courseware and hardware components on the participant's response to IVD is not perceived to be a confounding dynamic/variable. When exposed to the IVD for the first time, K-12 classroom teachers likely will experience their interface with IVD as a gestalt phenomenon rather than cognitively or affectively discreet experiences.

Responses to question 20 in the USI indirectly support the positive themes generated in participant answers to question 19.
(Table 4-3 gives a complete listing of participant responses as categorized by the researcher for USI question 20.) Eleven of the 29 left the space blank or verbalized in some manner that they found nothing to dislike. The following examples characterize written, noncritical responses: “There wasn’t anything about it that I disliked”, “Didn’t dislike it at all”, and, more cautiously, “Right now, nothing.”

Five participants illustrated the practicality ethic of many teachers, expressing some concern about transferring the technology in classroom settings (Category II). A secondary social studies teacher said “I’m not sure I disliked any of it. I have questions about how to incorporate this efficiently into the classes of 30 I have.” Another could see her 7th and 8th graders “pushing the screen over and over”.

Table 4.3

<table>
<thead>
<tr>
<th>RESPONSES TO USI QUESTION 19 (&quot;WHAT DID YOU MOST DISLIKE ABOUT USING THIS TECHNOLOGY?&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATEGORY I: NO RESPONSE OR VERBALIZED &quot;NONE&quot;.</td>
</tr>
<tr>
<td>561</td>
</tr>
<tr>
<td>572</td>
</tr>
<tr>
<td>576</td>
</tr>
</tbody>
</table>
5131 Nothing.
5135 None
5284 Didn't dislike it at all.
7111 Nothing.
7112 Right now, nothing.

Category II: Concern regarding classroom use.
561 ...I have questions about how to incorporate this efficiently into the classes of 30 I have.
571 If it was to be used by students (7th & 8th graders), I can see them just pushing the screen over and over. For myself---I enjoyed it!
5132 No moving pictures---looked like a filmstrip.
5134 Accountability for user.
5152 Too many monitors and computers needed in a math teaching situation to be practical at this time for me.

Category III: Generalized Concerns.
5221 It was intimidating at first.
5222 At times I didn't know where I was going with the exercise.
5223 I probably need more time to get a better overview of the material.
5224 To really learn anything on this disc, I think I would have to work individually rather than with a partner.
5225 Too impersonal -- no sponteneity
5226 Reading and following directions, getting lost in the program, feeling the info was inadequate to permit me to answer the questions or do the task.
5281 Maybe the size of the screen
5282 The map was blurry and hard to read on the smaller screen. Is a larger screen available?
6201 Sometimes the material was vague and there wasn't any way to expand on it.
Category IV: Extensively Negative toward IVD.

5153 Teaching is human to human, not machine to human. There is a place for technology but used in conjunction with a real live teacher that cares and can respond to needs etc.

6101 The "black frame" around the live action or photos was distracting -full screen would have been easier on the eyes. Task way to (sic) large for the simplistic options presented. I suppose there was more depth to explore, but the "path" was limiting. I was distracted by the + that kept showing up on the screen. All in all I don't respond to sitting in front of a video screen. We are deprived (by choice)--no cable TV--no video games in our family. I much prefer "real" contact. As an alternative to a "real" teacher, I wouldn't choose the interactive disc--it was too "acted" and seemed to fall into the realm of the "canned" learning that I kind of react negatively to. I guess it perpetuates the couch potato and lessens reading and research and action.

The third category included a variety of generalized concerns. One found it "intimidating at first". A secondary school special education teacher voiced a personal preference: "To really learn anything on this disc, I think I would have to work individually rather than with a partner." Others reported concerns about screen size, preferring to go through the entire program, or needing to get a "better overview of the material". Although not directly challenging the reproductive quality of the visuals, three subjects did mention dissatisfaction with some aspect of programming or technical shortcomings of IVD. One commented "No moving pictures---looked like a filmstrip." A social studies teacher found the map "blurry and hard to read on the smaller screen", then asked "Is a larger screen
available?" A secondary biology teacher described the program as "too 'acted'" and found it to be "'canned' learning".

Only two were extensively negative (Category IV) about their IVD experience, and, in both cases, seemed to be reacting from a generalized anti-technology perspective. Their responses articulate generalized viewpoints on technology's use in the classroom and, in the one case, more broadly about family life. These two participants clearly identify their biases (see Category IV in Table 4.3 above for their complete response), and would fall into a category that Langlee (1989) describes as reluctant or antagonistic respondents to new technologies.

The foregoing summary of participant responses to the two open-ended questions and question 3 from the USI provides a base of information which could guide school administrators and other education planners who intend to implement IVD into their schools learning environment. The data can also provide direction for further research into how users of instructional technology in educational settings compare the interactive videodisc learning opportunity to other means/media of learning.
Research Question 2

"Is there a relationship between past use of technologies, such as microcomputers and audio visual equipment, and comfort in using IVD?"

(NOTE: The analysis of topics in RQ 2 was designed to be derived from participant response data to SBQ Items 8, 9, 10, 11 and 12 ("past use" indicators), and USI Items 1, 3 and 8 ("comfort" indicators).)

The analysis of data generated for this research question began with comparing a variety of information garnered from participant responses to the SBQ and to three questions in the USI. Questions from the SBQ were selected by the researcher to elicit a profile of the subjects which would describe their self-reported usage and comfort levels with traditional K-12 technologies, as well as demographic data, such as age and gender. A number of the SBQ questions within item nine relate to educational technologies available in each school in the district where the research took place (i.e., overhead transparency projectors, 16 millimeter film projectors, filmstrip projectors, microcomputers). Because those technologies are also commonplace throughout U.S. schools, it has been concluded that the SBQ data generated would be reasonably similar to many K-12 schools across the U.S., and that cautious inferences about analysis extending from the SBQ into the USI would
be justified. The technology listed in SBQ 8 that is not clearly educational (video games) is similarly universally available and likewise contributed to a base of information about the participant's background.

The SBQ items designed to portray experience levels with "past uses of technologies" focus on basic skill level of usage of three types of typewriters, hand calculators and two types of video games (SBQ 8), setting up and operating proficiency of two types of 16 millimeter film projectors, filmstrip projectors, microcomputers, slide projector and overhead projector (SBQ 9), presence of a microcomputer in the home (SBQ 10), availability of microcomputers in the workplace (SBQ 11), and extensiveness of use of a microcomputer (SBQ 12). The researcher's nearly twenty years of classroom and other roles within the study district and discussions with classmates in the graduate course in which the SBQ was validated indicate that these five questions refer to the educational technology teachers generally find available and actually use in K-12 schools across the United States (see also Langlee, 1989).

To implement RQ2, data describing comfort level with the IVD experience were needed to juxtapose with experience levels of
traditionally-used media. Three questions were included in the USI to elicit the level of "comfort in using IVD" during the participants' short introduction to IVD. The three questions focus on whether they liked using IVD (USI 1), preference for regular classroom or IVD (USI 3), and their response to the opportunity to work at their own pace (USI 8). One of the features accented in the IVD system utilized in the study permitted the Alone and Group subjects to work at their individual or the collective small group pace. Two questions directly refer to comfort levels---people are not prone to like something they are not comfortable with. Similarly, a person is not likely, other factors being held constant, to prefer an option where another choice creates greater comfort. A pacing question was used as an indicator of comfort with IVD because self-pacing is relatively uncommon in the typical classroom, allowing comparison of self-pacing in the two experiences. IVD and other educational technologies are certainly not totally distinctive from each other and features of one can be more or less comparable to features of the other.

To determine the extent to which sampled participant background data could be used to infer how other classroom teachers might experience comfort in their first use of IVD, a step-wise
multiple regression analysis was conducted. The value of this statistical methodology is that it generates the proportion or percentage of relationship which predictor (independent) variables have with a criterion (dependent) variable (Bordens and Abbott, 1991). From the array of data generated from a regression analysis, statistically reliable assertions can be made which imply what variables in the research affected the teachers' comfort levels when novice users.

Standards required before a predictor variable would be included in the equation were set at levels commonly used in this type of research. The Alpha level required to accept correlations as statistically significant was 0.05; the probability that correlations existed due to chance could be no more than 5 percent. The F-Value (ratio of between subjects to within subjects) was statistically set at the minimal level of one to enter or remove a variable into or from the model, but in actuality was not lower than 4.396 for any predictor variable used (as is common, most were much higher).

Three criterion variables were selected in the research design as indicators of the user's level of comfort in using IVD: USI 1 ("I liked using the interactive videodisc system", USI 3 ("I would rather learn this material in a regular class than with the interactive
videodisc", and USI 8 ("The interactive videodisc allowed me to work at my own pace"). Although it was anticipated that SBQ items 8-12 could be used as predictors of these criterion variables, P values were not sufficiently low to permit their entry into the regression model. However, five variables did enter the equation as predictors of USI 1 (four were statistically significant based on P values and F values, while the fifth did not meet the P value criteria) and seven variables were entered as predictors of USI 3 (two of which met both standards).

As noted in Table 4.4 below, USI question 9 ("I tried to just finish the lesson rather than learn the material") predicted most of the correlation for those who liked using IVD: respondents who liked using IVD did not hurry through the lesson. Over half (52.32 percent) of the prediction as to why respondents liked using IVD is explained.

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>R-square at entered</th>
<th>R-square change from previous step</th>
<th>F-Value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>USI Q9</td>
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<td>0.5232</td>
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<td>0.0000</td>
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<tr>
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<td>0.0537</td>
<td>4.396</td>
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<td>0.0798</td>
<td>6.527</td>
<td>0.0194</td>
</tr>
<tr>
<td>5</td>
<td>Change</td>
<td>0.7677</td>
<td>0.0164</td>
<td>1.339</td>
<td>0.2616</td>
</tr>
</tbody>
</table>

*Data entry code referring to whether a participant had a microcomputer available to them in the workplace.
by this one variable. Interestingly, the probability that the correlation between USI 1 and USI 9 was not due to chance was 100 percent (P = 0.0000). USI 6 ("Q6": "I would like to take more lessons on interactive videodisc") contributes 9.46 percent of the additional prediction as to why subjects liked using IVD. Two additional factors (variables) met statistical criteria to enter the model and to help explain the phenomenon of a respondent liking to use IVD. The younger the participant's age ("years"), the more likely they would like using IVD (explained an additional 5.37 percent); not having a microcomputer at one's place of work on a permanent basis ("microwor") predicted an additional 7.98 percent. Both of these last two variables had low correlations with the criterion variable; "years" r equaled -0.2309 and the r for "microwor" was -0.1386. In the aggregate, these four variables predicted 75.13 percent of the criterion variable. As noted in Table 4.4, one additional variable was entered into the model, but was dropped because it did not meet the P value criterion established for this research.

The two variables which met the criteria to become predictor variables in the model for the criterion variable USI 3 ("I would rather learn this material in a regular class than with the interactive videodisc") were USI 6 ("Q6": "I would like to take more
lessons on interactive videodisc") and USI 4 ("Q4": "The lesson challenged me to do my best work"). Over 42 percent of the criterion variable is explained by USI 6, with USI 4 adding 9.91 percent. A check in the correlation tables indicates rather high r values: -0.5433 for USI 6 and -0.6276 for USI 4. As noted in Table 4.5, five additional variables were entered into the model but were dropped because they did not meet the P value criteria established for this research. The two predictor variables which met statistical standards explained an aggregate 52.72 percent of the subjects' preference for IVD to a regular class.

Although it is disappointing that the relationship between SBQ items 8-12 and USI items 1, 3 and 8 did not meet statistical significance when analyzed, it is important to note that a multiple
regression analysis based on rigorous standards did locate predictor variables for two of the three criterion variables. The variables which did predict two criterion variables do begin to profile characteristics of teachers who would most likely be comfortable in being introduced to IVD.

**Research Question 3**

"Does social support provided during a novice's use of IVD increase the level of interest in using IVD on future occasions?" 

(NOTE: The analysis of topics in RQ 3 is derived from participant response data to USI items 1, 2, 6 and 15 ("Interest in future use" Indicators), and from a Bales Interaction Process Analysis of videotapes of Groups (Indicators of "social support").) 

The data gathered for this question produced some important findings for those who administer K-12 schools. The results suggest that it is best to design opportunities for educators to become familiar with IVD in a manner which provides an opportunity for novices to interact with colleagues and permits some informal socialization as they are first exposed to its use.

As indicated in Chapter 3, an initial group of subjects in this research was used from a psychology class at the University of Minnesota-Duluth (this later was identified as the Pilot phase).
While analyzing a videotape which had been obtained in this phase of the research to capture ethnographic information during the introductory usage of IVD, it seemed very apparent that some subjects non-verbally expressed a need to obtain some type of assistance. This need was manifested in two disparate ways. A few participants who walked into the research area without social interaction with other participants (two sat, for example, for about five minutes without any discourse while waiting for the session to begin) subsequently cast periodic, sometimes furtive glances at another participant's work station (screen and/or participant) during the experiment. Others who had walked in with friends (talking and laughing with each other) periodically would consult with another, point to their screens and comment in a manner which suggested they were helping each other out and/or adding enjoyment to their activity. Their behaviors would be described by Bales (1950) as showing solidarity and tension release.

Subsequently, the research design was modified. During the second phase, an effort was made to extricate how social factors might contribute to successful introduction of IVD to novices. After negotiating the opportunity to borrow the IVD hardware, the researcher relocated it in a setting both familiar and convenient for
public school teachers. The use of classroom teachers greatly strengthened the research, as the subjects directly represented the research population, rather than all too familiar university student proxies. The research data ultimately used for RQ 3 were gathered while some subjects worked at an IVD station alone, and others in a group of two or three other teachers at the same machine. The intent was to capture more complete and precise information by “zooming in” on the smaller groups used in the Research phase and picking up voices as well as more detail of facial expressions. The modification of the Research phase to more closely examine the effect social interaction has when provided in initial use of IVD supports the premise Bowers (1986) makes in noting that qualitative research can help to facilitate issue identification.

Six groups of subjects were videotaped while they completed an assignment using the interactive videodisc. Two additional groups were also videotaped, but, due to technical difficulties, sound data was not picked up and a decision was made to use only data which included both sound and visual recordings. While participating in the IVD experience, each participant had several sheets of paper that detailed the process to follow during the experience (Appendix F). The six groups consisted of four diads
and two triads.

Two of the four groupings of the Bales Interaction Process Analysis published by Robert F. Bales (1950) were used to analyze the social interaction that occurred for each group. The Interaction Scoring Form developed by Bales includes 12 categories, paired in twos (see Appendix G for a complete form). Because the Interaction Process Analysis is designed to be more comprehensive than necessary for the purposes of this research, only three pairs of categories were used: 1) shows solidarity/shows antagonism, 2) shows tension release/shows tension, and 3) agrees/disagrees. The full Interaction Process Analysis is a complex process which can follow detailed multilateral and unilateral dynamics in problem solving groups. Since extensive training and practice is required to obtain reliable results, a sociologist from the University of Minnesota-Duluth, who also conducts research for an area school district, was secured to view each videotape while using select portions of the Bales Interaction Process Analysis Scoring Form (Appendix G) to assess each group's interactions. Trials using the scoring form in several social settings coupled with the opportunity to replay complex portions of the participants' interactions enhanced the scorer's accuracy in identifying and recording data.
The scorer later noted that the pace of interactivity in these videotapes made scoring manageable, because there was adequate time for analysis of observations and scoring without missing the next iteration. The scorer could continuously observe, analyze the observance and write down the score.

Table 4.6 below shows the results of the scoring. Bales (1950) discusses the need to look for “higher rates of activity” in the data which could ground the data to a theoretical base or contribute to the development of a theoretical model. A cursory review of the data indicates no participants were observed displaying antagonistic behavior. (For purposes of this research, “behaviors” denotes physical activity and vocal expressions.) It also readily appears that positive interactions (especially “shows tension release” and “agrees”) predominate. In a general sense then, a tentative conclusion can be drawn that the participants provided a supportive, tension relieving interaction during the work with IVD. Participants were nearly five times as likely to agree as to disagree with each other (75:16), and used tension releasing behaviors approximately 2 and 1/2 times as often as they demonstrated tension (51:21). The fact that behaviors showing solidarity appeared 4.5 times more
Table 4.6

ANALYSIS OF SIX GROUPS USING IVD
WITH SELECT PORTIONS OF THE BALE'S INTERACTION PROCESS ANALYSIS
SCORING FORM

<table>
<thead>
<tr>
<th>GROUP</th>
<th>SHOWS SOLID-</th>
<th>SHOWS TENSION</th>
<th>AGREES</th>
<th>DISAGREES</th>
<th>SHOWS TENSION</th>
<th>SHOWS ANTAGONISM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (triad)</td>
<td>1</td>
<td>9</td>
<td>13</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (diad)</td>
<td>3</td>
<td>11</td>
<td>13</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3 (diad)</td>
<td>1</td>
<td>12</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 (diad)</td>
<td>1</td>
<td>2</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>5 (triad)</td>
<td>1</td>
<td>12</td>
<td>8</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6 (diad)</td>
<td>2</td>
<td>5</td>
<td>22</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>14 subjects</td>
<td>9</td>
<td>51</td>
<td>75</td>
<td>16</td>
<td>21</td>
<td>2</td>
</tr>
<tr>
<td>ave./subj.</td>
<td>.6429</td>
<td>3.6429</td>
<td>5.3571</td>
<td>1.1429</td>
<td>1.500</td>
<td>.1429</td>
</tr>
</tbody>
</table>

frequently than its Bales counterpart, antagonistic behaviors (9:2 -- both antagonistic behaviors appeared in one diad), further suggests that a supportive environment existed.

The sociologist who had done the scoring of this data made the observation that emergent leaders data also surfaced during the analysis. Bales (1991) argued that groups require leadership to accomplish their goals and leaders will typically emerge after any group is formed. In larger groups two complementary leaders emerge: the instrumental leader who specializes in performing operational tasks, and the expressive leader who specializes in taking care of the group's feelings. The groups in this study were small, dyads and triads. However, in five of the six groups observed,
a leader emerged, three instrumental leaders and two expressive leaders.

The three instrumental leaders were observed guiding their group through the IVD experience. None of the subjects, including the emergent leaders, had prior IVD experience. As each group sat down in front of the IVD screen, and in front of the video camera, some subjects were observed to be initially nervous. It is probable that the nervousness was caused both by being videotaped and experiencing a new technology. In such a setting, individual and group success will increase from instrumental and/or expressive leadership. In this case, instrumental leaders were observed beginning the IVD experience by reading the instructions aloud and taking initial action such as touching the video screen. After about five of the twenty minute experience, participants were less tense as they became more comfortable with being videotaped and more comfortable with the self-paced nature of the IVD experience.

However, even after a comfort level began to develop, the instrumental leader was observed to continue in that role throughout the experience. An example of how the instrumental leader assisted group activity illustrates the dynamic. Instructional leader: "We should take a look at Asian languages now, that's number five" while
reaching to touch number five on the screen. The other participants concurred with a phrase such as “uh huh”. Analysis of the Interaction Scoring Form for the three groups with an instrumental leader confirms their leadership function; the number of occurrences of passive acceptance by the non-leaders is far greater than for the leader. The instrumental leader contributed to the learning experience by keeping the group on task, asking questions, and making clarifying statements.

Expressive leaders also had an impact on the social support which developed during this experiment. In this research, expressive leaders emerged in two of the groups. These two people used humor to break the tension both at the outset and then throughout the experience. Another expressive leadership device was to ask questions in order to draw others into the experience. “Should we go through the agency module too?” is an example. The extent to which these dynamics spontaneously emerged indicates how social support for novice use of IVD occurs warrants additional research.

Frequency data add additional, self-reported indications of an environment in which participants perceived social support. USI item 11 asked subjects to indicate the degree they “appreciated the
opportunity to work with other people while using the interactive videodisc equipment”. A “no” response was assigned a 1, “not sure” a 2, and “yes” a 3; 19 of the 22 participants circled “yes” and the mean for all responses was 2.7727. USI item 12 indicated a similarly high appreciation for a social environment for the experience. Item 12 indicated the degree to which the “opportunity to meet informally with people [they] were to work with helped relieve some of the anxiety...felt about using this technology”. Using the same standards, 14 respondents said “yes” for an overall mean of 2.8125 (six participants who indicated they were not anxious were not included in the data).

What this data offers in answering RQ3 is indications that social support existed for those who worked in a diad or triad from observational data recorded on the Bales instrument, as well as from the participant's point of view after the experience. The data do not show the causal connection needed to fully respond to RQ3, i.e., whether the social support present in the experience has an effect on the participant's interest in using IVD on future occasions?

The analysis necessary to answer the prospective aspect of RQ 3 began by comparing responses of those who experienced IVD alone
("Alone") and those who experienced IVD as a group ("Group") on three questions in the USI. The three questions were identified as likely to produce indications of a participant's interest in using IVD on future occasions. These dependent variables were "2) I learned a lot with the interactive videodisc", "6) I would like to take more lessons on interactive videodisc" and "15) I can use what I learned from these lessons on the job". A cross-tabulation of question 2 data and the experiment setting appears below in table 4.7.

Table 4.7

<table>
<thead>
<tr>
<th>I LEARNED A LOT WITH INTERACTIVE VIDEODISC</th>
<th>(IN PERCENT)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WORKED ALONE</td>
</tr>
<tr>
<td>YES</td>
<td>42.9</td>
</tr>
<tr>
<td>NOT SURE</td>
<td>42.9</td>
</tr>
<tr>
<td>NO</td>
<td>14.3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The results are obviously very similar; none of the three response categories varied more than 2.6 percent. The amount learned with IVD was similar between groups.

However, the responses to question 6 were very divergent, as shown in Table 4.8 below.
Table 4.8

"I WOULD LIKE TO TAKE MORE LESSONS ON INTERACTIVE VIDEODISC" (IN PERCENT)

<table>
<thead>
<tr>
<th></th>
<th>WORKED ALONE</th>
<th>WORKED IN A GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>42.9</td>
<td>77.3</td>
</tr>
<tr>
<td>Not Sure</td>
<td>57.1</td>
<td>22.7</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Subjects who worked in a group were much more likely to indicate a desire to take more IVD lessons. An affirmative response to this question indicates that there is at least curiosity to know more about IVD, and potentially a desire to share the experience with others, including those in their classroom. Data reported for RQ1 support this contention---most participants characterized IVD as potentially valuable for their classrooms. Although the dynamic which produced such a strong discrepancy between those who worked alone and those who worked with others cannot be identified from this research design, it merits further investigation in future research.

Although not with such a marked disparity, subjects who worked with one or two others also responded more positively to question 15, as reported in Table 4.9 below. Responses to this question potentially provide the most significant data since they
Table 4.9

"I CAN USE WHAT I LEARNED FROM THESE LESSONS ON THE JOB" (IN PERCENT)

<table>
<thead>
<tr>
<th></th>
<th>WORKED ALONE</th>
<th>WORKED IN A GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>42.9</td>
<td>57.1</td>
</tr>
<tr>
<td>Not Sure</td>
<td>42.9</td>
<td>33.3</td>
</tr>
<tr>
<td>No</td>
<td>14.3</td>
<td>9.5</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

report the degree to which a participant visualizes using what he or she learned from the experience on the job. Only 42.9 percent of those Alone said "yes," while over half (57.1 percent) of those in a Group said "yes".

The wording of USI item 15 ("I can use what I learned from these lessons on the job") creates an analysis problem. The "lesson" in this case could have been construed by a participant as the content from the IVD as directed by the worksheets, the use of a new technology (the request for participation had identified the experience as seeking responses to a new technology), or a combination of both. As has been already noted, how the participant interfaces with hardware and courseware is being viewed for purposes of this research as an aggregate or gestalt experience. Whether subjects responded to "lesson" primarily as hardware or software cannot be determined from this study. However, how this
dynamic operated in the participants' minds would likely be similar for Alone and Group experiences and as such is viewed as a constant for the interpretation of the above data.

T-tests were also run to obtain additional statistical data to help determine if this research design for RQ3 was able to determine whether a grouped experience (since shown to be supportive) produced a higher degree of interest in using IVD than for those who worked alone without social support. The exploratory efforts of this research provided moderate, though inconclusive support for a hypothesis that social support increases the probability that novices' exposure to IVD use will increase their interest in using the technology in their classroom. As reported in Table 4.10 below, the mean scores generated from the T-test analysis were higher for Group subjects than for Alone subjects on all three indices of interest in using IVD in the future (USI items 2, 6, 15).

Table 4.10

"Comparison of Means between ‘Alone’ and ‘Group’ on Three Indicators of Interest in Using IVD in the Future"

<table>
<thead>
<tr>
<th></th>
<th>Alone</th>
<th>Group</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>USI #2</td>
<td>2.286</td>
<td>2.318</td>
<td>0.032</td>
</tr>
<tr>
<td>USI #6</td>
<td>2.429</td>
<td>2.773</td>
<td>0.244</td>
</tr>
<tr>
<td>USI #15</td>
<td>2.286</td>
<td>2.476</td>
<td>0.190</td>
</tr>
</tbody>
</table>
Although the direction of the variation between means supports the hypothesis that social support would increase the likelihood of future IVD use, the variation is neither large nor statistically significant. Thus this set of data does not rule out the possibility that the variance is caused by chance. This research suffers from relatively low degrees of freedom, and in particular, the small N for those who experienced IVD alone. However, other previously described results from this research suggest that the difference in means might be found to be significant in a future iteration of research which includes a larger N and other factors more fully understood as this research progressed. What may result is a realization that what this research question seeks is support for the type of a priori generalizations that often "have some unmistakable content which recommends them to the human mind, [but] are neither rooted or bounded" (Bales, 1950, p. 122). Energy to continue the investigation may well come from Bales' stirring assertion that

Some of the most important advances in our field will come, it may be predicted, not from the discovery of brand new, high level generalization, but from the discovery of empirical generalizations which are previously unrecognized cases of well known tautologies and from the identification of previously unformulated conditions in which our well-known tautologies turn a flip-flop. Of such undignified misfortunes is scientific progress made. (Bales, 1950, p. 122)
CHAPTER 5

Central to the reasons this study was launched are the tenets that information processing technologies play a very significant, ever expanding role in our lives, and that teachers in turn play an important role in how technology is used in educational settings and how students develop appropriate use patterns and attitudes toward these technologies. Change is a cultural given in a society; new inventions, changing values, cross-cultural interactions are just some of the dynamics to which members of a society will always, to some degree, need to respond. The pervasive growth of information technologies in the United States illustrates these dynamics. The Information Age is upon us to the extent that intense rivalry often exists to produce the next improvement or next generation of a technology before a competitor captures that niche in the Information Age market.

IVD was chosen as a new technology focal point for this study because it has promising potential as an educational tool and because of its newness, it provides an opportunity to examine how the dynamics of a novice's interface with a new information
technology develop. By looking at this interface between teacher and IVD, it was hoped that knowledge could be generated which would assist educators to develop an appropriate plan for implementing IVD into a K-12 school setting effectively and efficiently. To the extent that a school district determines IVD is an appropriate educational instruction/learning tool, efficacious implementation can lead to effective classroom use and students can be nurtured in accepting and benefiting from that use. Teachers play a central role in how young citizens respond to change: student acceptance of a change can be nurtured or stifled, their attitude toward a change can become one of fear or security, their examination of a potential change can lead to it being carelessly or thoughtfully adopted or rejected. Cuban's (1984) study on the history of classroom teaching suggests that continuity, far more than change, characterize teacher practices, especially for secondary teachers.

The importance of this dissertation is premised on the paradox that the need to change must be juxtaposed to a tendency in people generally, including teachers, to resist change. When use of newer technologies like IVD is deemed appropriate for classroom use, an opportunity exists, at least indirectly, to model thoughtful adoption
and natural acceptance of the change it brings about in the lives of
the teacher and students. These opportunities are often not pursued,
however. James Mecklenburger, director of the National School
Boards Association's Institute for the Transfer of Technology to
Education estimated that "no more than five percent of schools are
truly harnessing the computer's power" despite the fact "we know
how to take the power of electronic technologies, make them broadly
available and have an impact" (ASCD Update, November, 1990, p.1).

Because the teacher is pivotal in the learning environment of
K-12 classrooms, they were chosen as participants for the study;
they become, in effect, a logical starting point to plan appropriate
classroom change. Good teachers know students, know the
instructional/learning dynamic and, through experience, skills, and a
knowledge base, know what is educationally sound and what is not.
As the study progressed, it became apparent that the teacher-
participants actually performed a dual role in the research. They
were learner themselves in what they could have viewed as a staff
development experience (i.e., as a learner). At the same time, they
were asked to evaluate IVD as an educational tool that they could
potentially use as teachers. Although not originally conceptualized
in the research design, this duality captures the teaching experience
on an essentially daily basis: teachers play multiple roles. The impact of this phenomenon (i.e., teacher as learner and teacher) on the study's results is unknown from the data generated. Further study would be required to isolate and examine other issues. Are teachers' multiple roles an integrative experience or an aggregation of distinct dynamics? Does the high frequency of forced decisions in classrooms, as faced by teachers, indicate that some decisions are made by default, i.e., that a particular decision may not be made from the vantage point of a particular role? If teachers permit one or more roles to dominate in the classroom, is that due to personality traits, certain classroom dynamics or classroom compositions?

Given this caveat, a number of generalizations can be made about the results for the three research questions. Along with a summary of the data, discussion will be included about possible ways this study can be expanded into future research questions which might extend the results, as well as ways to more precisely determine responses to each research question.

Research Question 1

The panoramic view that participants have of IVD is generally
quite favorable. Nearly twice as many preferred IVD to traditional instruction. Comments elicited through open ended questions about IVD features that teacher participants liked were generally very positive and can be categorized into three groups: self-pacing, visual and sound quality, and ease of operation. These findings give a degree of specificity about what these teachers were thinking about IVD from their perspective, unencumbered by researcher choices.

From this base, additional research can be conducted to obtain more precise data. For example, what features need to be programmed into courseware to encourage efficiency in the user's pace without creating distress and/or high error rates? What supplemental aids such as study guides are most helpful to the user attempting to learn the content or skill featured in an IVD program? The visual and sound quality of laser technology is unquestionably superior to that of the filmstrip, 16 millimeter film projector and other audio visual machines that middle aged adults typically experienced during their schooling years. Is the expense required to achieve this enhanced quality cost effective when compared to other potential means of assisting the learner? Are other means of nurturing the learner, e.g., field trips, small cooperative group projects, use of manipulatives, more efficacious? Many participants
reported the ease of IVD operation was a positive aspect of their experience. Is this experience true only for those who have good eye to hand coordination? What constitutes “ease of operation”? Did these participants actually operate the touch screen controls or did they merely observe the ease of operation as another participant pressed the screen?

Several participants wrote that they liked experiencing a new technology. The researcher chose not to consider this a positive aspect of IVD because it was interpreted to be a response to “novelty” rather than IVD per se. To determine what role the attraction to the newness of IVD plays in planning for its optimum use requires further study, ideally a longitudinal study which could examine why initial interest in a new technology is either sustained or diminished. Is the attraction to “new” more than curiosity and, if so, is it something which can be enhanced and/or operationalized for more teachers in a manner which leads them to increase their instructional use of IVD? “Novel” is not, by definition, enduring. Cuban (1986) documents that the early enthusiasm demonstrated by some educators for radio, 16 millimeter film and instructional television waned as each of these technologies became available to educators; in a more recent context (“Computer ‘Revolution’ on
Hold", November, 1990), he notes that "disappointment among cheerleaders and policy makers over the promise of computers in schools appears to be pervasive" (p. 4). It is argued from this research effort that "disappointments" from the use of newer information technologies can be minimized when their introduction is properly initiated.

**Research Question 2**

RQ 2 attempted to determine if past uses of educational technologies would predict comfort levels in novice users of IVD. Comfort was determined to exist when participants' responses indicated they liked using IVD, preferred using IVD over a regular classroom option, or liked working at their own pace. The application of a multiple regression analysis did show several predictors of comfort. Participants who 1) put in effort beyond just trying to finish the lesson, 2) indicated they would like to take more IVD lessons, 3) were younger, or 4) did not have a microcomputer readily available at work were more prone to like using IVD. Participants who 1) indicated they would like to take more IVD lessons, and 2) were challenged by the IVD lesson were more likely to prefer IVD over the traditional curricular tools of a "regular"
classroom. No predictor variable met the statistical standards to enter the predictor variable formula for the criterion variable on pacing.

These findings provide guidance to educators interested in introducing IVD into their school sites. The introduction of IVD is more likely to be successful with teachers who exhibit the characteristics of people who would respond to the above items as participants did in this study. Although some of the predictor variables need to be more fully studied to determine if they reliably portray characteristics as described below, a profile of teachers who would feel comfortable in IVD use would appear to include those who are likely to put in "honest efforts" in ventures they take on, show an eagerness in what they do, are younger, like to be challenged, and do not already have a microcomputer at their workplace. The first four characteristics in the profile appear to be intuitively probable, though not truistic. They are probable both in the sense that these characteristics describe traits of people who would respond to the questions as they did, and as an observational check by the researcher of colleagues in the teaching profession who have responded to new technologies in a K-12 school setting. The literature search conducted to establish a knowledge base
preparatory to development of the research design for this study did not locate studies which attempted to clarify which types of teachers would be drawn toward IVD. Additional iterations of this research effort need to be conducted to verify the reliability of these results.

The last profile characteristic listed above creates curiosity which implies a need for additional study. In what way does not having ready access to a microcomputer at work predict that a teacher would like using IVD? Does the lack of ready access also indicate a lower frequency of microcomputer use? Could low or non-use of a microcomputer reflect a dearth of negative experiences with that technology and an accompanying naivete about what can be problematic with technologies like IVD? Is there a "hunger" for technologies like IVD or a fear of being left behind among those who do not have ready access to microcomputers? To what extent do teachers subscribe to a belief that non-experienced technologies are a "magic feather"?

Research Question 3

In situations where IVD is determined to be an appropriate, effective and efficient means to assist student learning, a critical
question is how do educational planners develop or enhance classroom teachers' interest in using IVD? As indicated in chapter three, the social support dynamic emerged as a focus during this study. The study was adapted to try to determine if social support during a novice's use of IVD would increase interest in using IVD. One of the characteristics Pyatte (1987) indicates is important in achieving successful adult learning is a non-threatening climate and social support, as Bales (1950) argues, helps social interactions by reducing feelings of anxiety induced from a threatening environment.

Self-reporting by participants and guided observer recording indicate that social support was present and appreciated in the study by those to whom it was provided. Over 86 per cent of the participants who worked in a group reported that they appreciated the opportunity to work with other people; over 87 per cent said the opportunity to meet informally with co-participants relieved anxiety. Scores from the Bales Interaction Process Analysis of the social behaviors of those who experienced IVD for the first time clearly showed a pattern of agreeing and tension relieving behaviors among group members.

A cross tabulation analysis of the USI variables which were selected as indicators of interest in using IVD in the future
indicated a significantly higher number of participants who worked in a group reported they would like to take more IVD lessons than did those who worked alone (77.3 percent in Group compared to 42.9 percent Alone). A similar analysis of participants' reports about using what they learned in the lesson on the job indicated a higher percentage of participants who worked with a Group (57.1 percent) reported they could use what they learned on the job than did those who worked Alone (42.9 percent). This study suffers from the fact that the USI item used to predict future use of IVD did not ask more pointedly if participants would use IVD in their classroom. In retrospect, the question should have been reworded for teacher participants in the research. The opportunity to make more direct inferences about the teacher population from the data would have justified the risk of reducing the opportunity to compare pilot phase and research phase findings.

The adjustments made in the research phase created another dynamic which produced both positive and negative results. By shifting the participant base from a university psychology class to grades 3-12 teachers, the validity of the study's findings dramatically increased---subjects directly represented the population the study attempts to describe. The participation rate by
the university students was high in large part because they received credit from the course instructor for doing so. However, drawing from a teacher population which had different motives for participation resulted in fewer participants. Although the research design did not attempt to determine why some of the randomly chosen teachers did participate and others did not, the reality was that only 29 percent ultimately became part of the study. The study was further weakened because only seven participants experienced IVD Alone. Group experiences were scheduled first to respond to anticipated "no-shows" assuming that a balance between Group and Alone participants would ultimately result. The pool of available participants was depleted before a more reasonable balance was achieved. The number of Group participants (22) met acceptable standards for statistical analysis (Pierce, 1990); if the number of Alone participants had more closely approximated the Group number, more data which was statistically usable would have been obtained.

Research efforts are endeavors which both enhance knowledge and caution the researcher about the state of knowledge. It is perhaps no mistake that philosophers, "lovers of knowledge", often are seen as, if not confused, at least confusing. For it is in seeking
precision in knowledge that one sees how imprecise knowledge about all but the most simple of phenomena seems to be. The focus of this study certainly suggests this imprecision. The dynamic, complex nature of the teacher-interactive videotext interface is not easily explicated. The process of trying to understand does, in some way, help one *better* understand. In the classroom context, our culture ultimately relies on the instincts and reflective practice of the teacher. In the case of good teachers, this faith is not misplaced. Green (1993) states this well for the context of this study when he muses that studies are all, to some extent, idiosyncratic -- "Just because a specific piece of media appears to enhance learning in a specific situation does nothing to prove that another piece of media will have a positive effect. The extent to which the use of media can enhance learning is a function of the quality of the media itself and the manner in which it is used in the specific educational setting. Thus, we rely on the artist and the artistic judgment of the teacher to assure effective media use." (p. 24)
STATEMENT OF INFORMED CONSENT

I, ________________________________, (print name), freely agree to participate in a doctoral dissertation study being conducted by Jonathan Oleson. I certify that (a) the procedures of the study have been explained to me, including any benefits or discomforts which might occur, (b) I have been given the opportunity to ask questions, and (c) my questions have been answered to my satisfaction. I understand that all records resulting from my participation will remain confidential and that I am free to withdraw from the study at any time without prejudice.

(participant’s signature)  (date)

(investigator’s signature)  (date)
Appendix A
Subject Background Questionnaire

ID Number ______ (For purposes of the study, you will be referred to by this number; your name will never be included in any formal or informal reporting of results.)

I'd appreciate your help in getting some background information on how people respond to the use of technologies in educational settings. Please answer the following and place on the coffee table near the couch before beginning use of the interactive videodisc equipment. Thank you.

1. In what type of educational setting have you most typically taught? (circle responses whenever multiple choices are offered)
   ___ elementary
   ___ middle/junior high
   ___ senior high
   ___ alternative school
   ___ other:

2. What was/were your college major/s? __________ __________
   minor? ______________

3. For how many years have you taught? ______

4. For which grade level have you most typically taught?
   4 5 6 7 8 9 10 11 12

5. In what age range are you?
   18-25 26-30 31-35 36-40 41-45 46-50 51-55 56-60 61+

6. What is your gender?  M  F

7. How do you most typically learn to use new appliances?
   ___ asking someone else
   ___ studying the manual
   ___ experimenting
   ___ other:

8. Check each of the following which you have used with at least a basic level of skill.
   ___ non-electric typewriter
   ___ electric typewriter (1960's vintage)
   ___ electric typewriter (memory, screen etc.)
   ___ hand calculator
   ___ video game (commercial)
   ___ video game (home)
Appendix A2

9. Check each of the following for which you typically need assistance to set up, operate, or repair.

<table>
<thead>
<tr>
<th></th>
<th>set up</th>
<th>operate</th>
<th>repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 mm film projector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(self-threading)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 mm film projector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(non-self-threading)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>filmstrip projector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>microcomputer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e.g., Apple)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>slide projector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>overhead projector</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. Do you have a microcomputer in your home? yes no

If yes, how often do you use it?

___ never or almost never
___ 1 to 2 times per week
___ 3 to 4 times per week
___ 5 to 6 times per week
___ 7 or more times per week

11. Do you have a microcomputer in your place of work on a permanent basis? yes no

If yes, check the following as appropriate:

___ For my personal use.
___ In my immediate work area but shared by others.
___ Not readily available to me.
___ other:

Please answer questions 12-21 if you have used a microcomputer.

12. Indicate how extensively you have used a microcomputer.

___ up to 5 hrs.
___ 5-10 hrs.
___ 10-15 hrs.
___ more than 15 hrs.

13. What effect do you perceive computer monitors (screens) to have on you? (Place an x on continuum below.)

| neutral | positive | negative |
Appendix A3

14. Do you think the choice of colors used for the monitor background and the characters makes a difference to your comfort level?
   yes  no  not sure

15. For how many hours can you work at a microcomputer before experiencing physical, emotional or mental discomfort?
   1  2  3  4  5  6  more than 6

16. If you experience discomfort when using a microcomputer for an extended time, which of the following types do you usually first detect?
   emotional  mental  physical  none

17. Check any of the following that you typically experience when operating a microcomputer.
   ___ head ache
   ___ irritability
   ___ sore eyes
   ___ stiffness
   ___ tension
   ___ other (describe:
   ___ none of the above

18. What effect do you think microcomputer sounds have on you? (Place an x on continuum below.)
   negative  neutral  positive

19. If your response to the previous question was at the negative end, please indicate why you answered the way you did.

20. In most situations, how do you respond to opportunities to change the way you do something? (Place an x on continuum below.)
   embrace  resist

19. How do you feel about "technology"? (Place an x on continuum below.)
   favorable  unfavorable
Appendix B1
User Satisfaction Inventory

ID Number ________ [TrGr]

Now that you have used the interactive videodisc, "Understanding Human Diversity", please respond to the following questions by circling one response choice.

1. I liked using the interactive videodisc system.
   - YES
   - MOST OF
   - SOME OF
   - NO
   - THE TIME
   - THE TIME

2. I learned a lot with the interactive videodisc.
   - YES
   - NO
   - NOT SURE

3. I would rather learn this material in a regular class than with the interactive videodisc system.
   - YES
   - NO
   - NOT SURE

4. The lesson challenged me to do my best work.
   - YES
   - MOST OF
   - SOME OF
   - NO
   - THE TIME
   - THE TIME

5. Filling out the handouts helped me know if I really understood the material.
   - YES
   - MOST OF
   - SOME OF
   - NO
   - THE TIME
   - THE TIME

6. I would like to take more lessons on interactive videodisc.
   - YES
   - NO
   - NOT SURE

7. This lesson encouraged me to improve my basic skills.
   - YES
   - NO
   - NOT SURE

8. The interactive videodisc allowed me to work at my own pace.
   - YES
   - MOST OF
   - SOME OF
   - NO
   - THE TIME
   - THE TIME

9. I tried to just finish the lesson rather than learn the material.
   - YES
   - MOST OF
   - SOME OF
   - NO
   - THE TIME
   - THE TIME

10. The interactive videodisc system always seemed to be breaking down.
    - USUALLY
    - SOMETIMES
    - NEVER
    - NOT SURE

11. I appreciated the opportunity to work with other people while using the interactive videodisc equipment.
    - YES
    - NO
    - NOT SURE
Appendix B2

12. The opportunity to meet informally with the people I was to work with helped relieve some of the anxiety I felt about using this technology.
   YES   NO   NOT SURE   I WAS NOT ANXIOUS

13. Someone was available to help me when there were interactive videodisc system failures or other problems.
   USUALLY   SOMETIMES   NEVER   NOT SURE

14. For me, most of the work in this lesson was
   VERY   DIFFICULT   ABOUT   TOO
   DIFFICULT   RIGHT   EASY

15. I can use what I learned from these lessons on the job.
   YES   NO   NOT SURE

16. What is the number on the monitor you used?

17. Did you find the touch screen control of the lesson to be easy to use?
   YES   MOST OF   SOME OF   NO
   THE TIME   THE TIME

18. Did you find this brief experience helpful in understanding the educational potential of interactive videodisc technology?
   YES   NO   NOT SURE

19. What did you most like about using this technology?

20. What did you most dislike about using this technology?
Appendix C
Script Notes

Script/notes to present study to UMD class volunteers.

Intro self:
   18 year tchg career; leave to seek school admin. degree

Intro study:
   - fascination with variation in how adults respond to
     situations where they either need to use, or have
     opportunity to use, technology
   - as future administrator for public schools, interest
     in determining how to best support staff in wise use
     of technology
   - presumption is that there are a variety of factors that
     go into the phenomenon that some people seem to embrace
     technology while others seem to resist it
   - purpose of the dissertation is to study some of these
     presumed factors

Need for help in 3 ways:
   1. All of you to fill out 3-page questionnaire to give me
      a general background of this group
   2. As many as possible to spend about 30-45 minutes using
      interactive videodisc technology and then to fill out
      a survey about the experience
   3. Three to five people, whom I will select according to
      types of individuals, to interview with the intent of
      obtaining a more complete understanding of their
      response to technology use.

I would like to conduct these interviews within the
next several weeks and expect the interviews will last
approximately 30 minutes.

It is possible that I will want to conduct follow-up
interviews next fall with these same people.

Do any of you think you will be self-conscious or react
differently if you are video taped? The video camera would be
placed at one end of the room and set to view the whole group
rather than a specific individual.

I will now send around the questionnaire and the sign-up sheet.
Please note that the number in front of your name will become your
identification number for the purposes of this study. Please
memorize it or mark it down so you can put it on the questionnaire
today and the survey and other papers you will fill out during the
study. Your name is needed only to provide Dr. Grossman with a
list of those who have met his requirement that you take part in a
study; the list will be destroyed after this need has been
fulfilled. You will be identified in the dissertation by a
fictitious name and will have the opportunity to read the
resulting document by contacting me. Please note that I have
every intention of completing the dissertation within the year!
Appendix D

Letter to Potential Teacher Participants

February 13, 1991

Dear Colleague:

As some of you know, I am interested in the role technology can and should play in K-12 education. Some districts (state-wide in Texas) have begun to shift away from the predominant use of texts within classrooms to greater utilization of technologies such as Interactive Videodisc (IVD).

IVD combines the manipulation power of microcomputers with the high quality visual/sound reproduction and tremendous storage capacity of laser discs ("CD's" in the music industry). Software programs for school use are being developed in increasing numbers, yet little is known about how teachers feel about this technology.

Although the Duluth Public School District is considering the creation of a technology center where teachers could become familiar with technology hardware and software, we would like to know now how you feel about technology and its use in classrooms.

You have been randomly selected from a list of 4-12 classroom teachers in the district to be given the opportunity to use IVD and respond to a questionnaire about the experience. If we can get most of the teachers selected this way to participate, the information gathered can be more validly inferred to "teachers in general." The resulting data will be used in a personal research project and provided to the district.

Please fill out the following response form and send it to me as soon as possible. In hopes of better accommodating your schedule, a wide range of dates and start times will be arranged. The time requested of you will not exceed a half hour.

Sincerely,

Jonathan Oleson

---

Yes, I am willing to participate.

No, I am not willing to participate.

If willing, which times would you be able to come to CAB? Please check below.

4:00-4:30 p.m.  6:30-7:00 p.m.  Rather than a weekday, I'd prefer:

4:30-5:00 p.m.  7:00-7:30 p.m.  Saturday morning

5:00-5:30 p.m.  7:30-8:00 p.m.  Saturday afternoon

Weekdays which would be best are (please circle): M  T  W  Th  F

Name_________________________  Best time to call__________________

School_________________________  Phone_________________________
Appendix E₁

User Satisfaction Inventory
Open Ended Responses to Q's 19 & 20

Responses to Question 19 ( "What did you most like about using this technology?")

561 The approach seemed to be a personal one-on-one relationship

562 Keeps you focused on material. Work at own pace. Kept my attention better than just listening to someone in class. Easy to operate.

571 It was wonderful. The pictures were so real. It seemed very real. Very informative. It would be a wonderful tool for learning languages.

572 It was new to me but it seemed to be very complete, informative, and easy to use. Almost like being in the classroom.

573 I enjoy experiencing ‘what’s new’ in educational technology.

574 Chance to hear & see things not readily available in a traditional classroom. Opportunity to "experiment" with material.

575 Easy access to lots of material in short amount of time. Being able to follow a sequential pattern of directions.

576 New---Interesting---easy to use.

5131 Pictures!

5132 You were kept busy. Use of handouts information on screen my eyes were always moving.

5133 Variety of data. Working at your own pace.

5134 Individualizes learning.

5135 Variety of the lesson; easy to follow and use

5152 The exposure to it.

5153 Nothing--teaching is human to human, not machine to human. There is a place for technology but used in conjunction with a real live teacher that cares and can respond to needs etc.

5221 It helps if you are a visual learner. The pictures made it more interesting.

5222 Learning about what is available. Easy directions with my team members help.
Appendix E$_2$

5223 I found it quite fascinating. The video output of the photographs was really good.

5224 I enjoyed the graphics, music and the ability to work at my own pace.

5225 It's easy -- colorful -- not just reading the information.

5226 It could be self-paced. It could be reviewed.

5281 The Information is at my fingertips.

5282 - the ease of using it. Hopefully the setup is just as easy.
   - ability to go at my own pace
   - choices

5283 Speed

5284 Simple

6101 Variety. Touch response.

6201 I was able to work at my own pace. I was constantly given the choice to review any material I wanted to review. I liked the variety of sometimes just listening to material and sometimes having to read my own material. Nice photographs to accompany both.

7111 Self controlled, back or forth.

7112 1) Allows for individual pacing. 2) Can go back and repeat Info. 3) Right now, it's "novel".

Responses to Question 20 ("What did you most dislike about using this technology?")

561 I'm not sure I disliked any of it. I have questions about how to incorporate this efficiently into the classes of 30 I have.

562 N/R

571 If it was to be used by students (7th & 8th graders), I can see them just pushing the screen over and over. For myself—I enjoyed it!

572 I haven't used it enough to make this decision but I experienced nothing I disliked.

573 I would like to go through the entire program.
Appendix E₃

574 N/R

575 Not being able to save and review together the subjects history files. Need a print out of valuable information. Nothing like a book to reference.

576 There wasn't anything about it that I disliked.

5131 Nothing.

5132 No moving pictures---looked like a filmstrip.

5133 N/R

5134 Accountability for user.

5135 None

5152 Too many monitors and computers needed in a math teaching situation to be practical at this time for me.

5153 See above. [teaching is human to human, not machine to human. There is a place for technology but used in conjunction with a real live teacher that cares and can respond to needs etc.]

5221 It was intimidating at first.

5222 At times I didn't know where I was going with the exercise.

5223 I probably need more time to get a better overview of the material.

5224 To really learn anything on this disc, I think I would have to work individually rather than with a partner.

5225 too impersonal -- no sponteneity

5226 Reading and following directions. Getting lost in the program. Feeling the info was inadequate to permit me to answer the questions or do the task.

5281 Maybe the size of the screen

5282 The map was blurry and hard to read on the smaller screen. Is a larger screen available?

5283 N/R

5284 Didn't dislike it at all.
Appendix E\textsubscript{4}

6101 The "black frame" around the live action or photos was distracting---full screen would have been easier on the eyes. Task way too large for the simplistic options presented. I suppose there was more depth to explore, but the "path" was limiting. I was distracted by the + that kept showing up on the screen. All in all I don’t respond to sitting in front of a video screen. We are deprived (by choice)--no Cable TV--no video games in our family. I much prefer "real" contact. As an alternative to a "real" teacher, I wouldn’t choose the Interactive disc—it was too "acted" and seemed to fall into the realm of the "canned" learning that I kind of react negatively to. I guess it perpetuates the couch potato and lessens reading and research and action.

6201 Sometimes the material was vague and there wasn’t any way to expand on it.

7111 Nothing.

7112 Right now, nothing.
Appendix F1
Handouts to Participants

Cultural Diversity Use Guide (Research Study, 1991)

Thank you for agreeing to help in this study of the use of interactive videodisc technology. To provide some similarity of experience for each volunteer, please follow the path described below when using the "Understanding Human Diversity" disc.

1. Move cursor arrow down to "Cultural Diversity" and press "Do" or "Return" key. (You will have a blank screen for about 15 seconds while the program is loading. Note that sound does not accompany many portions of the program.)

2. Choose "Introduction to Disc". (From this point and on, you will press the screen to make choices; make sure that your finger does not go above or below item.)

3. "Overview". (#2)

4. "School Situation" (#3)

5. "Main Menu" (#6)

6. "Background Information" (#2) (when prompted, please fill out School Situation Initial Plan, attached to this sheet and identified as page 8)

7. "Lifestyles" (#2 in Module Menu: Background)

   "See individual photographs with computer text" (#2 in Lifestyle Section Menu)

   "Home-centered Life Events" (#2 in Lifestyles Section: Individual Photographs)

   "Return to the lifestyle section menu" (#5 in Lifestyles Section: Individual Photographs)

8. "Return to the module menu" (#4 in Lifestyle Section Menu)

9. "Languages" (#4 in Module Menu: Background)

   "Hmong" (#2)
Appendix F2

"Section summary" (#6 in languages Section Menu) (Please fill out "Language Section" and "Background Module Summary", attached as page 12)

"Return to the Main Disc Menu" (#6 in Module Menu: Background)

10. "Disc Conclusion" (#6 in Main Menu)

"School Situation" (#1 in Module Menu: Conclusion)
(Make your own choices at this point if you'd like and then return to "Write final plan" (#4) and fill out sheet identified as page 20.)

"Return to the module menu" (#5 in School Situation Section Menu)

11. "Go to Disc Ending" (#5 in Module Menu: Conclusion)
[You do not need to turn off machine]

When finished, please move to a table and fill out the questionnaire about your responses to using this technology. Place completed questionnaire on the coffee table near couch as you leave. Thanks!
Appendix F4

2. How might knowledge about languages help you in writing comprehensive final plans?

BACKGROUND MODULE SUMMARY

Describe how finding background information (such as language and lifestyle) related to persons from different backgrounds can help a person in an education profession.
PLEASE NOTE

Page(s) missing in number only; text follows.
Filmed as received.

UMI
<table>
<thead>
<tr>
<th></th>
<th>SHOWS SOLIDARITY, raises other's status, gives help, reward:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>SHOWS TENSION RELEASE, jokes, laughs, shows satisfaction:</td>
</tr>
<tr>
<td>3</td>
<td>AGREES, shows passive acceptance, understands, concurs, compiles:</td>
</tr>
<tr>
<td>4</td>
<td>GIVES SUGGESTION, direction, implying autonomy for other:</td>
</tr>
<tr>
<td>5</td>
<td>GIVES OPINION, evaluation, analysis, expresses feeling, wish:</td>
</tr>
<tr>
<td>6</td>
<td>GIVES ORIENTATION, information, repeats, clarifies, confirms:</td>
</tr>
<tr>
<td>7</td>
<td>ASKS FOR ORIENTATION, information, repetition, confirmation:</td>
</tr>
<tr>
<td>8</td>
<td>ASKS FOR OPINION, evaluation, analysis, expression of feeling:</td>
</tr>
<tr>
<td>9</td>
<td>ASKS FOR SUGGESTION, direction, possible ways of action:</td>
</tr>
<tr>
<td>10</td>
<td>DISAGREES, shows passive rejection, formality, withholds help:</td>
</tr>
<tr>
<td>11</td>
<td>SHOWS TENSION, asks for help, withdraws &quot;Out of Field&quot;:</td>
</tr>
<tr>
<td>12</td>
<td>SHOWS ANTAGONISM, defeats other's status, defends or asserts self:</td>
</tr>
</tbody>
</table>

**INTERACTION SCORING FORM**

Prepared for use with Interaction Process Analysis by Robert P. Bales
PRINTED IN U.S.A.

---

**Appendix G**

Complete Bales Scoring Form

Group __________________

Date __________________

Observer __________________
<table>
<thead>
<tr>
<th>Interaction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 SHOWS SOLIDARITY</td>
<td>Raises other's status, gives help, reward</td>
</tr>
<tr>
<td>2 SHOWS TENSION RELEASE</td>
<td>Jokes, laughs, shows satisfaction</td>
</tr>
<tr>
<td>3 AGREES</td>
<td>Shows passive acceptance, understands, concurs, complies</td>
</tr>
<tr>
<td>10 DISAGREES</td>
<td>Shows passive rejection, formality, withholds help</td>
</tr>
<tr>
<td>11 SHOWS TENSION</td>
<td>Asks for help, withdraws &quot;Out of Field&quot;</td>
</tr>
<tr>
<td>12 SHOWS ANTAGONISM</td>
<td>Deflates other's status, defends or asserts self</td>
</tr>
</tbody>
</table>

**Appendix G2**

Bales Scoring Form

(select portion used)

**GROUP DATE**

**INTERACTION SCORING FORM**

Prepared for use with Interaction Process Analysis by Robert P. Bales
Printed in U.S.A.

Published by ADDISON-WESLEY PRESS, INC.
Cambridge, Mass.

**Group**

**Date**

**Observer**


Clark, R.E. (1989, February). The singer as iconoclast: Six arguments about the use of video disk for teaching. Proceedings of Selected Research Papers, presented at the Annual Meeting of the Association for Educational Communications and Technology, Dallas, TX. (ERIC Document Reproduction Service No. ED 308 814, 113-121)


Combs, M. (1985, September). Exploring the composing process with microcomputers. Paper presented at the annual meeting of the National Reading and Language Arts Educators Conference, Kansas City, KS.


*Educational Technology, 5-10.*


Oleson, J. E. (1988). The teacher, the student, the classroom and Interactive videodiscs. Paper prepared in partial fulfillment of course work at the University of Arizona.


Shykes, D. (1995). Interview of a hesitant user of microcomputers, Duluth Public Schools, Duluth, MN.


