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An Evaluation Instrument for the Selection of an Integrated Learning System

Sally Ann Draper Zoll EdD
University of San Diego

AN EVALUATION INSTRUMENT
FOR THE SELECTION OF AN INTEGRATED LEARNING SYSTEM

by

Sally Ann Draper Zoll

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Dissertation Committee

Susan M. Zgliczynski, Ph.D. Director
Edward Kujawa, Ph.D.
Ralph V. Patrick, Ed.D

ABSTRACT

AN EVALUATION INSTRUMENT FOR THE SELECTION OF AN INTEGRATED LEARNING SYSTEM

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Director: Susan M. Zgliczynski, Ph.D.

The purchase and integration of integrated learning systems (ILSs) in schools is on the rise. Dissatisfied with stand-alone computers and software, educators are looking for a more sophisticated integration of computer technology throughout the entire curriculum, specifically, an ILS. Current research evaluating such systems is scarce.

The purpose of this study was to develop an instrument that decision makers in school districts could use to evaluate an ILS at the pre-purchase stage. The instrument was designed expressly for school district personnel who have completed a needs assessment and have determined that an ILS will meet their needs. The instrument was developed to help them assess which ILS will meet their needs.

A qualitative approach using case study methodology was used to elicit information from ILS vendors and school district decision makers which would contribute to the development of the ILS assessment instrument. Data collection was completed through interviews, observations, and document review. Data analysis was accomplished using a coding system and matrices. An instrument was developed based upon the data collection and analysis.

The final phase of the design process was the preliminary and operational field testing. Preliminary field testing was accomplished by asking representatives from ten school districts to evaluate the instrument for content, format, and usefulness. Based upon their responses the instrument was revised. To complete the operational field testing, personnel from five school districts used the revised instrument to evaluate integrated learning systems during their ILS selection process and validated its content, format, and usefulness to school district decision makers wanting an effective method to assess ILSs.

Results of this study suggested that (a) qualitative methodology was an appropriate way to collect and assess data for instrument design, (b) the instrument for the evaluation of ILSs was needed by school district decision makers, (c) within the limitations of small sample size, the developed instrument was proven to be valid, reliable, and useful by school district personnel, and (d) a secondary benefit of the instrument was its comprehensive coverage of ILSs, making it a useful instructional tool as well as evaluation tool.

DEDICATION

I dedicate this dissertation

to my family,

Mel, Odetta, Jim, Cory, Chelsea, Jimmy, and Bryan,

for their support and indulgence of my love of learning.

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The doctoral program at the University of San Diego has been a unique, fascinating, growing experience for me. Even more exciting has been the applicability of the theory to the business world I entered. Many thanks are offered to my dissertation chairperson, Dr. Susan Zgliczynski, for her many years of help, inspiration, encouragement, and wonderful sense of humor. To Dr. Edward Kujawa I extend warm gratitude for both his personal and professional friendship and guidance. Dr. William Foster quietly challenged my thoughts amd beliefs about organizations and how they behave for which I am appreciative. Finally, I thank Dr. Joseph Rost for his relentless expectation of excellence, his honest assessment of my performance, and his wonderful culinary extravaganzas!

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I have been particularly blessed to have so many special friends during this long process. To all of them I am grateful for their understanding during my lapses of attentiveness. I am especially thankful for Carol Raiter, my dearest friend. I thank her for her relentless support of what often seemed like a senseless pursuit. Equally important to my success has been the "tough love" assistance I

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I believe few children have the good fortune to be so believed in by their parents as I was. I believe few children have the good fortune to be so encouraged to do and be anything they choose. I believe few children have the good fortune to be so unselfishly loved and cared for. No other children have had the good fortune to have my parents for their parents. To Melvin M. F. Draper and Odetta Harbison Draper, my father and mother, I extend my upmost respect for accomplishing all that they have accomplished and my thanks for their simple love and faith in me.

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CHAPTER I

Statement of the Issue

Introduction

Computer technology is transforming society today, just as the invention of the printing press did 500 years ago. Giving society a more efficient and effective way to encode, save, and retrieve information, it "seems destined to have pervasive and lasting effect on our professional and our personal lives" (Kulik, 1985, p. 4). Educators, being part of this society experiencing the computer age, are questioning how education will transition into the computer age.

The number of computers in schools in the United States has increased dramatically since 1980. From Fall, 1980, to Spring, 1982, the number of microcomputers available for instructional use by public school students tripled (Wright, D., 1982). In 1985 the United States Department of Education commissioned Becker of Johns Hopkins University to conduct the National Survey of Instructional Uses of School Computers. The study was based on a random sampling of private and public schools. Results included the fact that there were no computers in over 50 percent of elementary

schools in 1983. However, in 1985 "90 percent of all United States school children attend[ed] a school with at least one computer" (Becker, 1985, p. 149). In the 1986-87 school year, the installed base of microcomputers grew to 2.03 million, an increase of 25 percent from the previous year, with schools spending $415 million for hardware alone (Goodspeed, 1988). Computer hardware purchases increased for 55% of school districts surveyed by QED in 1988 and software purchases increased for 64% of surveyed school districts. Indications are that this trend will continue.

Instructional Uses

The first uses of the computer in teaching occurred in the late 1950's at IBM's Watson Research Center (Levin, 1972). In 1958 the digital computer was programmed to teach binary arithmetic. Kulik and Kulik reported that in 1960 IBM unveiled the first computer assisted language, Courseware, that enabled educators to develop instructional models themselves (1984). This language was quickly adapted to teach German, stenotype, and statistics.

Major developments in computer applications followed. Donald Bitzer, along with engineers, physicists, psychologists and educators at the University of Illinois, began developing PLATO (Programmed Logic for Automatic Teaching Operators). Patrick Suppes and Richard Atkinson,

of the Institute of Mathematical Studies in the Social Sciences at Stanford University, began their own studies on computer assisted instruction (CAI) in 1963. In 1964 Pennsylvania State University established a CAI laboratory for research and development (Kulik & Kulik, 1984), recognizing the impact that computer assisted instruction would have.

The development of the microchip and the microcomputer during the late 1960s lead to even more use of computers in education, as prices of computers declined and memory capacity rose.

Computer-Assisted Instruction

The acronym CAI is often used in the area of educational instruction. It has been variously interpreted as "computer-augmented instruction," "computer-aided instruction," "computer-administered instruction," and "computer-assisted instruction." For the purpose of this study CAI will stand for "computer-assisted instruction" and is defined as hardware and software that provides individualized instruction meeting individual differences and needs. Just as the instructor can modify teaching techniques with respect to varying achievement levels, learning rates, and student interest (Blair, Rupley & Jones, 1986), so too can computer systems (Bitter, 1982; Goldman & Pellegrino, 1986; Yang, 1987).

An increasing number of agencies are relying on CAI to accomplish objectives. In fact, the literature pointed to

many examples where CAI was employed. In the private sector, CAI was used for a variety of training projects (Wehrenberg, 1985; Meyer, 1983) as well as for programs to change attitudes and values (Billings, 1984). Bennik (1980) reported use of CAI in a United States Army training program and Wisher & O'Hara (1981) showed the use of CAI for the United States Navy recruit program. State and local goverment used CAI for many different training programs (Broussard, 1983). The widespread use of CAI in all of the above areas was surpassed only by the use of CAI in schools.

Currently, CAI is the main use of computers in elementary schools. Why the increasing interest and use? A study, "Informational Technology and Its Impact on American Education," published by the congressional Office of Technology Assessment (OTA), cited four reasons for the increased interest in CAI: (a) declining cost of equipment; (b) escalating cost of traditional labor intensive classroom teaching; (c) improved understanding of how to create instructional software; and (d) the linking of computers with other technologies such as video disks or interactive cable, which opened up a wide array of teaching possibilities (Bell, 1983).

Games and programming languages such as BASIC and LOGO were the other applications found in elementary schools. Becker reported that grades K-3 used computers for CAI 77% of the time and grades 4-8 used CAI 48% of the time (1986).

Programming (using the instructions or language that make computers work), keyboarding, word processing and data file management were used in a minor way (Becker, 1983). Computers were also still used to play games in schools (Reed, 1986), however, CAI was having the most direct impact upon students.

What is CAI?

CAI software is produced by many different companies and is characterized by questions or problems to solve, rewards for right answers, rapid feedback to the user, graphics, and sound. The quality varies greatly and much criticism is directed toward CAI with limited levels of instruction (Edwards, Norton, Taylor, Weiss & Dusseldorp, 1975). Furthermore, CAI is criticized for lesson sequencing that is non-flexible, content that is boring, and the use of only drill and practice instructional techniques.

Good CAI should be such that "students will profit from an immediate evaluation of what they have done and will move forward as soon as they are ready . . .[even] those who move slowly will survive as successful students" (Skinner, 1986, p. 110). Skinner said that children using computers would free teachers to spend more quality time with their students. Instructionally strong CAI has also been associated with positive student motivation and with providing individualized instruction to those students out of step with their classroom instruction.

There are three basic types of CAI: drill and practice, tutorial, and simulation (Bitter, 1982; Kinzer et al., 1985; Dickey & Kherlopian, 1987). Drill and practice is the most prevalent type of CAI and is most often used in mathematics and spelling. Often remedial in nature, its goal is to strengthen student understanding of basic skill concepts. Tutorial courseware is designed to instruct as opposed to drill. Finally, simulation software involves students in actual simulations of real life experiences to apply previously learned knowledge.

Computer-Managed Instruction

A more sophisticated and individualized type of CAI is computer-managed instruction or CMI (Bolton & Clark, 1973; Burke, 1982). Patrick Suppes discussed the notion of CMI during the early years of CAI at Stanford University (Suppes & Macken, 1978). Since then, its development and use has become more established, to the point of being not only desirable but necessary. "The only long-term future in the educational market is in sophisticated, networked instructional management systems" (Smith & Kauffman, 1985, p. 28).

In CMI, the computer acts as an instructional clerk. It scores tests, keeps records, and maintains schedules. Historically, students in a computer-managed class might never see a computer but only have their instruction guided and maintained by the computer (Kulik & Kulik, 1984). But as computer technology has progressed so has the notion of

CMI.

In its fullest application, CMI can be described as a "management system for an educational program built around a design technology that uses student performance information to improve instruction" (Wager, 1985, p. 27). It is software that can diagnose educational needs via testing procedures, prescribe instruction based upon the diagnosed needs, continue to test and monitor needs, record test and lesson results, and match curriculum to learning objectives (Bluhm, 1987). In addition to the management system, it can incorporate the three previously mentioned types of CAI (drill and practice, tutorials, and simulations) to supplement classroom instruction. This happens in a networked environment where software allows for data transfer between workstations and the file server via cables that link workstations and file servers together (McCarthy, 1988). "Networking enables an entire class to access the same software program" (Kloosterman, Ault, & Harty, 1987, p. 36).

Advantages and Disadvantages of CMI

One of the advantages of CMI over CAI is the ability to set mastery levels for the student, as well as set the number of lessons and the difficulty of the level. CMI provides monitoring and frequent analysis on a broader scale than CAI. After each point of monitoring the student may be moved to a level of more or less difficulty - a notion known as branching. CMI presents "material at the student's

level, branches based on the type and quantity of errors made, and alleviates the teacher of many record keeping and management functions" (Kinzer et al., 1985, p. 129).

CMI is more expensive than CAI because of its higher level of sophistication. The cost of the hardware is generally more for a CMI setting than for CAI because of peripherals such as a file server which acts as the information and instructional manager (Smith & Kaufman, 1985)), the network, and the printer required for the operation of CMI.

The sophistication of CMI allows it to encompass an entire curriculum (e.g., K-8 reading or mathematics). Because of the magnitude of this instructional courseware, teachers must spend many hours becoming familiar with the objectives and content of the software (Morgan, 1978) and it takes longer to learn to use the software than a typical single CAI lesson (Kloosterman et al., 1987).

CMI has the potential to meet student needs in a more powerful way if the design of the software is instructionally sound and the design of the management system is equally superior. CMI is a step beyond CAI.

Integrated Learning Systems

An integrated learning system (ILS) is specially developed CMI which uses computers to diagnose, reinforce, and enhance individual or group learning of basic skills

(Bruder, 1988). T.H.E. Journal 1986-87 Source Guide described ILSs as "integrated hardware/software solutions, configured, installed and supported by the manufacturer . . [or other vendor]" (p. 9). It was stated in the Journal article that ILSs were becoming increasingly popular in schools as instructional support. The major ILS vendors reported that sales were on the rise. According to Reinhold (1986), the number of ILSs has greatly increased in the past three years.

T.H.E. Journal 1986-87 Source Guide authors acknowledged that because of equipment specifications, the acquisition of an ILS required a considerable investment: a standard 30-computer system could cost as much as $100,000. This cost was substantially lower in schools that had hardware in place that was compatible with the chosen software. If equipment was not available, computers were purchased either directly through a hardware vendor, or through the ILS company. Sometimes an ILS company provided the hardware and the software. Regardless of how or where the hardware was purchased, employees of the ILS company oversaw the installation, personnel training, and initial operation of the system.

Components of an Integrated Learning System

The components of an ILS include the hardware, software, supplemental materials, system assistant, training of school personnel, and ongoing school site visitation from

ILS company personnel. An ILS may consist of 2 to 40 student stations that are connected to a file server that sends appropriate lessons to the student stations, and continuously receives and records information from them regarding student progress.

Hardware. The hardware may be purchased through the software vendor or directly from the hardware vendor. Of course, the hardware must be compatible with the selected ILS software. Hardware consists of student stations (which may be microcomputers such as Tandy, Apple or IBM; or they may be dedicated stations that can only be used with the ILS) with memory of 640 k. to 1 mgb., a file server which must be a larger microcomputer with greater memory capacity than the student stations, a hard disk drive to use for storage, cables to connect the stations, and other hardware peripherals listed below.

Peripherals. These are pieces of equipment which may be necessary to support the student stations and file server. Such items might include printers, headphones, adaptive computer boards, or mice. In addition, network software is needed to connect the file server to the student stations.

Software. CMI in basic skills covering the areas of reading/language arts and mathematics comprises the majority of ILS curricula. In most instances, educators serve as advisors or curricula writers to develop the ILS courseware.

Other curricula are available including keyboarding, word processing, science, and English as a Second Language.

Report functions. Main features of an ILS are the record keeping and report functions and testing modules. The record keeping process monitors, records, and reports student progress to facilitate instructional management. These reports may be general class rosters showing student progress and comparative information or they may be individual student reports. The testing modules may include a pre-test and then appropriate placement in lessons as well as a post-test for achievement monitoring.

Training. Inherent in an ILS is the instruction provided to the school and district personnel on how to use the ILS in their particular setting. Hands-on training as well as extensive staff development about curricula content and educational philosophy is available with all ILS companies.

Customer support. Educational consultants visit schools with systems installed on a regular basis to not only support the school but to take back to the ILS company field information to improve the product. Most ILS companies also provide telephone assistance whenever problems arise with the system.

System assistant. Most integrated learning systems require an individual to run the system. Either the school district or the ILS company will supply the assistant. This

assistant is trained by the ILS company to operate the system on a daily basis, and to also serve as a liaison between the school and the ILS company.

ILS operation. An ILS is a combination of hardware, network software, and computer managed instructional software that work together in a laboratory setting or distributed throughout a school, supervised by a designated assistant. In elementary or middle schools, entire classes may be scheduled to go to a laboratory at one time, or parts of classes may attend. School faculty may also choose to distribute the student stations throughout the school with a small number of stations in each classroom. Students in each classroom may access their individual files at any point during the day. Ideally, the system assistant is always on-site to assist students as well as handle any system difficulties. The classroom teacher may or may not be present. Pre-selected CMI lessons from the the child's lessons sequence are ready for the student when he enters the system. Students typically work 15-40 minutes per session, from 2 to 5 times a week, depending on the school schedule.

When students finish their lessons, the results are sent to the file server to be stored in each student's file, and the students' next lessons are automatically sent to the students' computers. This process continues throughout the day. After every curriculum sequence ends, the each student should receive a unit review or test that evaluates long

term retention of learning. These unit test reports as well as daily lesson results may be printed for the teacher at any time.

Statement of the Issue

The purchase and integration of ILSs in schools is on the rise. 25% of all school districts surveyed by QED in 1988 used integrated learning systems (Quality Education Data, Inc.). Dissatisfied with stand-alone computers and software, educators are looking toward a more sophisticated integration of computer technology throughout the entire curriculum; specifically, an ILS. Current research evaluating such systems is scarce. Large school districts have the resources to perform product evaluations on ILSs before they purchase the system, small school districts do not. Smith (1981) suggested that evaluation methods and instruments are needed for use in small school districts where staff have little time, resources, or expertise. Large school districts have the personnel and other resources to perform such an evaluation but the notion of an ILS is so new that the necessary background knowledge required to develop an ILS evaluation may be lacking.

The Talmis research firm released its 6th Annual Report on Educational Technology in March, 1988. Talmis confirmed that "large-scale evaluations of the effectiveness of the

personal computer in instruction are lacking, as are implementation models that detail computer use in different settings with a variety of student populations" (Goodspeed, 1988, p. 16). And at a collaborative work session of the Chief State School Officers/Technology Group Meeting in Charlotte, North Carolina in September, 1988, the following recommendations were made:

1. State school officials and vendors need to collaborate on developing a policy for software evaluation.

2. State officials need to identify categories of global and specialized computer solutions for evaluation.

3. State officials need to define summative and formative standards/guidelines for evaluation of computer solutions.

4. State officials need to establish a task force among public and private entities to examine instructional solutions of individual integrated learning systems.

5. State officials need to define functional uses and solutions of technology.

6. State officials need to define a centralized mechanism for the review of the evaluation process and the dissemination of results to public and private entities. (Staff, 1988).

Purpose of the Study

It is the purpose of this study to develop an instrument that decision makers in school districts might use to evaluate the effectiveness of an ILS at the pre-purchase stage, assisting the decision makers in their selection of an ILS. This instrument will be designed expressly for those school district personnel who have completed a needs assessment and have determined that an ILS will meet their needs. The decision to be made is which ILS will meet their needs most appropriately.

Research Questions

The following questions motivated this study:

1. What kinds of evaluation models or instruments are available to evaluate products such as an ILS? What are the advantages and disadvantages of using these models for an ILS?

2. What kinds of questions do school district personnel currently considering the purchase of an ILS want answered about ILSs in terms of cost, curricula, instructional design and integrity, method of delivery, management, and system utilization? What questions do

the decision makers need answered to make their selection?

3. What is the most effective way to evaluate an ILS, considering areas of finance, curriculum, instructional design and integrity, hardware, method of delivery, management, and system utilization?

4. Can this evaluation instrument be used effectively by decision makers in school districts to make a decision as to what ILS is the most appropriate one to purchase?

Significance of the Study

The creation of an evaluation instrument for use by school district decision makers that assesses all available data, that is easy to use, and that minimally impacts resources and personnel at the school district, will provide a widely used, accurate analysis of an ILS which is currently unavailable.

Definition of Terms

The following terms have been defined as they apply to this study.

CAI: Computer assisted instruction is instruction provided to a student via computer hardware and software.

CMI: Computer managed instruction is the application of computers to the management of instruction, such as testing, diagnosis of learning difficulties, keeping records of student progress, and informing students of their next lesson.

Decision Makers: Decision makers are individuals within a school district who "feel a difficulty," locate and define it, propose possible solutions, rationally develop the implications of the alternatives, and make observations and experiments that lead to acceptance or rejection of the suggestion (Burns, 1978, p. 408).

Evaluation Instrument: An evaluation instrument is a device used for measuring the value of the quantity under observation. It might be a survey, a questionnaire, or an inventory.

Evaluation Model: An evaluation model is a pattern or mode of structure for the evaluation of a quantity under observation.

ILS: An integrated learning system is an educational product consisting of computer assisted instruction provided

to a student through a networked computer hardware/software configuration. It is managed by specially designed software called computer managed instruction or CMI.

Marketing Representative: Marketing representatives are employees of ILS companies whose primary responsibility is to sell and/or market the company's products to schools.

Qualitative Evaluation: Qualitative evaluation is evaluation that features: (a) a natural setting as the data source and the researcher as the key data collection instrument, (b) a description as the primary goal, (c) the process as much as product, and (d) data that are analyzed inductively (Tuckman, 1985).

Rationale

Ingersoll and Smith (1984) reported "recent criticism of American Schools has sent educators and the general public on a search for ways to improve their image and operation. . . . Computers are mentioned by all concerned as an important way schools can improve their reputation" (p. 86). A related comment was made by Bennett (1986) confirming that there is "pressure to keep up with current trends from parents, from school boards, and from general education itself" (p. 50). In many cases, this pressure

resulted in the haphazard purchase and placement of computers in schools. Scheffler (1986) warned that "Mere faddishness, or corporation hype, or status seeking, or parental panic, or widespread social use are not enough [for putting computers into schools]" (p. 514).

Debates regarding the effectiveness of computer assisted instruction are becoming "more than academic as educators consider competing demands for allocation of scarce fiscal resources" (Bozeman & House, 1988, p. 82). With competition of funds increasing, decision makers will begin to more carefully scrutinize the purchase of technology.

Accountability, traditionally associated with the evaluation of teachers, is now extended to computer instruction. There are growing efforts by school districts to prove that learning and achievement result from computer use. Talmis says "It is clear that the next few years will be ones of experimentation and evaluation. The schools need to develop evidence that their current investment in computers has paid off in terms of improved instruction" (Goodspeed, 1988). Studies on the effectiveness of computer instruction by computer companies, educational foundations, public and private agencies, universities, and researchers address the question of the impact of computers on learning. These studies are of great interest to superintendents, administrators, school board members, and parent/teacher

organizations (Gerber, 1986; Tucker, 1985; Watson et al., 1987). In addition to effectiveness (student achievement), other issues such as increased attendance, positive attitudes, time savings, instructional standardization and efficiency, system costs, and student learning retention are subjects of great debate and interest (Bozeman & House, 1988).

Lack of information regarding CAI and CMI is not a problem; there is much literature to be found concerning CAI and CMI effectiveness. However, findings are inconclusive and often contradictory. Bozeman and House (1988) faulted most CAI research efforts "for methodological problems and a failure to provide conclusive evidence to resolve the question of the effectiveness of [CAI]" (p. 83). "Different evaluation paradigms for [CAI] must be explored. Strategies which examine qualitative aspects of [CAI] may provide much richer analyses of the strengths and weaknesses of the programs" (Bozeman & House, p. 86).

In addition, because of their newness, there is very little research regarding ILSs. What research exists suffers from the same contradictory results that CAI research does. Bozeman & House (1988) insisted that different evaluation paradigms for computer based instruction must be explored and implemented.

Contribution to Educational Leadership Community

Ten years ago the first microcomputers were placed in classrooms. Ten years and 1 million microcomputers later (Bozeman & House, 1988), educators are still trying to determine the practical implications of computers in the classroom. In 1985/86, state departments of education reported expenditures of $550 million and $130 million for hardware and software respectively (Reinhold, 1986). Nancy Taylor, an ILS company representative, was quoted in an article by Barbour (1987) as saying that the total ILS market was currently worth $110 million a year and was expected to grow 30 percent per year for the next 3 years. The market is "on the verge of a boom" (Barbour, p. 10).

Such a "boom" in the marketplace indicates that educators are looking to ILSs as critical components of the educational process in an increasingly complex society. ILSs are, however, new and virtually unknown. Research tells very little about the overall integration of an ILS. Guidelines and objective studies available to educational leaders considering an ILS purchase and implementation are sparse.

Consequently, the development of an instrument that educators can use in virtually any setting to assess an integrated learning system is a major contribution of merit that has the potential to save millions of dollars.

Organization of the Dissertation

Chapter I provides a history and definition of computer assisted instruction, computer managed instruction, and integrated learning systems. It defines terms, the purpose of the study, and rationale for the study.

Chapter II provides a review of the literature relevant to CAI and ILS effectiveness. It also defines evaluation within the context of education, reviews models and instruments available for evaluating educational programs and products, and specifically describes evaluation instruments available for assessing educational software.

Chapter III provides a detailed description of the research design and methodology used to develop an instrument for ILS evaluation.

Chapter IV contains a description of the process of designing, testing, administering and refining the instrument of evaluation.

A summary of the dissertation is provided in Chapter V, suggesting implications for future study and development.

CHAPTER II

Review of the Literature

The review of the literature is divided into the following parts: (a) research completed on CAI effectiveness as previously defined, (b) research results on the effectiveness of ILSs as defined, (c) evaluation models, (d) instruments available to evaluate educational products, and (e) instruments for assessing CAI and integrated learning systems.

CAI - What the Literature Says

CAI has been used for instruction ever since educators began combining the features of Skinner's programmed instruction with Skinner's and Pressey's teaching machines (Dence, 1980). As early as 1960, James Finn suggested that CAI would have a positive impact on students, although he did not describe any specific situations (McBeath, 1972). In 1967, Heinrich recommended conducting experiments with control groups taught by computers (Cochran, 1977). From that point on, research conducted on various aspects of CAI versus traditional methods of instruction has been prolific.

Kulik et al. (1985) described two types of reviews used to integrate the numerous findings on CAI: box-score tabulations and meta-analysis. Box-score reviews reported the proportion of studies favorable and unfavorable and then provided a narrative as well. Box-score reviews were generally favorable. Vinsonhaler and Bass (1972) found positive results on eight separate reports on CAI in elementary schools. Edwards, Norton, Taylor, Weiss, and Dusseldorp (1975) covered an even wider range of applications of CAI and found 75% of the findings to be positive (Kulik et al.).

In 1981, Burns and Bozeman reported that despite the many published reports comparing the effectiveness of CAI to traditional instruction, the results were "conflicting and inconclusive " (p. 35). They then presented their own research, using the research integration methodology known as meta-analysis. Meta-analysis, developed by Glass (1976, 1978) and by McGaw and Glass (1980), analyzes the analyses, obtaining a quantitative synthesis of research outcomes. The meta-analysis of Burns and Bozeman concluded that the analysis and synthesis of many studies did point to a significant enhancement of learning in instructional environments, supplemented by CAI, at least in one curricular area - mathematics. Hartley (1978) and Burns (1981) also found positive results using meta-analytic research to review CAI in elementary schools.

A four-year research project conducted by the Educational Testing Service (ETS), showed dramatic results with CAI at the elementary level. Half the students in four Los Angeles elementary schools were allotted 20 minutes a day of CAI, divided among mathematics, reading, and language arts. Each year of the project the average test percentile of CAI students relative to the control group increased: 64/50 the first year, 71/50 the second year, and 76/50 the third year. This study also revealed that the effect of computers on learning was more pronounced among disadvantaged and low aptitude students than among talented students or high achievers (Bell, 1983).

By 1983, the majority of studies showed some sort of positive experience associated with CAI, whether it be achievement gain, attitude improvement, less time on task, or increased attendance. Most of these studies had methodological faults, however, including poor design, inappropriate statistical analysis, small samples, short time frames, or too many variables. However, Kulik et al. (1985) determined to avoid such pitfalls. Using state of the art methods in integrating research findings, they found that in each of the 28 studies with results from achievement examinations, "students from the CAI class received the better examination scores . . . and that the difference between CAI and conventional classes was statistically significant [in a total of 23 out of 28 studies]" (p. 68).

Despite the positive findings of these researchers, Clark (1985) presented contradictory evidence. He argued that existing evidence, including the meta-analytical techniques, indicated no gain in learning benefits (Ngaiyaye & VanderPloge, 1986). He stated that it was not the media that influenced performance but the instructional strategies of the computer.

The fact that "opinion is divided in the research community, compounded with the increase in demand for, or growing variety in, CAI systems, makes it imperative to continue research studies until sufficient evidence is available that refutes or supports, beyond the shadow of doubt, effectiveness of computer-based education" (Ngaiyaya & VanderPloge, 1986, p. 3).

Henry Becker of Johns Hopkins University has been conducting surveys on the effectiveness of CAI for several years. His most recent report, The Impact of Computer Use on Children's Learning: What the Research Has Shown and What It Has Not, acknowledged the great number of studies that have been conducted on CAI in the past 15 years, but pointed out that many are not relevant today. Early studies looked only at mainframe and minicomputer delivery, software was primitive, and the entire instructional milieu was different (Bracey, 1988).

Becker said that "all except two of the more than 200 studies contained in the Kulik, Kulik, and Bangert-Drowns

and Niemiec and Walberg meta-analyses were published prior to 1983. Even more significantly, "studies involving microcomputers constituted only one out of 64 studies in the two most recent Kulik et al. reviews, and only two out of 224 studies in the Niemiec and Walberg meta-analysis" (Bracey, 1988, p. 70).

Becker began a new review of the literature using best-evidence synthesis which required reviewers to establish explicit criteria for including or excluding studies. Studies he reviewed were produced after 1984 and included achievement in the outcome. Of the 51 studies he found, he discarded 34 because of no control group, no random assignment of groups, less than 8 weeks duration, or too few students.

Out of the remaining 17 studies, the one he found most methodologically sound project mathematics instruction in grades 3 and 5. The effect size was +.48 in the third grade and +.31 in the fifth grade which were educationally significant outcomes (Becker, 1988). Another study in this group was conducted in grades 1 through 6. Using the Metropolitan Achievement Tests as the evaluation instrument, the effect sizes averaged +1.00 which is interpreted as follows: the treatment shifted the experimental group one full standard deviation up (Bracey, 1988).

Becker suggested that despite the positive reports from his most recent research, 17 studies "do not come close to providing prescriptive data for deciding whether and how to

use computers as adjuncts for instruction " (Bracey, p. 71), and proposed a new model of research to build a knowledge bank that would tell educators under what conditions and circumstances computers would be effective.

Research from the University of North Dakota supported Becker's theory. Grabe (1985) said that research with microcomputers in elementary and secondary education has not generated a data base yet from which educators can evaluate software or hardware. In fact, current studies involve isolated skills or activities instead of integrated curriculum and management systems. He recommended future research that does not attempt to prove or disprove the superiority of computer assisted instruction over traditional instruction but, instead, research designed to determine what educational scenarios involving computers are most effective in impacting a student's education in a positive way.

In summary, most research pointed towards CAI having a positive effect on learning, even though the research was plagued by poor or inappropriate methodology and outdated data. More recently, researchers have encouraged the development of research studies that evaluate computer implementation as opposed to computer effectiveness.

ILS - What the Literature Says

Kulik, Kulik and Bangert-Drowns, prolific researchers in CAI effectiveness, have suggested that their research in CAI described specific computers used in specific ways for specific purposes (1985). Their research did not address microcomputer based systems nor did their computer searches produce adequate evaluation studies of integrated learning systems, just as Becker suggested. Their recommendation was for educational evaluators to turn their attention to computer based instruction in order for the research "to better reflect the breadth of computer uses in education" (p. 72).

Becker of Johns Hopkins University did just that. He implemented a new model of research, as previously suggested, in a nationwide study to determine if there were any significant gains in mathematics achievement when students received computer-assisted instruction on an integrated learning system as compared to students that were taught using only traditional methods. During the 1987-88 school year, Hurst Hills Elementary School in Hurst-Euless-Bedford Independent School District, Hurst, Texas, participated in the study at grades 5 and 6, using Education Systems Corporation's (ESC) integrated learning system. One class at each grade level was designated the experimental (computer) group and one as the control group. Both groups at each grade level were taught by the same teacher using

the same curriculum and learning objectives. The test variable was the ESC mathematics software which was used by the computer group students 3 days a week for one hour. Both teachers were encouraged to integrate the ESC curriculum into classroom activities. The achievement gains, as measured by the California Achievement Test (CAT), showed that the experimental group gained an additional year of achievement over the students in the 5th grade control group. Pre- and post-test results also indicated that computer students at both extremes of the ability-level spectrum showed significantly greater gains (Goode, 1988).

The Fort Worth Independent School District reported that in 1985-86, all Chapter I Parochial school students who had more than 750 minutes of CAI on an integrated learning system from Computer Curriculum Corporation (CCC), made a mean gain of 10.5 NCEs (Normal Curve Equivalent), equivalent to 1.5 grade years (Suppes, Zanotti, Smith & Tingey, 1986).

CCC also reported that 3500 students in Calvert County Schools, Maryland, spent 10 minutes a day on computers in mathematics and reading curriculum and moved the district in ranking from 23rd out of 24 districts to 3rd in the state, although the IQ of the tested population remained at the same level (Calvert County Public Schools, 1987). This study was validated by Gilbert Austin of the University of Maryland in an independent study.

Nine elementary schools used Prescription Learning

Corporation's integrated learning system in Portland, Oregon. The Research and Evaluation Department's findings included: (a) there was generally greater achievement gains by first year Prescription Learning students over their pre-program year and (b) computers were the most popular laboratory with students (Leightner & Ingebo, 1984).

Woodlands Elementary School in Central Kitsap School District, Bremerton, Washington, reported that second graders using the Education Systems Corporation (ESC) integrated learning system from October, 1986 to April, 1987, gained thirteen percentage points in reading, moving from the fifty-first national percentile rank to the sixty-fourth national percentile rank (Hanson, 1987).

Little Rock School District, the largest school district in Arkansas, had 27,000 students in 51 inner-city schools. The district administered the Metropolitan Achievement Test (MAT) to all students in the spring of 1987 and the spring of 1988 to obtain pre- and post-test data based upon implementation of a district-wide ILS. The purpose of the ILS was to strengthen overall academic achievement. Comparing MAT results for 1987 and 1988, the district average grade equivalent gain in mathematics was 1.01. That represented a two month growth for each month the ILS was in place, when calculated over a 5-month period. The district average reading gain was slightly higher than .8, representing 1.6 months growth for each month the ILS

was in place (Wyrick, 1988).

Because of the relative "newness" of the ILS, there were few published studies found. The majority of information regarding ILS effectiveness was in marketing documentation from ILS vendors, which could be biased in fact or presentation. The second most prominent source of information regarding the effectiveness of integrated learning systems came from school districts announcing their own results based on their own research.

Evaluation - What the Literature Says

Peter H. Rossi and Howard H. Freeman, well-known students and authors of evaluation have defined evaluation as "the systematic application of social research procedures in assessing the conceptualization and design, implementation, and utility of social intervention programs" (1982, p. 20). It is a process of determining what the areas of interest to be evaluated are and then selecting, collecting, and analyzing information which can be provided to decision makers regarding the program's efficiency, efficacy, and accountability (Alkin, 1971; Klein, Fenstermacher, and Alkin, 1971).

A commitment to a systematic evaluation of education programs can be traced to the turn of the century when public officials strove to provide literacy and occupational

training by the most effective and economical means. In the 1930's social scientists advocated assessing programs and in the 1960's formal educational evaluation was born (Popham, 1988).

Leaders in educational evaluation recognized in the mid-1970s that a set of standards for conducting evaluations could possibly enhance the quality of education. Led by Daniel L. Stufflebeam, a committee of seventeen members representing twelve organizations published Standards for Evaluation of Educational Programs, Projects and Materials. Thirty separate standards organized under four attributes of evaluation: utility, feasibility, propriety, and accuracy, were described and followed by a conceptual overview, procedural guidelines, a list of pitfalls to avoid, possible errors that could arise from overzealous application of the standards, and a fictional case showing how the standards might be used (Popham, 1988).

The standards have not been used long enough to determine their overall impact on educational evaluation but it appeared that they "proffer a pile of sensible practices" (Popham, p. 312). Cronbach said that "evaluation has become the liveliest frontier of American social science" (Rossi and Freeman, 1982, p. 27) with definitive guidelines and standards of conduct such as the above still emerging.

Evaluations in education are undertaken for many reasons (Chelimsky, 1978): for purposes of administration,

to assess the need for program changes, to find ways to improve delivery, for planning purposes, to test a particular hypothesis, or to make a comparative quality appraisal. In 1967, Scriven distinguished between two types of evaluation, formative and summative.

Formative evaluation takes place during the program or product design and is intended to improve still-malleable educational programs. Summative evaluations, on the other hand, refer to "appraisals of quality focused on completed instructional programs" (Popham, 1988, p. 14) whose audience is the end user or purchaser. Because an ILS is a completed product, this study will focus on summative evaluations of a product, the integrated learning system.

Product evaluation is the process of obtaining and providing useful information for judging decision alternatives concerning revision, disposition, and adoption of products (Stufflebeam, 1971). It provides information about the performance characteristics of the developed product for product users to support implementation decisions. Astute evaluators will frame their inquiry in terms of decision alternatives available (Popham, 1988).

An educational product is an exportable method or material which will produce specified outcomes with designated targeted populations (Bertram & Childers, 1974). For the purpose of this study, evaluation is undertaken to determine the suitability of a new product (ILS) for a

particular consumer (school district).

Are there evaluation models and instruments in place for the evaluation of educational products? With such diversity of educational products, clearly there was no single evaluation system found to be equally applicable (Wright & Hess, 1974). Popham said there was more than one way to conduct a defensible educational evaluation and did not adhere to a single model out of the many in existence.

The true emergence of evaluation models followed the Elementary and Secondary Education Act of 1965. Educators were held responsible and accountable for the spending of the federally funded ESEA monies and were searching for ways to defend their expenditures, proving the worth of the program. In a review of the evaluation literature, models were prolific. There was much overlapping of models, using many parts of older models in an effort to develop newer models that would serve evaluation even better. There were many models in place to evaluate educational products and programs.

The literature gave reference to the following models for program and product evaluation. Wright and Hess developed a "criteria acquisition model" for the evaluation of education products which was a three-dimensional matrix with stages of development and evaluation, audiences of evaluation, and criteria domains as the dimensions. Although the fundamentals of the model were solid and some

could be applicable, the model was generally inappropriate in the instance of ILS evaluation because it incorporated a pre-product development stage in the evaluation process (a formative evaluation) which was not possible in the case of school districts evaluating pre-packaged products.

Bertram and Childers prepared an evaluation model but it, like Wright and Hess's model, engaged the evaluation process at the product development stage. They recognized that their model might be inappropriate for all products, suggesting that evaluation procedures "should be tailored to the product" (1974, p. 192).

Popham (1988) attempted to categorize all existing evaluation models into five general approaches to educational evaluation: Goal-Attainment Model, Judgmental Model Emphasizing Input, Judgmental Model Emphasizing Output, Decision-Faciliation Model, and Naturalistic Model.

A goal-attainment approach was to assess the degree to which an instructional program's goals were achieved. Dating back to Ralph W. Tyler, this model involved the formulation of educational goals which were transformed into measurable objectives (behavioral objectives). At the conclusion of the instructional program, student success was measured to establish the degree of goal-attainment.

The judgmental model, emphasizing input, gave major attention to professional judgment. The evaluator exercised influence on the nature of the evaluation. An example of

this was the accreditation model which was a prevalent type of evaluation used to judge school programs. Accreditation evaluations were typically carried out by an association of schools which sent representatives to evaluate input criteria to assess school effectiveness.

A judgmental model emphasizing output was best described by Michael Scriven, a philosopher by training, and Robert E. Stake, a psychometrician by training (Popham, 1988). Scriven's approach was oriented toward program outputs. He distinguished between formative and summative evaluation, stressing that attention must be paid to the quality of the goal even if the goal must be repudiated in the evaluation process, advocating comparative evaluation, and proposing goal-free evaluation in order to focus on outcomes (whether intended or not).

Stake stressed output, also, in his countenance model, which emphasized description and judgment of the evaluator. He elaborated on the way judgments were made, focusing on relative and absolute comparisons. Although Scriven and Stake's emphasis was on outputs, their models reflected concern with additional factors as well.

Decision-facilitation models were oriented toward servicing educational decision makers. Typically, decision-facilitator evaluators strove to collect and present data to the decision maker, who determined the final worth. Program merit was the decision maker's province, not the

evaluator's.

One of the best known models within the Decision-Faciliation group was the CIPP, originated by Daniel Stufflebeam and Egon Guba. CIPP (context evaluation, input evaluation, process evaluation, and product evaluation) defined evaluation as "the process of delineating, obtaining, and providing useful information for judging decision alternatives" (Popham, 1988, p.34). It emphasized the provision of information useful to decision makers, implemented with a systematic program.

A fifth category of educational evaluation models was called naturalistic, "a substantial departure from most of the evaluation models" (Popham, 1988, p. 41). Guba and Lincoln contrasted naturalistic inquiry with scientific inquiry depending on the degree to which constraints were placed on variables and outputs (1981). If few or no constraints were put on potential outcomes or independent variables, the evaluation was naturalistic as contrasted to scientific inquiry where the constraints placed were considerable.

Instruments, as opposed to models, are concrete documents designed to evaluate, presumably developed with a theory or model of evaluation in mind. Instruments might be questionnaires, surveys, checklists, matrices, or some other tangible item used for assessment.

Tyler and Klein presented recommendations for the development of curriculum materials which were intended to

guide producers in the development of instructional materials, consumers in the selection of materials, and funding agencies in the evaluation of instructional materials (1974, p. 120). Their recommendations were cogent and appropriate, in a generic sense, for educators' use in product selection. Their instrument offered a comprehensive conception of what the product evaluation should encompass and was referred to during the instrument development stage of this study.

Alkin and Fink (1974) suggested that a major area of neglect in product development and distribution was providing the potential user with conveniently assembled and readily interpretable information before the user selected from competing products, to help the consumer in the evaluation process. They offered a description of six reports that potential users could use during the evaluation process. The reports were generic in nature, discussing the product's description, purpose, development and testing, effectiveness, efficiency and audience.

Borich (1974) presented a checklist as an instrument for assessing the quality of educational products such as filmstrips, science kits, tests, or textbooks. It was developed in an intensive, systematic activity through the Product Review Panels of 1971-72 done for the National Center for Educational Communication, on subcontract to the Educational Testing Service. Fifteen experienced educators

and evaluators provided the raw materials on assessment procedures from which Borich extracted a checklist with interaction from Educational Products Information Exchange (EPIE). The 13-item checklist was marked on a 5 point high/low scale.

Checklists were used as evaluation tools for new-product proposals in business also. When businesses evaluated potential new products, they routinely used a list of standard criteria of rule (Conference Board, Inc., 1973). Fifty percent of all companies had checklists for the guidance of planners and decision makers. The checklists varied from single page summaries to manuscripts. Some companies used checklists divided into two categories: (a) must have and (b) would like to have. Others used a weighted scale.

There has been much written about textbook evaluation and adoption for schools. Because textbooks are a primary source of information for students, they are second only to teachers in their effect on students' learning (Danielson, 1987). Therefore, the selection of textbooks holds great importance for educators and parents. However, the literature on textbook evaluation was process oriented, guiding the school administrator in the process of setting up timelines, committee structures, and budgets. Little was said about the translation of research findings into specific selection criteria, other than it was a difficult

task. There were checklists available; many had been developed by the publisher of a textbook company or created by a school district.

A review of the literature was also completed regarding the evaluation of instructional media, instructional media being defined as "the physical means by which an instructional message is communicated" (Reiser & Gagne, 1983, p. 5). Checklists were used to evaluate instructional media (Heinich, Molenda, & Russell, 1985). However, Reiser and Gagne said there was no generally accepted model for media selection and that no procedure could be applied to every instructional selection. Their recommendation was that whatever guidelines were chosen must consider local needs, situations and resources. They presented nine instruments which could be adapted to evaluation of instructional media. Three of those nine instruments (flowchart, matrix, and worksheet) would be particularly adaptable to the evaluation of an ILS. The flowchart was a procedure which lead to progressive narrowing of media choices where questions were posed in a particular order to eliminate certain options. The matrix evaluation technique, as explained by Reiser and Gagne, included all selection criteria at once. The evaluators looked at the number of criteria met and the importance of each. A worksheet became a tabular array of characteristics that was presented against the desired criteria for comparison and decision making.

Much was written and said about the evaluation of computer software in education. Monthly education journals, yearly computer and curriculum conferences, and experts in the field of educational technology have been giving advice on finding quality software since its insertion into the marketplace. With the expansion of the marketplace to 700 educational software companies producing between 7,000 and 14,000 software packages (Komoski, 1984), the ability to evaluate all of the software became increasingly difficult.

Computer software could be difficult to evaluate because the software was not always accompanied by a teachers' guide, a scope and sequence, list of instructional objectives, or other pertinent documentation. Many software producers did not grant previewing privileges, or they presented only sample lessons.

To meet the need for expansive software evaluation, the Educational Products Information Exchange (EPIE), since 1982, has been assessing the quality of educational software by continuously monitoring the production of all commecially available educational software. A national evaluation program used teams of trained software evaluators to assess systematically the quality of a large representative sample of the software in EPIE's database.

Results of those evaluations showed that (a) only 5 percent of hundreds of programs had been judged to be of truly high quality, while more than half had been judged not

worth recommending to educators or parents; (b) examination of a substantial subset of these evaluations revealed that only about one out of every five software programs had been learner-tested during its development; (c) most of today's software developers had been ignoring field testing with real learners and interactive feedback; and (4) assessment of hundreds of software packages showed no increase at all during 1984 in the percentage of software rated "highly recommended" and only a rating of 35 percent "recommended", up from 27 percent the previous year (Komoski, 1984). EPIE was quick to say that omission of an evaluation did not indicate a negative rating, just that there was so much software available they were unable to evaluate it all.

EPIE's self-imposed charge was to evaluate educational software but, at the time of this review of research, EPIE had not evaluated integrated learning systems.

The Northwest Regional Educational Laboratory formed MicroSIFT Clearinghouse (Microcomputer Software and Information for Teachers) to aid educators in evaluating educational software. Their guide, Evaluator's Guide for Microcomputer-Based Instructional Packages, provided and explained two instruments: the Courseware Description form and the Courseware Evaluation form. This guide was designed as a structure for learning to evaluate and select educational software in an organized, structured format. The four phase evaluation process included sifting, description,

peer review, and in-depth evaluation (Northwest Regional Education Laboratory, 1984). This guide was appropriate only for individual lessons on computer software.

There were no instruments, specifically appropriate for evaluating integrated learning systems, found via a computer search, a review of reference books and journals, or a review of major publishers. Several school districts had created their own instruments for the evaluation of integrated learning systems. The review of those few instruments showed little in common with each other, little if any linkage to any evaluation model, and no published results indicating the success or usability of the instrument.

Conclusion

The review of the research yielded the following information:

(1) There were numerous studies regarding the effectiveness of CAI but (a) the results were not always clear-cut, (b) the methodology was questionable, and (c) most of the studies were outdated and not applicable to the microcomputer software market of the 1990s.

(2) There were less than 30 published studies on integrated learning systems showing their effectiveness. The studies, with the exception of the one conducted by Becker of Johns Hopkins University, were not proven to be

methodologically sound. In addition, most were completed by an integrated learning system vendor or a school district, which implied a bias, intentional or not, in the evaluation.

(3) There was a plethora of evaluation models from which an educator might select to be used for educational programs. There were fewer models that provided a framework for the evaluation of educational products.

(4) There was information available describing several different types of instruments used to assess educational products.

(5) There were several evaluation instruments available that had been used to evaluate CAI but they were poorly conceived with no proven validity or reliability and no apparent model used for the conceptual framework. In addition, they were developed at the local level and were not published. No instrument available could be called superlative.

(6) Integrated learning systems were not assessed with any type of evaluation instrument, based on this review.

CHAPTER III

Methodology

Introduction

This study was designed to develop an evaluation instrument that school district decision makers can use in the selection of an integrated learning system (ILS). There were no such published instruments available; therefore, this was a new area of study. Using the research and development (R & D) process as defined by Borg & Gall (1983), the study took the generated findings and used them to build a product for operational use in a school. The steps to the research and development cycle consisted of, first, collecting research and information. This step included a thorough review of the literature and a report of the state of the art. Second, planning, implementing, and analyzing the data collection were completed. Third, a preliminary form of the product was prepared based on the data analysis. Next, preliminary field testing was conducted with five schools followed by product revision as suggested by the preliminary field-test results. The product was then tested in five

different school districts and a final product revision was completed.

Qualitative Evaluation

A qualitative approach using case-study methodology was selected to collect, organize, and evaluate data in order to create an instrument that would help educational decision-makers select the appropriate ILS for their setting.

Research in education was traditionally quantitative, using an experimental design. Qualitative research, in contrast, was often described as "that research which has a more interpretative, nonmathematical approach" (Green, 1983, p. 34). Although qualitative research has been criticized for lack of rigor and generalization, Good and Hatte (1952) suggested that the issue of qualitative vs. quantitative research is a false dichotomy. They emphasized that if observations were accurate and could be replicated, and conclusions could be demonstrated, then the research could not be criticized.

Qualitative research, or naturalistic inquiry, is a legitimate and desired alternative to quantitative research for this study. "An in-depth, holistic description of events, programs, procedures, and/or philosophies as they operate in natural settings is often needed to understand and make informed decisions" (Stainback & Stainback, 1988, p. 11). Qualitative research allows the researcher to

gather a broader range and variety of types of data, and also provides for the study of the interrelationships among the data. With qualitative research, the researcher can study the processes inherent in an educational situation. While quantitative research focuses on the product, qualitative research allows the researcher "to investigate and gain an understanding not only of products but also of how a program or situation operates, how it developed, and why a program did or did not work" (Stainback & Stainback, p. 12).

The unstructured, open-ended approach to qualitative research allows the participants to answer from their own perspective rather than from one structured by prearranged questions, which may or may not be pertinent to the research. The nature of quantitative research does not give the participant an opportunity to discuss the inappropriateness of the questions. Stainback and Stainback (1988) suggested that qualitative research is well suited to study how people, including educators, remember things, make choices, and solve problems.

In addition, qualitative research is especially suited to theory development. Through the expansive collection of data, patterns and consistencies can be found which can generate theories or ideas. Education could "benefit in terms of innovative ideas and theories emerging from a variety of diverse field data collected in naturalistic school settings" (Stainback & Stainback, 1988, p. 15).

Methodology of a qualitative manner is an "extension of normal human activities: looking, listening, speaking, reading, and the like . . .[The naturalistic researcher] . . . will tend, therefore, toward interviewing, observing, mining available documents and records, taking account of nonverbal cues . . ." (Lincoln & Guba, 1985, p. 199).

There is considerable support for qualitative research. Qualitative research methods are very appropriate for gathering, analyzing and reporting data from natural settings (Brandt, 1983; Bogdan & Taylor, 1975; Feldman, 1981; Glaser & Strauss, 1967; Lincoln & Guba, 1985; Lofland, 1971; Owens, 1982; Stake & Trumbull, 1983). Van Maanen (1983) also suggested the qualitative approach to research. He stated ". . .a renewed interest in and felt need for qualitative research has slowly been emerging. . ." (p. 12).

Lincoln and Guba (1985) described the naturalistic researcher using the following characteristics: (a) conducts research in a natural setting, (b) is the instrument used to collect data, (c) uses intuitive knowledge, (d) uses qualitative research methods, (e) determines sampling according to what will contribute to the context and design of the study, (f) uses inductive data analysis to move from raw data to core categories, (g) extracts resulting theory from the data as opposed to specifying a priori, (h) allows the research design to unfold and change throughout the study, (i) double-checks interpretations and findings with

the respondents, (j) reports findings in a case study style, (k) interprets data and draws conclusions based upon the context and details of the natural setting and raw data, (l) does not generalize findings to other contexts, (m) sets boundaries for the inquiry according to the unfolding focus, and (n) establishes the trustworthiness of the study.

Case Study

The case study is the specific method of research used for this study and is described as observations by the researcher of an organization or organizational variables (school district and ILS), and a written description of those observations (Jackson and Morgan, 1978). The observations may be interviews, questionnaires, or personal observation. (Stake, 1978).

The case study approach requires "intensive investigation of the particular unit represented" (Good & Scates, 1954, p. 729). In this instance, the unit is multiple: the school district and the integrated learning systems. It also allows the researcher to collect and evaluate a wide variety of information from many different sources, taking into account "all pertinent aspects of one thing or situation, employing as the unit for study an individual, an institution, a community, or any group considered as a unit" (Good & Scates, p. 726). Yin reinforced this, emphasizing that a strength of a case study is "its ability to deal with a full variety of evidence - documents, artifacts,

interviews, and observations" (1984, p. 20). Particularly appropriate in this study, various promotional documents from ILS vendors were reviewed, school RFPs (request for proposals) and contracts were reviewed, and interviews were conducted.

Borg and Gall (1983) defined several kinds of case studies in the behavioral sciences. The type used for this research was situational analysis where a particular event (the selection of an integrated learning system) was studied from the viewpoint of all of the major participants, the ILS vendors and the school district decision makers. "When all of these views are pulled together, they provide a depth that can contribute significantly to understanding the event being studied." (Borg & Gall, p. 489).

Procedures

Procedures for completion of this study follow:

1. A review of the literature pertaining to the types of evaluation models and instruments available for evaluating educational products was completed. This review served as a major source of data for the naturalistic research. Stern et al. (1983) wrote that "the existing literature, used as data, is woven into a matrix consisting of data, category, and conceptualization. Literature, carefully scrutinized, helps expand the theory and relate it to

other theories" (p. 207). This review formed the backbone of the evaluation instrument to be developed by providing information to use as a guideline for the development of the instrument. It also verified that there was no evaluation instrument in place appropriate for any school district assessment of an ILS.

2. Marketing and organization personnel from five ILS companies were interviewed. The purpose of each interview was to ascertain what ILS vendors thought school district decision makers recognized as important in an ILS selection. Marketing representatives meet with an average of 150 different school district personnel in a given year (D. Davidson, personal communication, March, 1989), which made them a valuable resource for obtaining information about schools and their perceived needs. The interview determined what the respondent deemed important about school district ILS selection, providing information that could not be found in literature or observed by the researcher.

3. Documents and other available media (videos and slide presentations) from the ILS companies were reviewed. These documents included contracts, promotional materials and sales literature, press releases, reports, manuals and other published or non-published materials relevant to the study. The purpose of the document review was to determine what attributes of an ILS the ILS company considered important to emphasize in the sale of a system to a school dis-

trict. Whether, in fact, those attributes were important to a school district was clarified as the study progressed. In naturalistic inquiry, "the naturalist begins inquiry with a particular focus in mind (however tenuous) but has no qualms about altering that focus as new information makes it relevant to do so" (Lincoln & Guba, 1985, p. 227).

4. Vendor booths at several national education conferences were visited and interaction between the vendor sales personnel and school personnel was observed and recorded.

5. Five school districts who had recently (1987-present) purchased an ILS were selected. Criteria for the selection of those schools included: (a) a K-12 district, and (b) the district selected two ILS laboratories from two different ILS companies. Two individuals determined to be decision makers in the selection process from each of the five school districts were interviewed. The purpose of the interview was to determine what questions the school district decision makers wanted answered about ILSs. In the naturalistic mode, initial interviews were semistructured, allowing for categories to emerge. Interviews became more structured as the data from the previous interview provided the researcher with more information. As information was learned from interviews patterns began to form, and the researcher focused the next interview toward that pattern.

6. Documents, such as memos, checklists, and

evaluation agendas and timetables, that the five selected school districts used in their ILS selection process were reviewed.

7. A practical evaluation instrument was developed for school districts selecting an ILS. The instrument was compiled based upon information collected during the research.

8. The instrument was reviewed by personnel from the five initial school districts for usefulness, and feedback was provided to the researcher. Appropriate changes were made to the instrument based upon the feedback.

9. Personnel from five different school districts were selected to evaluate the evaluation instrument as to usefulness, and provided feedback to the researcher regarding suggested improvements to the instrument. These personnel represented districts that were committed to purchasing at least one ILS and were currently in the process of evaluating ILSs. The appropriate decision makers in the school district used the evaluation instrument in light of their own selection process, with the knowledge that the instrument itself was a pilot to be modified.

10. Suggested changes from the personnel of the five reviewing school districts (in #8 above) were reviewed and evaluated by the researcher, and corrections were made as appropriate to create the final ILS evaluation instrument.

Propositions

In reviewing the current industry perception of integrated learning systems, these propositions were assumed:

1. There were five major ILS companies in the school marketplace today. Little qualitative or quantitative research regarding the effectiveness or integration of these systems into schools had been conducted except by the companies themselves.

2. Research that had been conducted addressed standardized test score gains in a pre/post test study, administered by the ILS company or the school district, while school districts were becoming more interested in what variables within an ILS contributed to performance.

3. School districts wanted an evaluation instrument that was valid, thorough, flexible to the situation and easy to use in the assessment of an ILS.

4. Large and small school districts alike were purchasing ILSs and were in need of resources to help the decision-making process.

In summary, the product of this study addressed the above assumptions and provided a resource to evaluate ILSs appropriately, which had previously been unavailable.

Limitations

1. The study included only five major ILS companies out of twelve total possibilities. The five were selected by matching to predetermined criteria.

2. The study included only five school districts that have already purchased at least one ILS for the school district from 1987-present.

3. The study included interviews and evaluations of documents from ILS companies that were expected to have a bias toward their own ILS product as opposed to a generic ILS.

4. The researcher attempted to have a non-biased outlook in conducting the inquiry, recognizing her employment with one of the ILS companies. It was conceivable that having worked for an ILS company, the researcher would have background assumptions and much intuition about the study and its outcomes. However, it was in the best interests of the researcher and the ILS company where she was employed, to perform an unbiased study so that the company could receive a clear, non-biased picture of what school district decision makers wanted in an ILS.

5. Using only five school districts for the final evaluation of the completed evaluation model was limiting in scope and feedback.

Sample

Three samples were necessary for this study: (a) ILS companies, (b) school districts who have purchased ILSs from two different ILS vendors, and (c) school districts currently selecting an ILS.

Sample One

Sample One was the ILS companies. Review of current literature repeatedly named the following vendors (in alphabetical order) as the best and most prolific in the ILS marketplace: (a) Computer Curriculum Corporation (CCC), (b) Computer Networking Systems, Inc. (CNS), (c) Computer Systems Research, Inc. (CSR), (d) Control Data Corporation (CDC), (e) Degem Systems, (f) Houghton-Mifflin (Dolphin Curriculum), (g) Education Systems Corporation (ESC), (h) Ideal Learning Corporation, (i) Prescription Learning Corporation (PLC), (j) Wasatch Education Systems, (k) Wicat, Inc. and (l) Unisys (Icon Courseware) (Bruder, 1988; Solomon, 1988; Goodson, 1988; Education Turnkey Systems, 1989). Effective July 1, 1989, two of these vendors (Education Systems Corporation and Prescription Learning Corporation) merged and the new company name became Jostens Learning Corporation.

Further criteria matching eliminated seven of these companies. Criteria used for the elimination process was:

1. The number of installed systems in schools was over

400.

2. Microcomputers, not dumb terminals, were used for student stations.

3. The company was active in the ILS marketplace for at least five years.

4. The majority of the installed base was in the United States.

5. The main product of the company was ILSs.

6. The company provided K-12 curriculum with an emphasis on K-8 curriculum.

7. The company was most often mentioned in the literature as a leading ILS company.

8. In initial interviews with the five school districts' representatives of Sample Two, the company was most often mentioned as a vendor the school district personnel considered during the ILS selection process.

Based upon the additional criteria, five of the above ILS companies were selected for Sample One.

Sample Two

Sample Two was a sample of five school districts who have, since 1987, purchased two integrated learning systems from two different ILS vendors. The rationale for selecting school districts who had purchased two ILSs from two different vendors was to attempt to alleviate any bias the school district personnel might have about one particular vendor. It was theorized by the researcher that a school

district owning systems from more than one vendor would also be more knowledgeable about ILS attributes. Further criteria for selection of these schools included: (a) a K-12 district, (b) willingness to participate in study, (c) representative of small, medium, and large sized student enrollments; varied ethnic populations; and geographic locations in the eastern, southern, midwestern, and northwestern parts of the United States.

Approximately 40 districts were identified as intensive users of integrated learning systems from Education TURNKEY System's data base on trend-setting districts (1989). In addition, appropriate individuals in Sample One, and in three hardware companies, who supply hardware for ILSs in schools, were contacted to confirm their participation in an ILS in TURNKEY's identified districts, and to also name additional districts which met the criteria listed previously.

Five districts were selected from the initial pool based upon the criteria listed previously. After telephone or personal contact with the key coordinator at the district (usually the technology coordinator or an assistant superintendent) was made, school district approval was obtained.

Sample Three

Sample Three consisted of another five school districts who used the developed evaluation instrument to assist their ILS selection process. Criteria for this group included:

(a) a district that was in process of selecting an ILS, (b) a K-12 district, (c) a willingness to participate in the study, (d) and representative of small, medium, and large student enrollments; varied ethnic populations; and geographic locations in the eastern, southern, midwestern, northwestern, and southwestern parts of the United States.

Approximately twenty-five districts were identified by Sample Two as school districts who had contacted them regarding their ILS selection. These twenty-five districts were narrowed down to five, after telephone or personal contact with the key coordinator at the district to confirm their intent to select an ILS, to assure the researcher that the other criteria had been met, and to obtain school district approval for participation in Sample Three.

The small sample size was presented as a limitation in this study, but Borg and Gall (1983) suggested that in some cases small samples were more appropriate than large ones. In instances where time consuming techniques were used such as extensive interviewing, a small sample could often "provide more knowledge than a study that attacks the same problem by collecting only shallow information on a large sample" (Borg & Gall, p. 261).

Participants

Sample One participants were marketing or organization executives for five major ILS companies. Five women and five men were interviewed. Their ages ranged from 35 to 65

and they had been employees of their respective companies from 5 to 18 years. Their positions were typically in sales, marketing, or management.

Sample Two participants were representatives of five school districts in the United States. The five districts included a large county district on the east coast, an inner-city district in the east, a midwestern district of over 25,000 students in an urban/suburban setting, a large city school district in the south, and a small, suburban district in the northwest. The sample represented a diversity in geography, enrollment size, and ethnic population. The representatives interviewed from these districts were all male, employed with the school district from 3 to 20 years, and held positions of technology coordinator, assistant superintendent, or superintendent.

The participants in Sample Three were representatives of five school districts who were in the process of selecting an ILS. The school districts were located in the east, midwest, south, southwest and northwest. The participants were members of committees from the districts whose purpose was to make a recommendation to the school board regarding an ILS purchase. The majority of the participants were women and positions held included teacher, principal, supervisor at the district level, technology coordinator, and assistant superintendent.

All participants were assured of confidentiality of

their responses. They signed a consent form which stated: (a) the purpose of the study, (b) that there was no anticipated risk, (c) the personal benefit was receiving a copy of the evaluation instrument when completed, and (d) the estimated time requirements. The research study received approval from the University of San Diego Committee on Protection of Human Subjects.

Data Gathering

Interviews

Data was gathered through individual interviews, with the researcher serving as the interviewer. The interviews were conducted between March, 1989 and March, 1990 with three different audiences: ILS company representatives in Sample One, five school districts' representatives in Sample Two, and five school districts' representatives in Sample Three.

The purpose of the interview, initially, was to determine what these individuals deemed important to know when a school district was assessing an ILS for purchase. The interviews were informal and semistructured. Generally most appropriate for education, the semistructured interview provides "a desirable combination of objectivity and depth and often permits gathering valuable data that could not be successfully obtained by any other approach" (Borg & Gall,

1983, p. 442). Zemke (1987) characterized the informal interview as being spontaneous and lacking structure. He emphasized the informal approach "to add depth of understanding to things observed or learned in other ways. It serves to tap opinions of a broad range of performers and provides us with quotes and thoughts for enriching data gathered in other ways" (p. 100).

The semistructured interview allowed for categories to emerge through the informality of the session. As is the nature of a naturalistic inquiry, each semistructured interview served to shape the next one. Semistructured interviews may be focused or open-ended. Open-ended interviews were used to allow the interviewer to ask for facts and opinions. Yin suggested that the interviewer may ask the respondent "to propose his or her own insights into certain occurrences and may use such propositions as the basis for further inquiry" (Yin, 1984, p.83).

An interview guide (Appendix A, B, and C) was used during the interview (a different guide was prepared for each sample), not to limit or keep the interview within boundaries but to ensure that information was requested to meet the specific objectives of the study and to standardize the situation (Borg & Gall, 1983). Questions for each guide were developed based upon the review of the literature, the study of documents, and the researcher's knowledge and experience in the field of education and integrated learning

systems. Used truly as a guide, not a schedule, the researcher used latitude in asking and sequencing questions, segmenting them appropriately for each respondent. This instrument was modified steadily throughout the study to explore new leads and new lines of inquiry that pertained to the research questions. In addition, as the study progressed, it was determined by the researcher that the guide was too structured. Adjustments were made to the guide to increase the flexibility of the interview. Approximately one third of the questions were eliminated, several questions were expanded, and several questions were added.

Interview guide for Sample One.

All interview questions related to the research questions and purpose of the study. Questions in the guide for Sample One were divided into seven headings: (a) personal information, (b) product information, (c) financial impact, (d) hardware, (e) management, (f) system utilization, and (g) miscellaneous (Appendix A). Personal questions were intended to establish the reliability of the respondent, in this case, an ILS company representative. Length of time and position with the company, and education and career background helped establish the respondent as a reliable source of information. Likewise, questions five through seven created a clearer picture for the researcher of the the respondent's working environment, indicating once again

how reliable the answers of the respondent might be.

Product information questions nine through nineteen were designed to extract information specifically about the product in the eyes of school district personnel, as perceived by an ILS vendor. These questions proved to be a most important part of the interview process, often expanded and elaborated upon by respondents.

The importance of the financial impact questions weakened as the study progressed. Initially, the researcher theorized that cost was an important issue in an ILS selection. As data was collected and analyzed, it became clear that cost was a minor issue to evaluation teams in school districts already considering an ILS purchase. Consequently, less time was spent on questions twenty through twenty-three as the interviews progressed.

Hardware questions (24-27) did not yield the expected responses of importance, either, in early questioning. Although the responses indicated the lack of importance of hardware in ILS selection, that fact, in itself, was an important part of the final evaluation instrument and the questions were asked of every respondent.

Management system questions (28-34) and system utilization questions (35-38) were designed to again ascertain elements of an ILS that are important to evaluate during ILS assessment. Both sections expanded as the study progressed and yielded invaluable information to the researcher.

The remaining questions were classified under miscellaneous and were intended to further ascertain from the respondent his or her perception of school district needs. In addition, final questions regarding observed evaluation practices in school districts and competitor information were asked as part of the research review and formation of Sample Three.

Interview guide for Sample Two.

Questions for the interview guide for Sample Two were divided into five headings: (a) personal information, (b) ILS purchase, (c) product, (d) system utilization, and (e) miscellaneous. Personal information questions were asked of Sample Two (school district representatives) to establish their credibility with the researcher. In addition, questions three through ten described the computer environment of the school district which not only established credibility but gave the researcher continued insight into what school districts need and want in computer implementation.

Questions eleven through fifteen established that the respondents did, indeed, meet the criteria set for participation in Sample Two. The remaining questions under the ILS purchase heading (16-24) were included to determine how the overall selection process happened. These questions yielded many new paths which led to critical information in the final instrument design.

Product questions (25-31) and system utilization questions (32-34) were intended to further clarify what needs school districts have in ILS selection. These areas of questioning expanded as the study proceeded and contributed a wealth of information to the instrument design.

Miscellaneous questions 35-38 helped give the researcher a perspective on overall education issues that representatives of the sample school districts thought important and offered further validity to the respondents' participation in the study. Questions 39-43 were included to give further information about the ILS selection process.

Interview guide for Sample Three.

Members of Sample Three evaluated the designed instrument for evaluating ILSs. All questions were related specifically to the instrument. The respondents were asked to critique each item of the instrument for clarity and relevance to the task. They were also asked if they would use the instrument, who would benefit from it, and if they thought there was a need for the instrument. These interviews were critical to the final revision of the instrument to make it truly usable in the field.

Guide piloting.

The guides were piloted by the researcher in three pilot interviews with educators not involved in the study in order to check vocabulary, language, respondents' understanding of the questions, and respondents' reactions to the

interview as recommended by Borg and Gall, and emphasized by William Belson in a study of subjects' understanding of survey questions (1981). These interviews were taped for further study and review. Revisions were made based upon those pilot interviews.

To document the interviews, note taking and tape recording were the methods used. Tape recording was the method of choice when the respondent granted permission. The use of taping has several advantages in recording interview data. Most importantly, having all of the responses on tape "reduces the tendency of the interviewer to make an unconscious selection of data favoring his biases." (Borg & Gall, 1983, p. 445). In addition, the responses can be studied much more thoroughly and it speeds up the interview process. Members of Sample One did not allow their interviews to be tape recorded, due to the high degree of competitiveness and perceived classified information existing among the ILS vendors. The majority of the members of Sample Two and Sample Three allowed their responses to be taped (two participants would not permit taping due to district policy).

Interviewing.

For the interviews where note taking was the method of recording, duplicate sets of the interview guide were prepared with space provided for answers. The notes were later transcribed and coded for analysis. The advantage of

this method was that it was easy to process the data for each question separately in a short period of time. Lincoln and Guba (1985) said "The advantages of handwritten notes are impressive: Taking them forces the interviewer to attend carefully to what is being said; the interviewer can interpolate questions or comments (including notations about nonverbal cues) onto the paper without the respondent's awareness, the notes can be easily flagged for important items to which the interviewer wishes to return later; the interviewer need not rely on his or her memory to compose the all-important summary that should be provided at the end of the interview" (p. 272). Care was taken by the researcher to not disrupt the communication with the respondent because of the note taking.

All respondents in Sample Two and Sample Three were contacted at least twice. The initial contact for 70% of the sample was face-to-face and the telephone was used for initial contact of the remaining 30%. The second contact was via telephone. Response reliability should not be affected by the two different types of contact. In a carefully controlled study by Graves and Kahn (1979) it was found that the distribution of responses for telephone interviews versus face to face interviews were generally very similar. In addition, their study found that telephone interviews were completed at half the cost.

Observations

"Interviews are an essential source of case study evidence because most case studies are about human affairs. These human affairs should be reported and interpreted through the eyes of specific interviewees, . . . However, the interviews should always be considered verbal reports only . . . a reasonable approach is to corroborate interview data with information from other sources" (Yin, 1984, p. 84-85). Interviewing should not be the only approach. "Research that is based solely on interviews may be sabotaged or crippled" (Lincoln & Guba, 1985, p. 155).

Observation is recommended as an important adjunct to interviews. Observation allows the observer to more fully understand complex situations by providing a here-and-now experience in depth, recording behavior and events as they occur (Lincoln & Guba).

The researcher participated in one type of observation for this study, the observation of the ILS vendor interacting with educators and the setting in which the interaction took place. The researcher acted as a nonparticipant observer which requires the observer to play only the role of observer. In 50% of the observations, the vendors were unaware of the observer's role as an observer.

Observation of the ILS vendors took place from February, 1989 until June, 1989 at the following national conferences: ASCD (American Society for Curriculum and

Development); AASA (American Association for School Administrators); NCTM (National Council for Teachers of Mathematics); NSBA (National School Board Association); NAESP (National Association of Elementary School Principals); and NECC (National Education Computing Conference).

At these conferences large areas of floor space in exhibit halls are typically designated for vendors to display their products. In addition, it gives conference attendees, in this case, educators, an opportunity to talk at length with literally hundreds of vendors about their products and how they might be appropriate for a schools. This is not a selling arena in terms of signing contracts and collecting money but an arena to market the product. The size of each vendor's booth ranged from 25' x 25' to 50' x 140'. Each of the ILS vendors provided computers displaying their courseware for demonstration purposes. In addition, posters, signs, wallboards, charts, fliers, pamphlets, brochures, and manuals were readily accessible.

This researcher spent 3-4 days at each conference browsing from booth to booth; observing marketing techniques during face-to-face encounters between vendor and potential client; and reviewing the printed advertisements, including its content, its appearance, its availability and its location within the booth.

Borg and Gall suggested that the presence of an

observer can affect the behavior of the observed (1983). That was conceivably true in this study. The ILS market is highly competitive and vendors in this setting are constantly aware of corporate spies who might be stealing trade secrets. Therefore, because the researcher was known to about 50% of the vendors, it was possible that in those instances the presence of the researcher impacted the behavior of vendors during interaction with clients.

Observation of media within the booths, however, was not impacted. An observation checklist (Appendix D) was prepared by the observer to use, unobstrusively, for recording of data. Lincoln and Guba (1985) explained that field notes taken during observations could be treated similarly to field notes taken during interviews.

In an effort to eliminate observer bias in the observation of media, a second observer (an educator unknown to the vendors) was used in a pilot observation at the first conference. Data notes were shared and compared with the researcher to check for reliability. Approximately 95% of the observational data correlated between the two observers. All efforts were taken by the researcher to be unbiased in the recording of observed information. As is the nature of a naturalistic inquiry, as the observations proceeded, the focus was narrowed and the checklist was revised.

Documents

The word document was defined in the Random House

College Dictionary, Revised Edition (1982), as an original or official printed or written paper furnishing information. Lincoln and Guba (1985) gave examples of documents including: letters, journals, textbooks, newspaper articles, pamphlets, publications, and photographs. According to Lincoln and Guba, documents were "a stable, rich and rewarding resource. . ., representing a legally unassailable defense, . . . they are a natural source of information, . . available on a low-cost or even free basis,. . . and are nonreactive" (p. 232). Yin (1984) confirmed Lincoln and Guba's discussion on documentation, suggesting it was very relevant to case studies.

Documentation, in this study, referred to all printed materials from ILS vendors, including promotional materials, sales literature, press releases, reports, contracts, manuals, and any other published or non-published papers relevant and available for the study. Using a content analysis technique which was "a research technique for the objective, systematic, and quantitative description of the manifest content of communication" (Borg & Gall, 1983, p. 511), the documentation was classified by a coding and matrix system, using a documentation summary form (Appendix E) developed by the researcher. "If the researcher cannot locate a content-analysis dictionary or classification system that fits his research, he will have to develop his own because it is necessary to define content categories

that measure the variables indicated by the research objectives or hypotheses." (Borg & Gall, p. 518). A summary of the documentation data was achieved through the use of absolute frequencies (the number of specifics found in the documentation) and relative frequencies (proportion of specific events to total events).

In summary, interviews, observations, and documentation review were the three major sources of data which completed the case study research. A simple file folder format was used for storing and retrieving the data. Lofland (1971) suggested using two types of files: mundane files which were organized by simple categories of the study and analytic files which contained materials on major themes and patterns found during the study. The files were cross-referenced for ease in analysis.

Data Analysis

Researchers using qualitative methodology are "long on their discussions of data collection and research experiences and short on analysis - how to interpret the data" (Miles, 1983, pp. 125-6). Data analysis is not a simple, technical process nor are there formal, universal rules to follow when analyzing qualitative data (Patton, 1980). Miles called qualitative data an attractive nuisance: attractive because it is "rich, full, earthy,

holistic, real" (1983, p. 117), but a nuisance because the analyst has very few guidelines to follow in the analyzing.

Data analysis has been defined as "the process of systematically searching and arranging the interview transcripts, fieldnotes, and other materials you accumulate to increase your own understanding of them and to enable you to present what you have discovered to others" (Bogdan and Biklen, 1982, p. 145). It is the process of bringing order to the data and organizing it into patterns and categories (Patton, 1980). Qualitative data has no meaning when it stands alone. Instead, specific characteristics of the data must be identified systematically and objectively in order to convert it into meaningful data (Mostyn, 1985).

In the true spirit of naturalistic inquiry, data analysis in this study was ongoing, occurring throughout the investigative process. Bogdan and Biklen (1982) suggested that it occurs in a pulsating fashion - first, data is collected, then analyzed, then more is collected based on the first analysis, until the research is complete. "Thus, the analysis is recursive; that is, the findings are generated and systematically built as successive pieces of data are gathered" (Stainback and Stainback, 1988, p. 64).

Data analysis was accomplished by linking data to the propositions and research questions as set forth in this study. "The original objectives and design of the case study presumably were based on such propositions, which in

turn reflected a set of research questions, reviews of the literature, and new insights" (Yin, 1984, p. 100). The propositions and questions helped focus the study on certain data and organize the entire case study.

The analysis of the data consisted of three concurrent flows of activity as recommended by Miles & Huberman (1984): data reduction, data display, and conclusion drawing/ verification. Data reduction, as defined by Miles and Huberman, is "the process of selecting, focusing, simplifying, abstracting, and transforming the "raw" data that appear in written-up field notes" (p. 21). It is a way to sharpen, sort, focus, discard and organize data in order to make final conclusions.

Data display is "an organized assembly of information that permits conclusion drawing and action taking" (Miles & Huberman, 1984, p. 21). Data display for this study included the use of matrices.

Conclusion drawing, or deciding what the data meant, was an ongoing process and summarized the data collection when the study was concluded. Based upon the conclusions midpoint through the study, the evaluation instrument was developed. Verification (confirming the validity of the conclusions) was completed when the five school districts used the instrument during their selection process.

Data reduction, data display and conclusion drawing/verification were accomplished through coding of

data and then formatting the data by matrices. Because qualitative data consists of words, thousands of them, it becomes difficult to process the data. The most meaningful words must be retrieved, groups of words that go together must be assembled, and the number of words must be reduced (Miles & Huberman, 1984). A most effective way to accomplish this is the coding of all fieldnotes, documentation, and observations. A code is "an abbreviation or symbol applied to a segment of words - most often a sentence or paragraph of transcribed field notes - in order to classify the words" (Miles & Huberman, p. 56).

The codes were created before the field study began based upon the conceptual framework of the research, the research questions and propositions, and the experience of the researcher. Codes were named in a simple, semantic way and defined operationally in order to make the coding process easy and useful for the researcher (Appendix F).

Some of the original codes became inappropriate as the study progressed. It also became necessary to create new ones as new information and patterns emerged. Coding was completed after each data collection to ensure data quality and to guide the study.

After the data was coded, it was transferred to a data display, a spatial format that was designed by the researcher to present information in a systematic, compressed fashion to help the researcher see patterns and

draw valid conclusions. The format generated for this study was a checklist matrix.

A checklist matrix is a format for analyzing field data, combined into a summative index (Miles & Huberman, 1984). Checklist matrices were created for input from interviews of Samples One and Two in this study. In addition, checklist matrices were designed and used to format data from the documentation summary and the observation checklist.

A role-ordered matrix was also used in order to "systematically permit cross-role comparison" (Miles & Huberman, 1984, p. 104) on issues of interest to this study. It sorted data into rows, reflecting and comparing views of vendors and school district decision makers. (Samples One and Two).

Care was taken during the development of the matrices to limit the number of variables, to keep the displays on one sheet, and to constantly evaluate the effectiveness of each matrix.

Throughout the data collection and analysis, the original research questions were referred to regularly in order to focus the study and look for emerging patterns. Yin (1984) recommended the use of pattern-matching as the most desirable strategy for case-study analysis. This analysis compares an empirically based pattern with a predicted one. "If for each outcome, the initially

predicted values have been found, and at the same time alternative patterns of predicted values have not been found, strong causal inferences can be made (Yin, p. 103). The outcomes in this study were the four propositions and questions stated previously. Data analysis was the examination of the data collected and comparison of the data to the propositions and questions.

Conclusion

To summarize, the case study methodology was used to elicit information from integrated learning system vendors and school district representatives which would contribute to the development of an instrument that school district decision makers could use when assessing integrated learning systems for purchase. Data collection was completed through interviews, observations, and documentation review. Data analysis was accomplished using a coding system and matrices. The instrument was verified by using it in a field test.

CHAPTER IV

Research Findings

The purpose of this study was to develop an evaluation instrument that school district decision makers could use in their selection of an integrated learning system. Through qualitative analysis, using interviews, observations, and documentation and media review, data was obtained that indicated the attributes that school district personnel seek in a superior ILS. Using a case study approach, school district personnel and ILS vendors' thoughts, perceptions, and strategies about what made an exceptional ILS were recorded and analyzed to support the development of an evaluation instrument.

Presentation of the Data

The analysis of the initial data collected for the development of the instrument was completed using a variety of specific analysis tactics as recommended by Miles and Huberman (1984). The tactics used for generating meaning from the data displays were: (a) counting, (b) noting patterns and themes, (c) seeing plausibility,

(d) clustering, (e) splitting variables, (f) subsuming particulars into general, (g) noting relations between variables, (h) finding variables, (i) building a logical chain of evidence, and (j) making a conceptual/theoretical coherence.

In implementing the above tactics of data analysis of the matrices, the following constructs were used. First, a quick scan of the matrix was done to see what initial impressions came from the data. Miles and Huberman call this a "squint analysis" - a scanning of the rows and columns to see what jumps out (1984, p. 213). Second, as conclusions began to form with the researcher, text was written to explain them which led to reformulation of ideas for further analysis. Third, as conclusions began to emerge, they were compared to field notes for confirmation. Reappraising raw data can guard against unjustified conclusions. Fourth, great effort was taken to avoid using only vivid or exciting quotes to "spice up the narrative" (Miles & Huberman, p. 213) and rather, to use genuinely representative examples of conclusions. Finally, in writing the final text, the researcher attempted to present a clear explanation of the display and analysis methods used.

The data analysis is presented in response to the four original research questions which guided the study. The four questions and resulting data appear in sequence.

Analysis of the Study

Research Question One

What kinds of evaluation models or instruments are available to evaluate educational products such as an ILS? What are the advantages and disadvantages of using these models for an ILS?

As described in the R & D process as the first step, a literature review was undertaken to collect information pertinent to the planned product, an instrument for the evaluation of an ILS. The purpose of the review was to determine the state of knowledge regarding the evaluation of integrated learning systems and how that applied to the development of an assessment instrument.

Research review was focused on these areas: CAI, ILS, evaluation models for education, instruments for evaluating educational products, and instruments for evaluating ILSs. The review followed the steps recommended by Borg & Gall (1983) as being the most appropriate for education. First, key words were listed by the researcher. Next, preliminary sources were identified, including Education Index, Psychological Abstracts, Resources in Education (RIE) and Current Index to Journals in Education (CIJE) through ERIC, Social Science Citation Index (SSCI), State Education

Journal Index, and Educational Administration Abstracts. Other sources reviewed were the Bibliographic Index, Review of Educational Research, Review of Research in Education, the Encyclopedia of Educational Research, NSSE Yearbooks, Dissertation Abstracts International, Comprehensive Dissertation Index, and the Reader's Guide to Periodical Literature. A computer search was conducted if the sources were on-line, otherwise, a manual search was completed. Three university libraries were used to complete the literature review.

In order to determine the state of the art for ILSs, it was necessary to study the predecessor of ILSs which was computer assisted instruction (CAI). A review of the literature on CAI revealed only studies of effectiveness. There were numerous studies completed, beginning in the 1960s but most were victims of poor methodology. The research showed that as computer technology improved and software became more sophisticated, researchers and educators began seeking information beyond the effectiveness of CAI. Journal articles in the late 1980s began calling for studies of CAI implementation and environmental factors for success.

Literature regarding ILSs was mostly limited to information regarding features of the systems. Effectiveness studies were not published but could be found through inquiry of ILS vendors and school districts who had conducted

or commissioned their own studies. One shining exception was the research conducted by Henry Becker of Johns Hopkins University. His research conducted at Hurst Hills School in Hurst, Texas, demonstrated measurable achievement gains of students using an ILS compared to the control group. His study also addressed the implementation of the system by reviewing and controlling the surrounding environment.

A review of the literature regarding evaluation models in education showed numerous types of evaluation models available as well as a regard for setting standards for evaluation in education. Evaluation was divided into two types: formative and summative. Most theorists of evaluation encouraged a formative evaluation which engages from the beginning of the program or product development. That kind of evaluation was inappropriate for the development of the instrument in this study because the product had already been developed. Therefore, the assessment of an ILS must be summative. In addition, there were many models for program evaluation in education and fewer for product assessment. It was often stated in the research that there was no one "right" evaluation model; evaluation must be developed and molded to the situation.

Of the many evaluation models examined, the CIPP model was determined to be the most appropriate to guide the creation of an ILS assessment tool. It was with this model as a reference that the final product was developed. The

CIPP model consists of a taxonomy of four decision types: (a) context, (b) input, (c) process, and (d) product. Product evaluation is concerned with comparing actual to intended ends but also takes into effect unintended effects (Guba & Lincoln, 1981). It is "a process for delineating, obtaining, and applying descriptive and judgmental information concerning some object's merit as revealed by its goals, structure, process, and product. In addition, it is a process undertaken for some useful purpose such as decision making" (Guba & Lincoln, p. 16). It is very rational and systematic in approach with well developed guidelines for application, emphasizing the need to determine merit.

The literature review of instruments for evaluating education products was replete with advice to producers of educational materials on how to make a product easy to evaluate. In addition, there were many references to textbook evaluation which were primarily interested in the process of the evaluation, not in selection criteria itself. Checklists were presented as a most effective and proven way to assess products, as were flowcharts and matrices.

Specific instruments to evaluate computer software for education are abundant. Virtually every educational computer journal publishes a new checklist or survey yearly. The instruments have improved in quality and substance in the past ten years but address singular, floppy disk programs only.

In the formal review of the literature there were no instruments found for the evaluation of an ILS. Informal inquiry of school district personnel yielded a handful of surveys and checklists that they had developed during their ILS selection process. None were validated or published by outside sources.

In summary, there was an appropriate model to use conceptually in the development of an ILS evaluation tool - the CIPP model. There were currently no published instruments found to evaluate an ILS.

Research Question Two

What kinds of questions do school district personnel currently considering the purchase of an ILS want answered about ILSs in terms of cost, curriculum, instructional design and integrity, method of delivery, management and system utilization? What questions do the decision makers need answered to make their selection?

Counting.

Step two of the research and development cycle was the planning, implementing, and analyzing of data. The data collected was analyzed initially using a counting strategy. This strategy was helpful because it allowed the researcher to see trends emerging quickly. The counting strategy is an appropriate way to keep the analysis honest. Because

qualitative researchers work to some extent by insight and intuition, there is a library of research that shows that people habitually tend to overweight facts they believe in, forget data not going in the direction of their thinking, and see confirming instances more easily than nonconfirming (Miles & Huberman, 1984). Counting is a good way to evaluate how robust the researcher's insights are.

Data was first transformed into 94 different codes (Appendix F) and transferred to a checklist matrix (Appendix G). The 94 codes fell into five categories: hardware, instructional software, management system, training and service, and other. Counting the number of times each coded item was mentioned by all sources on the matrices, the reporting function of the management system (M/REP) was the most often mentioned and the primary focus of interest. Following closely behind was initial and ongoing training of school staffs (T/INIT and T/ONGO) and the desire for a truly individualized instructional program in the curriculum (C/II). The final high tally was in the 'other' category - a need for the software to be motivational (O/MOTI). The fifth category, hardware, was not emphasized in the first scan.

Scanning for a second level of data important in an ILS selection, curriculum issues continued to emerge. Important to all samples in the study were the issues of a correlated curriculum (S/CUR/COR), a valid curriculum designed with

instructional integrity ((S/CUR/VAL), a curriculum that incorporates the notion of higher order thinking into the teaching strategies (S/CUR/HOTS), a management system that allows for teacher override (M/TCHOVER), and a system that can operate equally well in a laboratory setting or distributed throughout a school in various classrooms (O/LAB.CLASS).

In a third scan 13 secondary categories emerged: hardware graphics (H/GR), hardware audio (H/AU), hardware flexibility (H/FLEX), a comprehensive curriculum (S/CUR/COMP), curriculum that emphasizes basic skills (S/CUR/BASIC), curriculum that incorporates tutorials in the teaching strategies (S/CUR/TUT), and curriculum that emphasizes and proves student achievement (S/CUR/ACHIEV). In addition, a management system that prescribes student instruction (M/PRES) and is user friendly (M/UF), complete initial installation handled by the ILS vendor (T/INSTAL), a variety of training materials that are instructionally sound (T/MATER), an 800 hotline that is time sensitive (T/HOT), and a cost effective system (C/EFF) were mentioned numerous times as critical parts of an ILS.

These items represented 30% of the 94 codes established for the data display. All remaining codes were highlighted at least once during the data collection, most of them much more often.

The fifth category, last code, was titled Other/other

(O/OTH). This code was developed for any attribute that did not fit the other classifications. There were 16 entries in this category but no duplicates of each other.

Noting patterns and themes.

The next step was to find patterns and themes in the data. This step was deceptively easy. As Miles and Huberman (1984) pointed out, the mind finds patterns quickly. Therefore, the researcher must subject the patterns to skepticism and to conceptual and empirical tests before they represent useful knowledge.

The first theme to emerge was that educators would not value an ILS unless it was stringent and comprehensive in the reporting strategies. The reporting capabilities of the management system, above all other considerations, was the primary attribute mentioned. "An ILS provides for immediate feedback to teachers regarding an individual student's progress and understanding level. There is no other way for a teacher to get this quality of information," reported a member of Sample Two. Another respondent said that the reporting structure of an ILS "delivers to teachers and parents a very definitive picture of how students are progressing." Finally, "reports that aggregate data at various levels and develop easily understood summaries of student progress on different strands and objectives are critical to the success of an ILS." Other parts of the management system were also mentioned as high priority: the

ability to prescribe student placement and the ability for the teacher to override the computer. "Teacher access to the computers is key. The ILS must have the flexibility to be aligned with classroom programs at any given moment, for the class or for an individual student." Almost as an apology, several participants tagged on final words to their management system discussion: "The management system must (should, has to be, is) be user friendly or all of its power will be lost." The management system of an ILS was the most important concern and valued part of the system.

The second, and almost equally mentioned, theme to emerge was the great interest and concern regarding the curriculum of an ILS. Educators want a comprehensive, sequential curriculum that has been developed by curriculum experts. "Lessons must have clear objectives, just like our textbooks do," responded a participant. "Quality of lessons is the most important thing to our teachers, none of this fancy, smancy video-game stuff." Curriculum that is built on the precepts of higher order thinking was also at the top of the list. Vendors emphasized HOTS (higher order thinking skills) in their promotional materials, their sales pitches to clients, and their interviews with the researcher. School district representatives recalled bad experiences with software that emphasized drill and practice, and stressed their desire to see instruction that encouraged the learner to think, to discover, to apply, to evaluate, and to

synthesize, which are all a part of HOTS.

Curriculum continued to emerge as an important issue as the data revealed great interest in the individualization of curriculum capabilities of an ILS. "An ILS allows an individualized approach to teaching and learning that a teacher absolutely cannot provide in a classroom setting." Another respondent: "Individualization is the key to an ILS." "The system that we purchased has embedded, within the instructional strategy, terrific coaching techniques that allows the student to work independently. The students can be autonomous learners." An assistant superintendent was quoted, "We wanted a system where each child learns at his own pace, in his own way. That's what an ILS can do."

ILS curriculum that is correlated to classroom programs, district objectives, state guidelines, and standardized tests was mentioned often as a desired attribute. An ILS vendor stated: "One of the most often asked questions from educators is: How is your system aligned with my classroom instruction?" "The curriculum must fit state frameworks and competencies, that was our first criteria," said a participant from Sample Two.

The majority of data showed that school districts wanted an ILS curriculum to teach basic skills to all populations. "The curriculum is so comprehensive in our system that it is the best way to teach basic skills and assure ourselves that nothing is missed." "We believe that

basic skills can be acquired more quickly and thoroughly with our ILS."

The last issue of importance within the curriculum theme was the belief that an ILS will enhance student achievement more than traditional instruction. ILS vendors distributed literature which described achievement reports from school districts using their product. School district owners of integrated learning systems either have already conducted research that shows statistically significant achievement gains with students using ILSs or are in the process of an evaluation study to prove such a gain. School district personnel felt it was necessary for an ILS to be accountable and the best way was to prove enhanced student achievement. "That ILS is very expensive but worth every penny. The gains that the students showed in the first year even made the school board members believers."

The importance of training and subsequent service to schools became a pattern very early on. Not only did it have a high degree of absolute and relative frequency but the comments made were emphatic. "Training is crucial." "Training is critical." "Without training, the ILS is worthless." "The training held for our staff was a Godsend." "The consultant who visits our schools is dynamite." "The trainers who work for our company are the best and the brightest." Almost all of the statements regarding training held emotional words. School

administrators shared concerns about lack of teacher ownership and the only way to overcome that was training. Another participant said, "The success of an ILS implementation hinges on the kind of training the users receive. They must be trained on how to coordinate the system with classroom activities, and they must be trained on the role of the teacher in the lab. Without that training at the beginning, the ILS will not be successful." Several school personnel commented on the change in the instructional process when a teacher uses an ILS: "Teachers are no longer deliverers of instruction, they are managers." They must learn how to change their teaching strategies. Therefore, the consensus was that teachers must be trained to act effectively in the new role.

In addition to initial and ongoing training and service to school users, three other areas of training were emphasized. Installations completed only by the ILS vendor were mentioned several times as critical to ILS purchasing criteria. The variety and quality of the support and training materials was equally important to schools, as confirmed by school personnel and vendors; and the existence of a time-sensitive, accessible, 800 hotline with knowledgeable personnel serving it was likewise important.

A final theme that emerged was a type of non-theme. The researcher anticipated that hardware issues would be more predominant than they, in fact, were found to be in the

study. The only issues regarding hardware that yielded enough data to respond to were: the flexibility of the hardware, the graphics capabilities, and the audio components. Viewed as very important by many respondents was the open architecture of the hardware configuration. That means that the hardware can be used for the ILS, for other networked courseware, and as stand-alone microcomputers. Several school district participants talked about systems that have hardware that work only for that system. Their responses were generally that, to meet their needs and their school boards' desires, the systems they purchased had to have more flexibility. Graphics and audio were mentioned as important for meeting the needs of students with different learning styles and a great part of the motivation factor that is apparent in ILSs.

Insert Table 1 here

Seeing plausibility.

The next tactic to be applied to the data analysis is to determine if the conclusions that are being drawn are plausible. Do they make sense? The researcher, coming from an education background, believes that the conclusions drawn are plausible. As an educator, the researcher's initial intuition said that curriculum would be the most critical issue for an ILS purchase and that was proven incorrect.

Table 1

Emerging Themes from Data Analysis in Order of Importance

1.	Management system
	a. report strategies
	b. student prescription and placement
	c. teacher access and override
	d. flexibility
	e. user friendly
2.	Curriculum
	a. comprehensive and sequential
	b. developed by educators
	c. higher order thinking skills
	d. individualization
	e. correlated
	f. basic skills
	g. student achievement evidence
3.	Training and Service
	a. initial
	b. ongoing
	c. installations
	d. variety and quality
4.	Hardware
	a. flexibility
	b. graphics and auditory capability

Instead, the attributes of the management system were counted as most important. In evaluating the data responses, however, it can be ascertained that educators know that regardless of how good the curriculum is, if the management system is not superlative, the curriculum can't be either. That becomes plausible.

The researcher was not prepared for the omission of hardware as a critical issue. Again, in the review of data, and follow-up questioning, information showed that educators viewed hardware as transparent to the system, and expected it to do whatever the system required. That represented a change in the ILS industry in the past five years, based on the researcher's experience. The data review and subjection of the researcher's intuition to tactics of conclusion drawing proved the plausibility of the conclusion.

Clustering.

"Clustering is the act of trying to understand a phenomenon better by grouping, then conceptualizing objects that have similar patterns of characteristics" (Miles & Huberman, 1984, p. 219). The clustering technique typically relies on aggregation and comparison and is closely interwoven with the use of the codes.

In the initial coding process, possible attributes of an ILS were coded under the headings of hardware, instructional software, management system, training and other. As the study progressed and the data results began emerging,

there became a need to regroup certain subheadings under new headings. For example, flexibility (H/FLEX) was initially listed under hardware. As interviews and observations proceeded, it became clear that flexibility was an attribute of the management system more than hardware. The code was regrouped under M/FLEX.

The act of clustering was the initial step in creating the evaluation instrument. Attributes must be placed in appropriate categories for ease of evaluation which was done.

Splitting variables.

Splitting variables is a tactic used to allow the researcher to see differences that might otherwise be hidden. It avoids monolithism and blurring of data. It was first used in this study when the codes were being developed. Some codes, upon initial review, were too encompassing and did not delineate important information. For example, hardware graphics (H/GR) and hardware audio (H/AU) were combined in the code hardware features (H/FEA). As data was collected, it became apparent that the importance of graphics and audio might be different and the category should be split, which it was.

During data collection, much information was forthcoming regarding the appearance of the computer screen. The initial code structure did not allow for separate commentary on screen attributes so a separate structure was developed (S/APP) for six categories of software screen appearance.

In final retrospect, that splitting of variables was unnecessary, creating no theme or pattern. During the interview and observation process, variables continued to be split to meet the needs of so many varying data responses. Again during the stages of conclusion drawing and verification, some variables were split to clarify concepts.

Subsuming particulars into the general.

This particular tactic is a conceptual activity where the researcher clusters information in a more theoretical base. Particular to this study, data regarding the student achievement desired from an ILS not only was seen as an important attribute clustered under the curriculum heading, but it also lead to the more generic question of how a school would evaluate for student achievement with an ILS and if the evaluation is appropriate. While evaluating most attributes is a relatively simple process, this one is more complex and involves a larger theoretical base.

Noting relations between variables.

The basic task here is to see what kind of relationship exists between variables. The first test of this tactic was the review of the role-ordered matrix (Appendix H), which listed each vendor and school district interviewed separately and listed their priorities of ILS attributes. The second use of this tactic was comparing the responses of vendors to school districts on the checklist matrix, looking for a pattern. Intuitively, the researcher believed that

what the vendor thought school districts wanted in an ILS might not necessarily be what school districts really wanted. Studying the relationship between the responses of the two samples, the researcher's intuition was proven incorrect. Vendors' and school district personnel's desired ILS attributes had a high correlation.

Building a logical chain of evidence.

To build a chain, Miles and Huberman (1984) said that "several informants with different roles have to emphasize these factors independently," (p. 227). The researcher has to verify the claims and the relationships need to make sense. In this study, the several informants were personnel from ILS companies and school districts, all playing different roles. The claims were verified by cross-validation of data collected from other informants and again when the actual instrument was used in a pilot study and the usability was verified.

In answer to research question two, the specific attributes of an ILS that school district decision makers want to know about were classified in the data analysis, asdiscussed and will be presented in the evaluation instrument.

Research Question Three

What is the most effective way to evaluate an ILS, considering areas of finance, curriculum, instructional design and

integrity, hardware, method of delivery, management, and system utilization?

The third step of the research and design process was to build a preliminary form of the product, in this case, the evaluation instrument, based on the data analysis. Because the actual procedures involved in product development vary depending upon the nature of the product, there was little guidance given to this part of the R & D cycle (Borg & Gall, 1983). However, Brenner, Brown and Canter (1985) recommended a three stage process: (a) content determination, (b) question wording and sequencing, and (c) physical design and layout. Fowler concurred with recommendations for defining objectives, framing questions, and designing the format of the instrument (1984).

The first step in designing the instrument was writing a paragraph about what the instrument is supposed to do. In creating the instrument, each item was compared against the paragraph to ensure the suitability and necessity of the item. This paragraph is included in the instrument under the heading, Purpose (see Figure 1).

Figure 1

PURPOSE: The purpose of this instrument is to provide a way for school district personnel to easily assess the traits of any integrated learning system and select one that will best meet the needs of the school.

Next, using the coded data described in Research Question Two, categories were developed and variables for each category were listed. Through this process, objectives were defined and content determined.

The instrument was designed to evaluate three primary and one secondary area of interest. The primary areas were Curriculum, Management System, and Training and Service. The secondary area to be evaluated is Hardware. The first criteria evaluated in the instrument was Curriculum. Although the data analysis showed a greater concern and interest for management system components, the difference between management system and curriculum interests was not significant. The researcher decided to place curriculum evaluation first to create a logical sequence in the evaluation process. If one evaluator were evaluating all four parts of the ILS as defined by this instrument, a sequential movement through the system would make the process easier. If, for example, evaluators did not know what the curriculum consisted of, it would be more difficult to evaluate the management system. If curriculum criteria had been evaluated, management system was a logical follow-up.

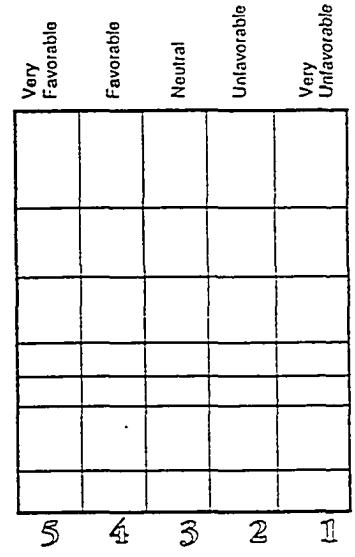
Although all eleven items under Curriculum were important to the evaluation process, the items were listed according to rank order of importance, based upon data analysis. Question 1 asks about the comprehensive nature of the curriculum and question 2 asks about the sequential

structure and the validity. Both areas held the greatest interest for the samples. Of almost equal concern, question 3 discusses the individualized nature of the system.

When the questions were developed, four standards were used: (a) Was this a question that could be understood exactly the way it was written? (b) Was this a question that would mean the same thing to every one? (c) Was this a question that people could answer? and (d) Was this a question that people would be willing to answer? To enhance the meaning of each question, bullet items were included under the question to further define it. For example, question 3 which discusses individualized instruction, offers 7 bullet items (Figure 2) to clarify its intent.

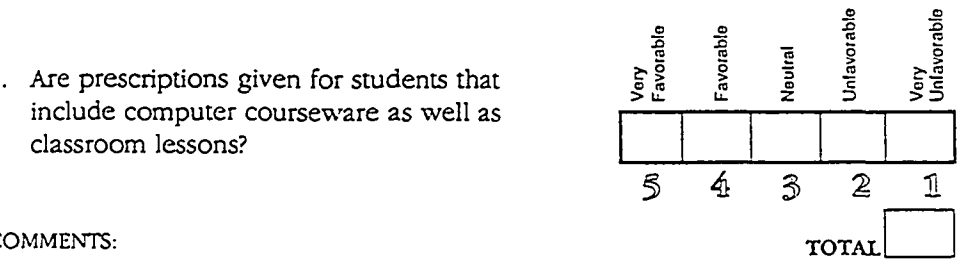
Figure 2

3. Does the courseware have all the attributes necessary to encourage individualized instruction and learning?
   - has clear, complete instructions using examples, demonstrations, procedural prompts and help screens
   - instruction is appropriate to age or grade it is designated
   - uses appropriate bookmarking of lessons (leaving and re-entering lessons)
   - learner objectives are clearly stated
   - learning is anchored to concrete ideas
   - student controls rate of lesson presentation
   - student can review previous frames



Closed-ended (or forced choice) questions were used in the instrument but the opportunity to write comments was included with each closed-ended question (See Figure 3).

Figure 3



The intent was to provide the user with the opportunity to add comments that might be important to the evaluation process but were not included in the printed form. Closed-ended questions have proven to be more efficient than open-ended questions because they are easy to use and score, and more reliable because of the uniform data they provide (Fink & Kosecoff, 1985). The analysis and interpretation of open-ended responses, on the other hand, can be quite complicated. Instructions pursuant to that were included in the instrument.

The following rules of construction were used for the development of the instrument items: (a) standard English was used and when special terms were necessary, definitions were provided, (b) items were concrete (close to the user's

experience), (c) biased words and phrases were avoided, and (d) each question had just one thought. Question 6 in Curriculum addressed the higher order thinking skills issue which was designated as very important during data collection. The term, HOTS, is defined in the question, in order to standardize the response as much as possible (Figure 4).

Figure 4

6. Does the instructional strategy use tutorials, drill and practice, and higher order thinking skills?

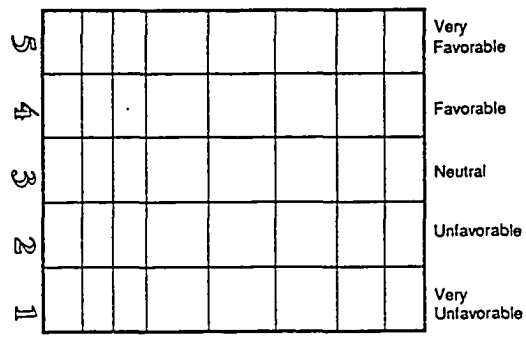
(Higher order thinking skills {HOTS} are defined as skills that involve more than direct recall, such as evaluation, integration, synthesis, comparison, etc.)

- variety of questioning strategies are used
- missed items are recycled through lesson again
- strategies keep student interacting with lesson
- strategies lead student from concrete to abstract
- discovery techniques encouraged with student
- problem solving techniques taught
- offers open-ended learning activities
- creative thinking encouraged

The category scale was selected as the rating scale. A category scale is defined as an ordinal scale where responses require that respondents place answers in rank order. Respondents select one of a limited number of categories previously ordered with respect to their position on a scale. This scale was selected because it is easy to use and interpret. Five categories were chosen to achieve a fairly refined rating: very favorable, favorable, neutral,

unfavorable, and very unfavorable (Figure 5).

Figure 5



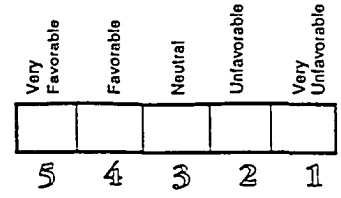
Further examination of the actual questions in Section I: Curriculum, show that items 7 and 8 (Figure 6) were the final primary concerns within the area of curriculum as determined by data collection. Questions 9-12 (see Appendix H) were secondary issues which educators want to address but were not designated as critical.

Section II: Management System was the consuming passion of educators knowledgeable in integrated learning systems, and particularly when addressing the reporting system. Consequently, question 1 has 13 bullet items to completely define the question (Figure 7). The remaining questions 2-8 (see Appendix H) were ranked in order of importance from data analysis.

Figure 6

7. Are the basic skills thoroughly taught and sequenced?

   - covers skill continuum as basal text does



8. Has enhanced achievement using this system been proven or documented?

   - have validated reports from school districts using system for more than one year
   - evaluation processes used were methodologically sound
   - other benefits besides enhanced achievement evident (e.g. increased attendance, decreased drop-out rate, reduced time for task completion)

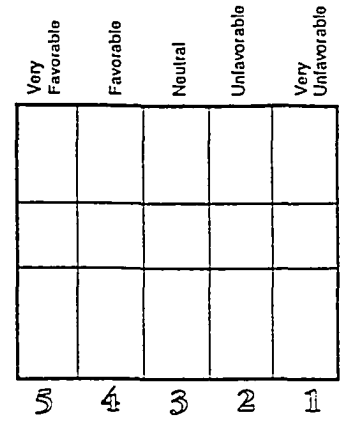
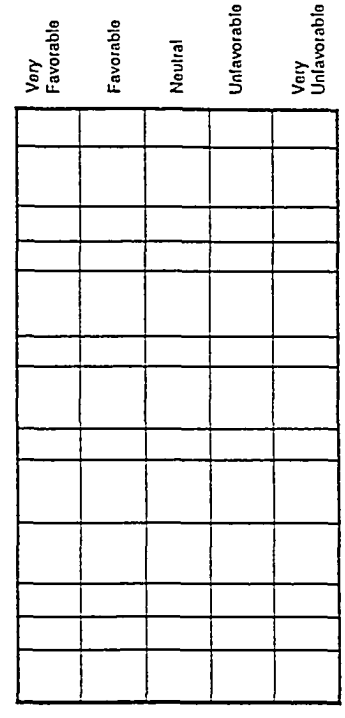


Figure 7

1. Is the report feature comprehensive and useful?

   - has student, class, group reporting
   - can request any period of time (report for one day, one week, etc.)
   - are clear, easy to read and explain
   - can be screen-displayed or printed
   - has option for highlighting only students outside of range (up or down)
   - can be accessed while system is in use
   - provides reports specifically for parents, teachers, and students
   - school can customize report forms
   - variety of formats and flexibility of configurations is available
   - correlated to school and district objectives
   - stores student demographics
   - offers security of student information
   - provides school-wide progress information



Section III: Training and Service addressed the issues that were more emotionally described than any other during data collection. Initial and ongoing training were primary areas of focus (see Figure 8).

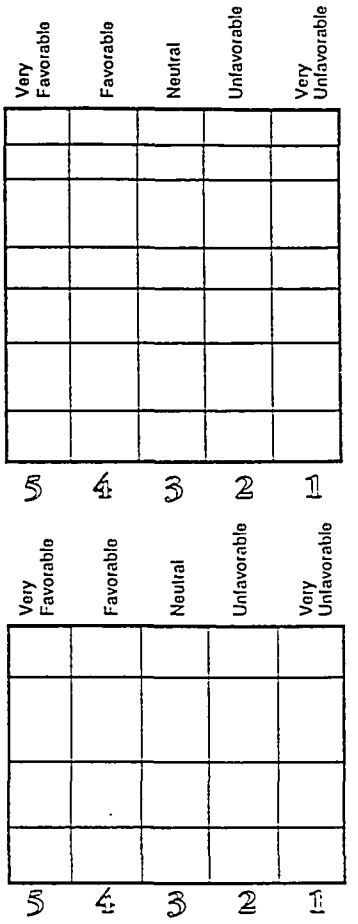
Figure 8

1. Is the breadth and depth of the initial training complete and well managed?

   - trainers are qualified
   - no limit to number allowed training
   - training outline and agenda available prior to training
   - training modified to fit needs of school
   - appropriate support documentation available for training session
   - content and training techniques instructionally sound
   - training takes place with system operational

2. Is the ongoing training and support program appropriate and necessary for the program?

   - can be regular or as needed
   - scope and sequence of ongoing training developed with school district needs in mind
   - one individual assigned to school for support and on-going training
   - extra training and retraining available to school as needed



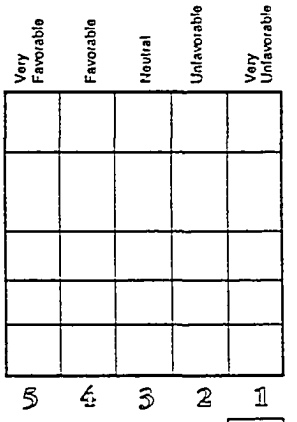
In addition, concerns to address in questions 3-8 included peripherals offered to school users, such as documentation, newsletters, update provisions, hotline services, and user groups.

Section IV: Hardware was discussed by respondents in the study and obviously was important to the operation of the system. However, it was not a primary concern. Hardware was viewed as a transparent item that provided the vehicle for the software. Most respondents indicated that if the software could function using all of its attributes on given hardware, and the hardware system was flexible in usage, then it was no longer an issue. Questions 1-7 address those concerns (Figure 9).

Figure 9

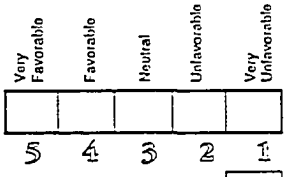
1. What kind of hardware requirements are necessary for this ILS?

   - requires dedicated hardware (hardware that can only be used for the ILS courseware) or
   - has open architecture (hardware can be added onto, can expand, can be used for other courseware)
   - student stations may operate as stand-alone computers
   - needs no special wiring requirements
   - peripherals are needed to operate the system



COMMENTS: TOTAL

2. How does speed of the network impact transfer of lessons and operation of lessons?

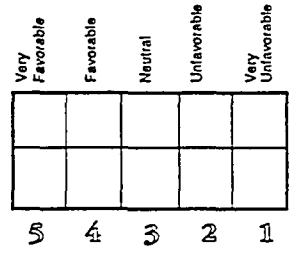


COMMENTS: TOTAL

Figure 9 continued

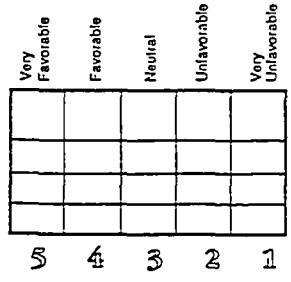
3. How flexible is the system as mandated by the hardware?

   - system operates either in lab setting or distributed in classrooms
   - hardware may be used for other networked or non-networked, third party software

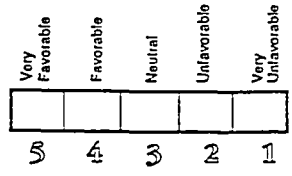


4. Does the hardware maximize the audio and graphics capabilities of the software?

   - audio and graphics are integral part of instruction
   - quality of text fonts is superior
   - audio is clear and adjustable
   - graphics and audio motivate student

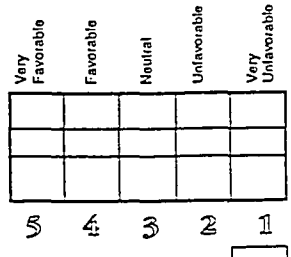


5. Does the hardware allow multi-users?



6. How many stations can operate off of one file-server?

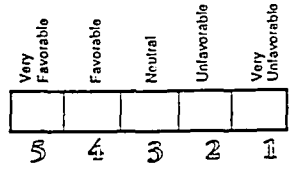
   - will this number increase?
   - why this parameter?
   - what steps are being taken to enhance this factor?



COMMENTS:

TOTAL

7. Does the ILS vendor handle hardware maintenance? If so, what are the details and if not, who does?



Cost, was rarely mentioned as an issue other than selecting the least inexpensive of two comparable systems would be prudent. School administrators indicated that quality was most important in ILS selection. If a more costly system was selected than originally budgeted, less system would be purchased, but a less expensive system would not be chosen for cost efficiency alone. Several school district decision makers concurred that once the decision was made to purchase an ILS, the money would be found. In addition, several school decision makers advised the researcher that the intent of this instrument was for use with evaluation teams and that cost factors was an inappropriate arena for them to address. Therefore, in the instrument, no assessment tool was put in place for cost evaluation.

The main goal of the instrument format was ease of use. It was designed to be self-explanatory; of a singular format; and laid out in a clear, uncluttered, visually attractive manner. Instructions were provided in the instrument for the analysis of data. It was recommended that the arithmetic average, the mean, be computed. That required summing each unit and then dividing by the number of units. Users were reminded in using the instrument that when computing an arithmetic average, every number counts. One or two unusually high or low scores could make the average higher or lower than it realistically should be. Users were urged to assess the range and determine if it is making the

average artificially low or high.

The researcher relied on the data analysis and also constantly referred back to field notes and other forms of raw data to ensure that all pertinent issues were addressed in the instrument.

Research Question Four

Can this evaluation instrument be used effectively by school district personnel to make a decision as to which ILS is the most appropriate one to purchase?

The final steps of the research and design cycle were the preliminary field testing and product revision, and the operational field testing. The purpose of the preliminary field test was to obtain an initial qualitative evaluation of the product. Borg and Gall (1983) suggested that it was important to carry out the field testing in sites similar to those in which the product will be used. In keeping with that thought, the preliminary field testing was done with the original Sample Two, consisting of decision makers from five school districts who had purchased two ILSs from two different vendors. The participants in this sample were the ones originally interviewed to determine what questions school district decision makers wanted answered about integrated learning systems.

The participants were mailed a copy of the preliminary instrument and asked to evaluate it for content, format, and usefulness. They were advised that the researcher would call them to discuss their comments in ten days. During the phone interview, the researcher used the Interview Guide for Sample Three (Appendix C) to structure the discussion. Further questioning focused on specific problems and deficiencies as well as suggestions for improvement.

Results of the preliminary testing showed that the basic content of the instrument was good. The participants in the preliminary evaluation said it was thorough, offering great depth and breadth. Two persons suggested two areas to be included that were not mentioned in the instrument, (a) cost and (b) use for distance instruction. However, review of initial raw field data and further data analysis caused the researcher to conclude that these two areas were specific, local concerns that should not be included in this instrument.

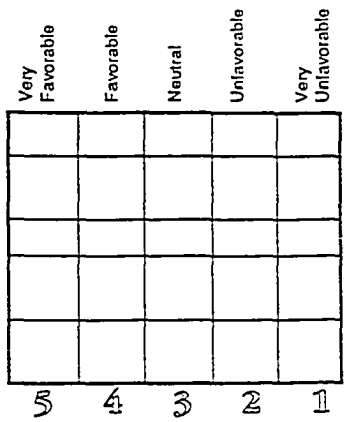
Numerous suggestions were made regarding the bullet items under each question. The addition of the items as descriptors was applauded as a helpful technique but several items were unclear or inappropriate from the respondents' points of view. Respondents recommended reordering in instances where two "like" bullet items were not located next to each other. Several bullet items were not clearly understood, so rewriting was recommended. Adding bullet items

was also suggested. For example, Section I, Question 1, offered two bullet items: (a) Does curriculum cover all grades? and (b) Are there enough lessons per grade/level? Respondents suggested that this question needed more definition, therefore, three more bullet items were added (Figure 10).

Figure 10

1. Is the curriculum comprehensive in coverage?

   - covers all appropriate grades
   - sequence of lessons covers standard curriculum
   - has enough lessons per grade/subject
   - has good depth of coverage, treating each topic thoroughly
   - has good breadth, covering a wide variety of topics

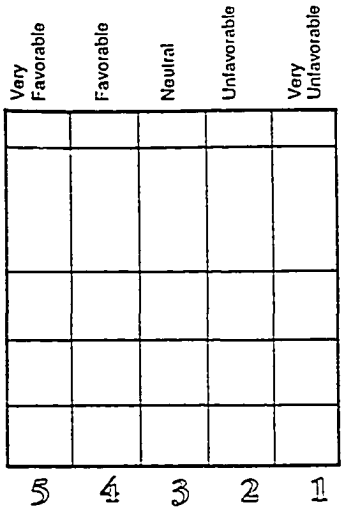


Section I, Question 3, addressed whether the software had the attributes to encourage individualized instruction and learning. One of the bullet items for that question spoke to "effective feedback". Several respondents suggested that feedback was such a critical issue within an ILS that it should be a question unto itself. The recommendation was taken and Section I, Question 4, addresses the issue (Figure 11).

Figure 11

4. Is the feedback provided to the learner appropriate and consistent?

   - feedback is error specific, not generic
   - offers variety of types, such as right/ wrong, correction, coaching with explanation, or branching to more information
   - graphics and auditory feedback used as appropriate
   - all responses considered correct are accepted as correct by computer
   - feedback geared to coach student to success



Section II, Question 1, referred to the report features of the management system. Evaluative feedback from respondents said that the question needed to be expanded and more specific. Review of raw data and data analysis reemphasized the importance this point of information held with educators and a second question was added (Figure 12).

Several bullet items were inappropriately worded. In addition, it was noted that grammatical format was not consistent throughout. Based upon respondents' recommendations, corrections were made.

Format was generally pleasing to respondents. It was recommended by several participants that the rating scale be enlarged in order to refine the results. The researcher reviewed rating scales and based on that review and respondents' comments, revised the scale to include 7

delineations instead of 5. However, based on further comments from persons using the instrument, the original rating scale of 5 was used in the final instrument.

Figure 12

2. Do individual reports provide useful feedback to school, parents, and students?

- monitors student progress towards lesson mastery
- monitors student progress towards unit mastery
- monitors time on task
- provides % correct on last lesson and current lesson
- offers detailed text of student responses
- gives date of lesson completion
- provides student performance for last 3 - 6 lessons
- provides item analysis of lessons
- provides list of mastered objectives
- lists student's most problematic objective

Respondents found the instructions to be weak and lean. In addition, it was suggested by nearly all respondents that some additional information be presented somewhere in the instrument that spoke to overall ILS assessment. A forward was added to meet that need (Figure 13) and the instructions were revised.

Overall response to the preliminary instrument was positive. Indications were that, with revision, the instrument would be very usable and beneficial to a wide variety of educational settings. Furthermore, respondents indicated that there was a great need for this type of instrument.

After revisions were completed, the final instrument

was formatted using an Apple MacIntosh computer to give a more professional appearance and bound in a booklet format

Figure 13

FOREWARD

This instrument was developed based on input from school district personnel regarding their requirements for an integrated learning system (ILS). Integrated learning systems may be used to supplement instruction or to supplant instruction in certain ways, but regardless of how they are used, it is critical that a needs assessment be conducted prior to the evaluation and selection process.

All integrated learning systems have strengths and weaknesses. School personnel need to determine their school's needs, and how an integrated learning system fits into the school curriculum and the classroom instruction. A system should be selected that makes the best fit with district philosophy regarding instruction. It is with that in mind, that each area should be reviewed and evaluated.

An ILS must be computer-based (the majority of instruction is completed on the computer). By nature of the definition, it is networked and it has comprehensive management system that works with a sequentially developed curriculum to integrate instruction with classroom learning.

School administrators should be aware that the more involved teachers are in the selection process, the more successful is the integration of an ILS into classroom instruction. To use this instrument it is recommended that a committee be formed, comprised of teachers, administrators, and curriculum specialists. Depending on the size of the committee and the time available for the evaluation, the committee can all assess the entire ILS, or the committee can be broken into four sub-committees, each of which evaluates one of the four areas of the ILS.

In addition to reviewing quality and comprehensiveness of courseware, sophistication and flexibility of the management system, implementation and ongoing support of the system, and the flexibility of the hardware; evaluators should also consider the following recommendations. First, request hands-on demonstrations by integrated learning system companies. Visit schools who are using systems and request copies of evaluation studies they have used. Finally, ask for references. References who have used the system more than two years are more credible for research tells us it takes that amount of time for appropriate implementation of any new product.

(Appendix H). It was then used in an operational field test to determine whether it was fully ready for use in school districts. The instrument was distributed to the participants in Sample Three who were all members of ILS selection committees in five school districts, committed to purchasing an ILS and currently in the selection process. Members of this sample were asked to use and evaluate the instrument in light of their assessment process. As is necessary with an operational field test, the use of the instrument was set up and coordinated by school personnel to closely approximate regular operational use.

Feedback was collected by means of the interview process, using Interview Guide for Sample Three (Appendix C), to structure the discussion. Responses were very favorable regarding the instrument, overall. Respondents indicated that the most useful part of the instrument was the structuring of the criteria under four headings. In addition, the bullet items defining each question were mentioned often as being very helpful. Changes that were suggested in most cases had to do with making the instrument site-specific. In those cases, the researcher recommended to the respondents that the instrument could and should be adapted by the school district personnel to meet specific site concerns.

In reviewing each question, suggestions for change to four questions, either in the wording or in the addition of

a bullet item, were made. The researcher, upon careful review, revised three of the suggested four questions. The fourth question was left unchanged, based on initial raw data and feedback from Sample Two. It was also suggested that the rating scale was too unwieldy and should be reduced to 5 responnses, which it was. NA (non-applicable) was removed as a choice.

All respondents said that they would use the instrument, that it was very helpful in the ILS selection process, and that they saw it as an educational tool. Prior to using the instrument, in many cases, the committees were focused on school needs but were unaware of the many attributes available in an ILS. The instrument acted as a non-biased instuctional devise, guiding and instructing the committee members on what to look for in an ILS. Many comments were made that, prior to using this instrument, school personnel had to rely on ILS vendors to tell them what an ILS could or should do. This instrument provided a neutral description of the parts of an ILS.

Respondents said that this instrument would be helpful and beneficial to any individual or committee in the educational community whose task it was to evaluate and select an ILS. Respondents felt that teachers, curriculum specialists, and administrators could all use the instrument with ease. The final question asked if there was a need for an instrument of this type. The answers were overwhelmingly

positive and the researcher was encouraged to make this instrument available to school districts nationwide.

Conclusion

The researcher completed this study to develop an evaluation instrument that school district decision makers could use in their selection of an integrated learning system. All data was collected and analyzed with the intent to answer the four research questions.

Question One discussed the appropriate evaluation model to use as the framework for the development of the evaluation instrument. In addition, it was noted that no such evaluation instrument exists.

Question Two asked what kinds of questions school district decision makers wanted answered regarding their selection of an ILS. Data collection and analysis were completed to determine what those questions were.

Question Three addressed the most effective way to evaluate an ILS. An instrument was developed by the researcher based upon data input to be used for ILS evaluation.

Question Four asked if the designed instrument would be used effectively by school districts. Representatives from 10 different school districts evaluated it and deemed it a useful, needed evaluation tool for school personnel.

CHAPTER V

Conclusions and Recommendations

Introduction

The purpose of this research was to design and validate an instrument that school district decision makers could use to evaluate integrated learning systems for purchase. This chapter is organized in six sections. The first section reviews the procedures of the study. The second section discusses the use of qualitative methodology to develop the instrument. Section three addresses the effectiveness of the instrument. Section four highlights the major findings of the study based on the four research questions. Section five presents the significance of the research to educational leadership. The final section provides implications and recommendations for future study.

Procedures

This study, a research and design process, followed the R & D cycle as recommended by Borg and Gall (1983). First, information was collected. Next, the information was

analyzed. Third, a preliminary product was developed based on the data analysis. Finally, preliminary field testing took place, revisions were made to the product, and the final product was used in an operational field test.

Specific to this study, the following procedures were implemented:

1. A complete review of the literature was completed and was a major source of data for the research. The review also verified that there was no ILS evaluation instrument in existence.

2. Representatives from ILS vendors were interviewed to collect data from them regarding their perceptions of what school districts want in an ILS. The data collected from these interviews could not have been found anywhere else.

3. Documents and all available media from ILS vendors were reviewed for the purpose of finding out what ILS attributes were emphasized by vendors in marketing the ILS to school decision makers.

4. ILS vendor booths at national trade shows were observed for media presentation and ILS attribute emphasis. In addition, interaction between vendor sales personnel and school district personnel was observed and recorded for further data regarding school district personnel's needs in an ILS.

5. Decision makers from school districts were

interviewed to determine what questions they wanted answered when they evaluated an ILS.

6. Documents that the school district personnel used during ILS selection were reviewed.

7. An evaluation instrument was designed based upon the data collection and analysis.

8. The instrument was reviewed by the school district personnel who were initially interviewed (procedure #5) for usefulness and the instrument was revised accordingly.

9. The revised instrument was reviewed by school district personnel, who were in the process of purchasing an ILS, for usefulness in the evaluation process.

10. The instrument was revised again, based upon the changes recommended in procedure #9 to create the final product, an instrument for the evaluation of an integrated learning system.

Qualitative Research for Instrument Design

The instrument's linkage to the actual needs of school district decision makers is critical if it was to be valid, reliable, and useful. There were several ways the researcher could have chosen to determine what those needs were. Survey research was one distinctive research methodology that would have been a logical choice for this study. Surveying school personnel would have included

collecting standardized information from a sample and using statistical procedures to analyze the data for results. The researcher considered this methodology, but her experience in the field of education and the ILS market suggested that there was more information to be obtained than could be collected through a singular survey. The researcher was concerned that preconceived, possibly artificial, questions in a survey would not determine the actual needs of school personnel.

Qualitative research, on the other hand, offered the researcher the opportunity to be more flexible, exploratory, and discovery oriented (Stainback & Stainback, 1988). The initial data collected could, in a qualitative study, guide the researcher toward other relevant data which "aids in gaining a deeper, more valid understanding of what is being investigated than can be achieved with a more restricted approach" (Stainback & Stainback, p. 6). It was a method oriented toward exploration and building of theory, focusing on data that existed in the minds of people. Data was collected in a naturalistic manner and people were interviewed and observed in their natural setting which allowed variables that naturally influence the data collected to operate without interference, giving the researcher a truer picture. This type of data collection allowed for a depth and detail otherwise unavailable.

Selecting the qualitative method of research reassured

the researcher that as much data as possible would be gathered, which would ensure that the instrument created would be as thorough and comprehensive as conceivably possible. In the final analysis, the wealth of information collected provided a most thorough picture of the needs of a school district. Based on the school personnel's support of the final instrument, the instrument was determined to be valid, reliable, and most importantly, usable.

Instrument Effectiveness

In determining the effectiveness of the instrument, the following questions were posed: (a) Was the instrument a valid and reliable measure of the ILS it was intended to assess? and (b) Did the instrument fulfill the purpose for which it was intended?

Validity

Qualitative researchers tend to concentrate on validity. A valid instrument is one that "represents a true or full picture of what the researcher is investigating" (Stainback & Stainback, 1988, p. 7). The questions in the instrument were carefully constructed through intensive data analysis to reflect the stated needs of school district personnel. Through preliminary field testing with Sample Two and operational field testing with Sample Three, face validity (an evaluator's appraisal of what the content

measures) of the instrument was confirmed. Participants were enthusiastic in their support of the instrument and repeatedly verified that the instrument was thorough, comprehensive, and representative of their needs.

In summary, face validity was achieved by the nature of the qualitative study, in which extensive data was collected. The resulting instrument provided an opportunity, which had previously been unavailable, to match criteria of a desired ILS with existing systems available for purchase. The end result was a face valid instrument for school district decision makers to use for their selection process.

Reliability

Reliability, as defined by Borg and Gall (1983), is the level of internal consistency or stability of the instrument over time. The instrument was evaluated for use by Sample Two and Sample Three. When Sample Two evaluated the instrument, their suggested revisions and corrections had little to do with content and a great deal to do with appearance, format, and design. When Sample Three evaluated the instrument, their suggestions for revision and correction were few and content was not an area of concern, but an area of enthusiastic support. Hence, two separate samples, at two different times, confirmed that the content of the instrument was appropriate and consistent.

Limitations

Although the instrument showed great initial promise

with sample participants, it was recognized that it had limitations. Benson & Clark (1982) said validity is never accomplished or proven by one researcher or one study. Likewise, lasting proof of reliability needs time and more research.

Other limitations included the concern that respondents offered honest assessments. A respondent's honesty depended upon perceived fear of retribution, the respondent's feelings about the subject personally, past history, and the perceived importance/usefulness of the instrument (Hanes, 1987). A related limitation was the attention to accuracy the respondent gave when evaluating the instrument. Little could be done to ensure that the respondent answered honestly and accurately other than to communicate to the respondents the importance of their responses.

The size of samples was small but as Borg and Gall suggested, a small sample was not necessarily inappropriate when doing a case study methodology. However, as this instrument is evaluated by more individuals (and the size of sample grows), the reliability of it will be enhanced.

Purpose

The purpose of this instrument was to help school district decision makers evaluate an ILS at the pre-purchase stage, assisting them in their selection process. In selecting any item to purchase, whether it be a personal item such as a car or television, or a purchase for a public

organization such as a school, evaluation criteria is considered to support the selection process. The more expensive and critical the item is, the more serious is the evaluation and the more important is the criteria. School district personnel have used evaluation forms and instruments for purchase of textbooks, science kits, and media materials. However, because of the newness of ILSs, no such instruments have been available to help in an ILS selection.

This instrument was designed and revised with direct, intense input from school district decision makers, regarding their needs in an integrated learning system. The value of such an instrument is obvious.

In addition, a secondary outcome from the final evaluation of the instrument by Sample Three, was the recommendation that because the instrument offers superior, comprehensive information about integrated learning systems it should be considered an instructional tool in itself. Although no data collection was done on this concept, the theory is sensible and should be validated by future research.

Review of Research Findings

Research Question One

What kinds of evaluation models or instruments are available to evaluate educational products such as an ILS? What are the advantages and disadvantages of using these models for an ILS?

Literature review focused on: (a) CAI, (b) ILS, (c) evaluation models for education, (d) instruments for evaluating education products, and (e) instruments for evaluating ILSs. The findings showed that there were numerous evaluation models in education, though few appropriate for this study. The CIPP model was determined to be the most appropriate model to use as a guideline for the ILS evaluation instrument. Likewise, there were many instruments that were designed to evaluate educational products but no instruments were found that had been developed specifically for the evaluation of an ILS.

Research Question Two

What kinds of questions do school district personnel currently considering the purchase of an ILS want answered about ILS in terms of cost, curriculum instructional design

and integrity, method of delivery, management and lab utilization? What questions do the decision makers need answered to make their selection?

School district decision makers were interviewed and asked to discuss what ILS attributes were critical to them when they made purchasing decisions. As the data was collected and analyzed, themes began to emerge. The first theme to emerge was the necessity for a management system that provided stringent, comprehensive, and flexible reporting options and flexibility in the use of the system.

The second theme, of almost equal importance to educators, was the interest and concern for the ILS curriculum. Educators want a comprehensive, sequential curriculum that was developed by curriculum experts; built on the precepts of higher order thinking skills; provided individualization of instruction opportunities for students; and that correlated with classroom instruction, district objectives, state frameworks, and standardized tests. They also emphasized the need for the curriculum to address basic skills and to improve academic achievement of students.

The third theme was the importance of training and subsequent service to schools. School personnel suggested that the success of the ILS implementation was almost solely based on the initial installation and training that school staff received. Ongoing training was critical to meet the

needs of teachers on the learning curve. The variety and quality of training was considered important as was the documentation and 800 number support.

The final theme was the importance of hardware flexibility, the graphics capabilities of the hardware, and the audio components of the hardware.

After the data collection was complete, the themes that emerged very clearly defined the kinds of information school district personnel need when evaluating ILSs.

Research Question Three

What is the most effective way to evaluate an ILS, considering areas of finance, curriculum, instructional design and integrity, hardware, method of delivery, management, and system utilization?

The collected data was analyzed using coding and matrices. Based on the data analysis, content of the instrument was defined. Questions were then framed based on the data analysis using standard rules of question construction. A rating scale was chosen and the format for the instrument was designed in an attempt to be clear, uncluttered, and visually attractive. The instrument was designed by the researcher to answer Question Three.

Research Question Four

Can this evaluation instrument be used effectively by school district personnel to make a decision as to which ILS is the most appropriate one to purchase?

The instrument was reviewed by two samples of school district personnel. Feedback was received through interviews by the researcher and instrument revision occurred when the feedback suggested that revision was appropriate. Question wording was revised in some instances and some question placement was changed. In addition, school personnel feedback called for additional directions and background information prior to using the instrument.

After being revised, the instrument was used in an operational field test by school district personnel who were in the process of selecting an ILS for purchase. The field test yielded positive results in the use of the ILS instrument. Suggestions for changes to four questions were made; three questions were subsequently changed in the final revision, based on researcher judgment. The rating scale was also changed from 7 responses to 5. The users of the instrument found it helpful, beneficial, instructional, and needed.

Significance of the Research to Educational Leadership

"Electronic learning is the new technology of education" (Mecklenburger, 1988, p. 18). The National School Boards Association (NSBA) in A National Imperative: Educating for the 21st Century, emphasized that technology is going to transform education. Perelman suggested how that is going to happen. He said that the entire system of education has undergone a fundamental shift to a new philosophy based on mastery (1988). The switch to mastery learning has been facilitated by the use of advanced information technology, which can design, manage, and deliver instruction tailored to individual learners. Schools are beginning to show great diversity in settings, instructional methods, technologies, and styles. "Increasingly common across these diverse settings is the use of advanced learning technologies to deliver personalized instruction" (Perelman, p. 22), an integrated learning system.

Instructional technology is presenting new opportunities to schools but it must be viewed broadly, not as an add-on, but as a part of the whole infrastructure of the school. "Teachers, principals, superintendents, and school boards are making tough choices about whether and how to link computers and learning" (Lapointe & Martinez, 1988, p. 59). As those tough choices are being made, hardware

configurations and prices change, curriculum emphasis shifts, and new uses of computers arise, making the tough choices tougher.

With their commitment to technology, school district personnel are spending millions of dollars. Computers are becoming a major and continuing financial commitment, and school personnel are only beginning to understand all the costs (Charp, 1988, p. 32). To justify the dollars spent and ensure the dollars are spent well, evaluation of the technology to be purchased is critical. Computer technology is becoming such an integral and expensive part of education that "it is not enough to leave it to a band of dedicated enthusiasts" to select the system to be purchased (Blease, 1986, p. 1). The quality of the decision made by school district personnel regarding an ILS selection will determine the success of the ILS implementation and the future of further technological enhancements in the school.

User decisions were previously based on the reputation of the commercial vendor or the presumed academic qualifications of the product's authors (Alkin & Fink, 1974). Now, potential users of ILSs are becoming sufficiently sophisticated to realize they need comprehensive and understandable information about an integrated learning system before they make their decision. They need information about the product's description, purposes, intended learners, development and testing,

effectiveness, and efficiency. They need an evaluation instrument that will obtain and provide useful information for judging decision alternatives for ILS product adoption.

The development of this instrument provides the leadership of education with the first tool of its kind to guide and assist decision making in the selection of an ILS. It is not only a decision making tool, but an instructional device as well, aimed at any educator who is involved in the evaluation of integrated learning systems. It was developed with a strong theoretical and concrete base of information. It was judged to be "extremely useful", "exceptionally thorough", and "very timely" by educators using it in a pilot study. It is an instrument that has tremendous potential to assist school district decision makers who are spending millions of dollars on an ILS for their students in this decade.

Recommendations

As a result of this study, the researcher recommends focus on the following areas for future research:

1. Future researchers should explore more thoroughly the reliability and validity of this instrument, using larger samples and longer time-frames.

2. Future researchers should review, revise, and expand the items of this instrument to meet the needs of a

constantly evolving integrated learning system.

3. Future researchers should expand upon the suggestion of respondents to use this instrument as an instructional tool for educators seeking information about ILSs.

4. Future researchers should examine the barriers to the expanded used of integrated learning systems, such as (a) high reoccurring costs in the form of software updates and system manager salaries, (b) lack of teacher ownership, (c) time and effort to prepare and install networks, and (d) high initial funding outlays and inflexible pricing arrangements (Education TURNKEY Systems, Inc., 1989).

5. Future researchers should design and implement independent, objective research to evaluate student performance on integrated learning systems.

6. Future researchers should explore the relationship between network users and ILS users in schools.

7. Future researchers should examine the entire ILS selection process.

8. Future researchers should examine the implementation of ILSs within schools and the impact the implementation has on the success of the system.

9. Future researchers should address the cost-effectiveness component of an ILS.

10. Future researchers should examine policies and plans for technology, as developed by school district personnel.

11. Future researchers should compare and contrast the Educational Products Information Exchange's (EPIE) report on integrated learning system, released March, 1990, with this researcher's study. Initial comparisons completed by the researcher indicated a high correlation between areas to be assessed as determined by EPIE and by this study which would validate this instrument. A more thorough review of the instrument and its correlation to the EPIE findings and the impact that would have on the validity of this instrument should be undertaken.

Educational technology "doesn't just appear with the wave of a magic wand," suggested the leadership of the National School Board Association in their latest report (Bruder, 1990, p. 10). Planning and careful evaluation of technology is inherent in successful technology implementation. The instrument developed in this study will set the direction for the evaluation and selection of ILSs in school districts, and the suggested research will address the future of technology in education.

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APPENDIX A

INTERVIEW GUIDE FOR SAMPLE ONE (ILS COMPANY REPRESENTATIVES)

Interview Guide for Sample One

ILS Company Representative

PERSONAL INFORMATION

1. What is your position in the company?

2. How long have you been with the company?

3. What is your education background?

4. What is your career background?

5. Who do you interact with within the company?

6. What kind of contact do you have with clients?

7. What positions do your clients hold?

8. How are you personally influential in convincing clients to purchase your product?

PRODUCT INFORMATION

9. What makes your product good?

10. What makes your product the best?

11. What makes your product unique?

12. How do you prove your product is needed in the school?

13. How do you prove your product works in the school?

14. How is your product developed?

15. What kind of field testing is done?

16. What input do clients have in changing your product?

17. Why do schools think your product is good?

18. What can you tell me about the integrity of the instructional design? Is that important to schools? To the product?

19. What concerns your clients most when they purchase your product? How do you address that?

FINANCIAL IMPACT

20. Is money a factor in the decision making for the purchase of your product? If so, how important is it in comparison to the other factors?

21. How do most schools pay for the product?

22. Is your product expensive?

23. Is your product price-competitve in the market place?

HARDWARE

24. Is hardware an important issue with your product?

25. What do schools perceive as more important, hardware or software?

26. What do you you perceive as more important?

27. How does hardware positively impact your product? Negatively?

MANAGEMENT

28. Tell me about your management system.

29. How important is it to your product? Why?

30. Why was the management system developed?

31. Do schools know how to tap the power of the management system?

32. How does your management system compare to your competitors?

33. How do you sell the management system?

34. What school personnel is the management system most important to?

SYSTEM UTILIZATION

35. How do most schools use your system? Is that their own idea or your recommendation?

36. Does the way the system is used impact the effectiveness of the system?

37. What influence do you have on how a system is used?

38. What is the most effective lab utilization model? How many of your schools use that model?

MISC.

39. What do you think is needed in education today to make it better?

40. What do schools think is needed in education today to make it better?

41. Do teachers want a different product than administrators?

42. Who are the true decision makers in a purchase of your product?

43. What percentage of your current clients would make the same decision over again? Why?

44. Which of your marketing techniques has been most successful?

45. What is your approach at trade shows?

46. On what is the majority of your marketing budget spent?

47. What is the most effective procedure you have observed that school districts use for ILS selection?

48. What is the most common procedure?

49. Who are your competitors?

APPENDIX B

INTERVIEW GUIDE FOR SAMPLE TWO (SCHOOL DISTRICT PERSONNEL)

Interview Guide for Sample Two

School District Personnel

PERSONAL INFORMATION

1. What is your position in the school district?

2. How long have you been with the district?

3. Where does your district stand with computer integration?

4. What part do you play regarding computer integration?

5. Are you pleased with where the district is?

6. What is your long range computer goal?

7. What will have to happen to see the goal achieved?

8. What obstacles will stand in the way?

9. How will you address the obstacles?

10. How do you compare your district with other school districts in computer integration?

ILS PURCHASE

11. How many ILSs do you have in your district?

12. What vendors?

13. How long have you had them?

14. What was the rationale behind selecting the ILSs?

15. Who were the major decision makers in the selection process?

16. Tell me about the selection process.

17. What were the 5 most critical "got-to-haves" when making the ILS purchase?

18. Did hardware play a part?

19. How did finances impact the decision?

20. What evaluation process did you use?

21. Did it work? Was is fair? Was it effective?

22. Are ILS companies responding to schools' needs? How?

23. Did any particular marketing technique influence your decision?

24. Tell me about your marketing rep. who sold you the product.

PRODUCT

25. Why is the product you purchased the best?

26. How did you know the product would work, would do what they said it would do?

27. Did the ILS company have any effectiveness validation?

28. If they did, was that important to you? Which part?

29. How was your ILS curriculum developed? Did you have any input?

30. How good is the management system? How important is it?

31. What kind of service and training comes with your ILS? How important is that to you?

SYSTEM UTILIZATION

32. How are the systems utilized in your district?

33. How did you determine the utilization model?

34. Has the system been proven effective in your district? In what way?

MISC.

35. What do teachers need most to teach today?

36. What do students need most to learn today?

37. How can computers help teachers?

38. How can computers help students?

39. If you could design your own ILS with unlimited funds what more would it do that your purchased system can't?

40. What is the continued evaluation plan for the ILSs?

41. What one piece of marketing information was most crucial to your decision to purchase from that vendor?

42. What did you need to know about the system that was difficult or impossible to find out?

43. What vendors did you consider before making your selection?

APPENDIX C

INTERVIEW GUIDE FOR SAMPLE THREE (SCHOOL DISTRICT PERSONNEL)

Interview Guide for Sample Three
School District Personnel

1. Tell what was most useful about the instrument.

2. Tell me what needs to be changed? Added? Deleted?

3. Review each part of instrument - record feedback.
   Ask specifically about clarity and relevancy?

4. Would you use this instrument again?

5. Who would benefit most from an instrument of this kind?

6. Is there a need for an instrument of this type?

APPENDIX D

OBSERVATION CHECKLIST

Observation Checklist

Booth

Size:

Attractiveness:

Furnishings:

Computers:

Accessibility:

Other:

Personnel

Sex:

Age:

Background:

Approachability:

Style:

Knowledge:

Other:

Wall decor and media

Emphasis on:

Computers:

Hardware:

Curriculum:

Achievements of vendor:

Performance of software:

Past users:

Management system:

Service:

Other:

Client Interaction

Passive or aggressive:

What did vendor emphasize most:

What did client emphasize most:

Follow-up with client:

Other:

APPENDIX E

DOCUMENTATION SUMMARY

Documentation Summary

COMPANIES

ATTRIBUTES	(1)	(2)	(3)	(4)	(5)
Cost effective					
Maintenance					
Training supp.					
Leasing					
Volume discount					
Experienced					
# Installs.					
Dropout prevent.					
Attendance					
Parent involved					
Motivation					
Cutting edge					
Meets needs					
Initial train.					
Ongoing train.					
Handbooks					
Manuals					

ATTRIBUTES	(1)	(2)	(3)	(4)	(5)
800 #					
Newsletters					
User groups					
Yearly service					
Complete install					
Several different hardware					
Turnkey					
# computers					
Open architect.					
Third party					
Graphics					
Sount					
Multi-user					
Flexibility					
Speed					
Color					
Curriculum					
Experienced authors					
Measurable results					
Diff. pop.					

ATTRIBUTES	(1)	(2)	(3)	(4)	(5)
Individual					
Interactive					
Thinking skills					
Tutorial					
Updates					
Time on task					
Worksheets					
Basic skills					
Recordkeep.					
Reports					
Prescriptions					
Word process.					
Authoring					
Auto. placement					
Customization to site					
Scheduling					

APPENDIX F

CODES FOR DATA ANALYSIS

Codes

V: Vendor generated D: Documentation

S: School generated O: Observation

H: Hardware

Brand	H/BR
Turnkey	H/TURN
Network	H/NET
Number of stations	H/NUM
Open architecture	H/ARCH
Third party software	H/THIR
Graphics	H/GR
Audio	H/AU
Multi-user	H/MULTI
Flexibility	H/FLEX
Speed	H/SPEED
Speech synthesis	H/SP
Mouse	H/MOU
Stand-alone stations	H/STAND
No special wiring	H/NOWIR
Other	H/OTH

S: Software

Appearance - superior screen format	S/APP/FOR

Appearance - directions recalled	S/APP/DIR
Appearance - instructions clear	S/APP/INSTR
Appearance - animation	S/APP/ANI
Appearance - video	S/APP/VID
Appearance - screen error free	S/APP/ERROR
Curriculum - correlates with class	S/CUR/CORR
Curriculum - shortens time on task	S/CUR/TIME
Curriculum - appropriate feedback	S/CUR/FEED
Curriculum - comprehensive	S/CUR/COMP
Curriculum - valid	S/CUR/VAL
Curriculum - interactive discovery	S/CUR/DISC
Curriculum - higher order thinking	S/CUR/HOTS
Curriculum - tutorial	S/CUR/TUT
Curriculum - individual instruct.	S/CUR/II
Curriculum - basic skills	S/CUR/BASIC
Curriculum - enrichment	S/CUR/ENR
Curriculum - reteaching	S/CUR/RET
Curriculum - cooperative learning	S/CUR/COOP
Curriculum - learning styles	S/CUR/LS
Curriculum - clear objectives	S/CUR/OBJ
Curriculum - current lessons	S/CUR/CUR
Curriculum - effect. teach. strat.	S/CUR/STRAT
Curriculum - lessons sequential	S/CUR/SEQ
Curriculum - branching	S/CUR/BRAN
Curriculum - different populations	S/CUR/POP
Curriculum - student achievement	S/CUR/ACHIEV

Curriculum - non-discriminatory	S/CUR/NONDIS
Curriculum - random generate probl.	S/CUR/RANGEN
Maintenance - yearly updates	S/MAIN/UPDAT
Maintenance - support materials	S/MAIN/SUPP
Maintenance - tutorials/ system op.	S/MAIN/TUT
Maintenance - teacher modification	S/MAIN/TEMOD
Other	S/OTH

M: Management System

Reports	M/REP
Prescriptions	M/PRES
Teacher override	M/TCHOVER
Automatic student placement	M/AUTOPL
Scheduling	M/SCH
Testing	M/TEST
Security	M/SEC
Student Demographics	M/DEMO
Menu driven	M/MENU
Time spent on lessons	M/TIME
User friendly	M/UF
Customization to site	M/CUST
Regular updates	M/UPDATE
Documentation	M/DOCU
Authoring system	M/AUTH
Word processing	M/WP
Other	M/OTH

T: Training and Service

Initial on-site training	T/INIT
Ongoing training and visitation	T/ONGO
Training instructionally sound	T/SOUND
Complete initial installation	T/INSTAL
Variety of training materials	T/MATER
Ease of use of materials	T/EASY
Toll-free hotline	T/HOT
Newsletter	T/NEWS
User groups	T/USER
Yearly service contracts	T/CONT
Other	T/OTH

C: Cost

Cost effective	C/EFF
Maintenance and training costs sep.	C/SEP
Leasing available	C/LEAS
Volume discounts	C/VOL
Other	C/OTH

O: Other Benefits

Experience company	O/EXP
Number of installations	O/#INST
Helps dropout rate	O/DROP
Increases attendance	O/ATTEN
Encourages parent involvement	O/PAR

Motivating to students	O/MOTI
Cutting edge of education	O/CUTED
Cutting edge of technology	O/CUTTEC
Student-teacher acceptance	O/ACCEP
Promotes positive attitudes	O/POS
Work habits and time on task	O/TOT
Lab setting or classroom	O/LAB.CLASS
Can add tools for teachers	O/TOOLS
Other	O/OTH

APPENDIX G

CHECKLIST MATRIX: ATTRIBUTES IMPORTANT TO AN ILS

Checklist Matrix: Attributes important to an ILS

ATTRIBUTES	Sam.1	Sam.2	Observed	Documents
Hardware				
H/BR				
H/TURN				
H/NET				
H/NUM				
H/ARCH				
H/THIR				
H/GR				
H/AU				
H/MULTI				

H/FLEX

H/SPEED

H/SP

H/MOU

H/STAND

H/NOWIR

H/OTH

Software

S/APP/FOR

S/APP/DIR

S/APP/INSTR

S/APP/ANI

S/APP/VID

S/APP/ERROR

S/CUR/CORR

S/CUR/TIME

S/CUR/FEED

S/CUR/COMP

S/CUR/VAL

S/CUR/DISC

S/CUR/HOTS

S/CUR/TUT

S/CUR/II

S/CUR/BASIC

S/CUR/ENR

S/CUR/RET

S/CUR/COOP

S/CUR/LS

S/CUR/OBJ

S/CUR/CUR

S/CUR/STRAT

S/CUR/SEQ

S/CUR/BRAN

S/CUR/POP

S/CUR/ACHIEV

S/CUR/NONDIS

S/CUR/RANGEN

S/CUR/UPDAT

S/MAIN/UPDAT

S/MAIN/SUPP

S/MAIN/TUT

S/MAIN/TEMOD

S/MAIN/OTH

Management System

M/REP

M/PRES

M/TCHOVER

M/AUTOPL

M/SCH

M/TEST

M/SEC

M/DEMO

M/MENU

M/TIME

M/UF

M/CUST

M/UPDATE

M/DOC

M/AUTH

M/WP

M/OTH

Training and Service

T/INIT

T/ONGO

T/SOUND

T/INSTAL

T/MATER

T/EASY

T/HOT

T/NEWS

T/USER

T/CONT

T/OTH

Cost

C/EFF

C/SEP

C/LEAS

C/VOL

C/OTH

Other Benefits

O/EXP

O/#INST

O/DROP

O/ATTEN

O/PAR

O/MOTI

O/CUTED

O/CUTTEC

O/ACCEP

O/POS

O/TOT

O/LAB.CLASS

O/TOOLS

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APPENDIX H

AN INSTRUMENT FOR THE EVALUATION OF AN INTEGRATED LEARNING SYSTEM

EVALUATING AN INTEGRATED LEARNING SYSTEM

EVALUATING AN INTEGRATED LEARNING SYSTEM

Vendor Name _____

Evaluator Name _____

Sections:	I. Curricula	II. Management System	III. Training & Service	IV. Hardware
Possible Points	12 x 7 = 84	9 x 7 = 63	8 x 7 = 56	7 x 7 = 49
Earned Points				

Section I	+	Section II	+	Section III	+	Section IV	=	Total
_____	+	_____	+	_____	+	_____	=	

Total

FOREWARD

This instrument was developed based on input from school district personnel regarding their requirements for an integrated learning system (ILS). Integrated learning systems may be used to supplement instruction or to supplant instruction in certain ways, but regardless of how they are used, it is critical that a needs assessment be conducted prior to the evaluation and selection process.

All integrated learning systems have strengths and weaknesses. School personnel need to determine their school's needs, and how an integrated learning system fits into the school curriculum and the classroom instruction. A system should be selected that makes the best fit with district philosophy regarding instruction. It is with that in mind, that each area should be reviewed and evaluated.

An ILS must be computer-based (the majority of instruction is completed on the computer). By nature of the definition, it is networked and it has comprehensive management system that works with a sequentially developed curriculum to integrate instruction with classroom learning.

School administrators should be aware that the more involved teachers are in the selection process, the more successful is the integration of an ILS into classroom instruction. To use this instrument it is recommended that a committee be formed, comprised of teachers, administrators, and curriculum specialists. Depending on the size of the committee and the time available for the evaluation, the committee can all assess the entire ILS, or the committee can be broken into four sub-committees, each of which evaluates one of the four areas of the ILS.

In addition to reviewing quality and comprehensiveness of courseware, sophistication and flexibility of the management system, implementation and ongoing support of the system, and the flexibility of the hardware; evaluators should also consider the following recommendations. First, request hands-on demonstrations by integrated learning system companies. Visit schools who are using systems and request copies of evaluation studies they have used. Finally, ask for references. References who have used the system more than two years are more credible for research tells us it takes that amount of time for appropriate implementation of any new product.

Finally, evaluators should not only assess the ILS as it operates today, but should also be interested in the future thrust of the ILS and how it will impact the school in the next decade. Technological advancements are having great impact on integrated learning systems and schools should be planning for that impact.

Using this instrument will assist all educators in making an appropriate, informed decision where an ILS matches the needs of the school district. Hopefully, the instrument will make the process easier as well!

PURPOSE: The purpose of this instrument is to provide a way for school district personnel to easily assess the traits of any integrated learning system and select one that will best meet the needs of the school.

INSTRUCTIONS: This instrument has been divided into four areas of concentration: Curriculum, Management System, Training and Support, and Hardware.

After each question are several bullet items marked with an asterisk (*). These are issues to consider in the rating of the question. Score each asterisk (*) item, scan the asterisk (*) boxes to determine an overall score, and place the final rating in the box next to the question.

The instrument allows for numerical ratings (5 = very favorable, 4 = favorable, 3 = neutral, 2 = unfavorable, and 1 = very unfavorable). Please mark the number that best describes your assessment of each item.

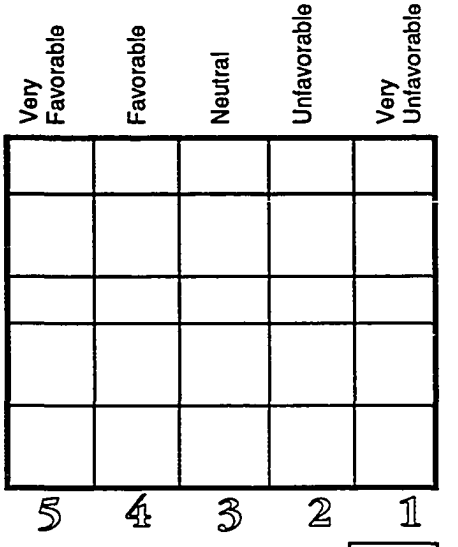
Add the total number of points for each area and write them on a cover page of this instrument. Then total all four areas and place in the TOTAL box on the cover page.

To compute a final score, add all Totals and divide by the number of units. Remember that when computing an arithmetic average, every number counts. One or two unusually high or low scores could make the average unrealistic. Access the range to ensure that the average reflects all input.

Section I:
CURRICULUM

1. Is the curriculum comprehensive in coverage?

   * covers all appropriate grades
   * sequence of lessons covers standard curriculum
   * has enough lessons per grade/subject
   * has good depth of coverage, treating each topic thoroughly
   * has good breadth, covering a wide variety of topics

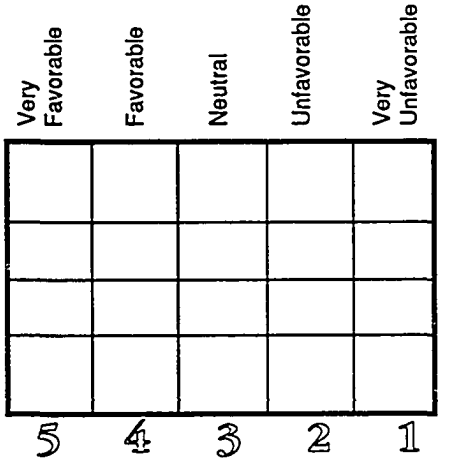


COMMENTS:

TOTAL ☐

2. Has the curriculum been developed sequentially and with integrity?

   * developed by respected, credible authors
   * has no gaps between concepts
   * content is accurate
   * courseware contains no errors of information, spelling, or grammar

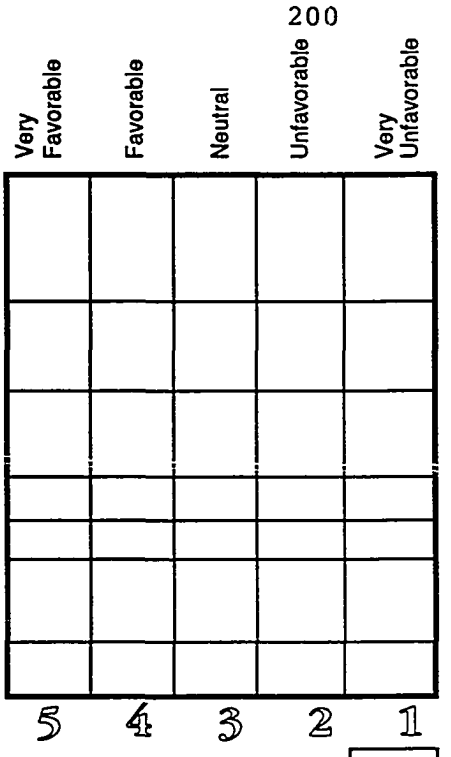


COMMENTS:

TOTAL ☐

3. Does the courseware have all the attributes necessary to encourage individualized instruction and learning?

   * has clear, complete instructions using examples, demonstrations, procedural prompts and help screens
   * instruction is appropriate to age or grade it is designated
   * uses appropriate bookmarking of lessons (leaving and re-entering lessons)
   * learner objectives are clearly stated
   * learning is anchored to concrete ideas
   * student controls rate of lesson presentation
   * student can review previous frames

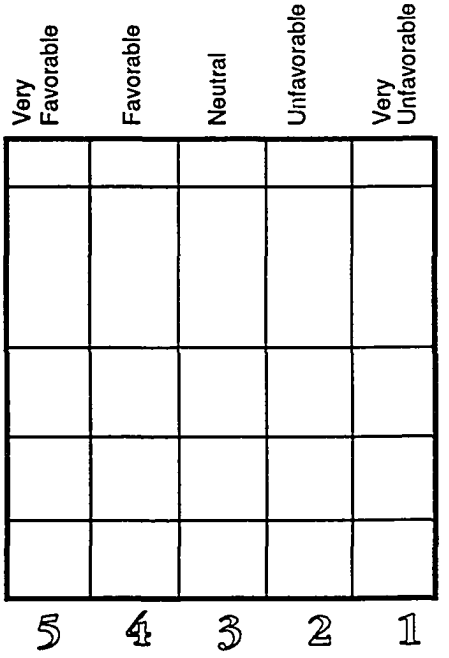


COMMENTS:

TOTAL ☐

4. Is the feedback provided to the learner appropriate and consistent?

   * feedback is error specific, not generic
   * offers variety of types, such as right/ wrong, correction, coaching with explanation, or branching to more information
   * graphics and auditory feedback used as appropriate
   * all responses considered correct are accepted as correct by computer
   * feedback geared to coach student to success

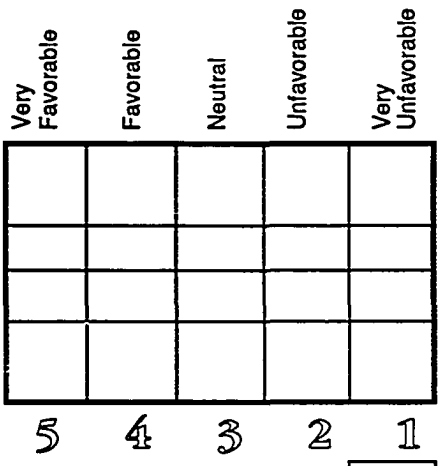


COMMENTS:

TOTAL ☐

5. Does the curriculum correlate with classroom instruction, district competencies, state frameworks, and standardized tests?

   * has correlation matrixes for textbooks (including appropriate edition)
   * correlation is easy to read and use
   * correlations are complete and accurate
   * suggestions for classroom integration provided in documentation and training



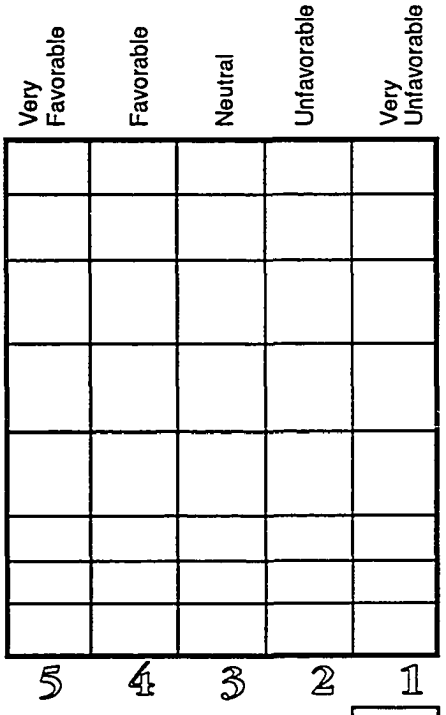
COMMENTS:

TOTAL ☐

6. Does the instructional strategy use tutorials, drill and practice, and higher order thinking skills?

   (Higher order thinking skills {HOTS} are defined as skills that involve more than direct recall, such as evaluation, integration, synthesis, comparison, etc.)

   * variety of questioning strategies are used
   * missed items are recycled through lesson again
   * strategies keep student interacting with lesson
   * strategies lead student from concrete to abstract
   * discovery techniques encouraged with student
   * problem solving techniques taught
   * offers open-ended learning activities
   * creative thinking encouraged

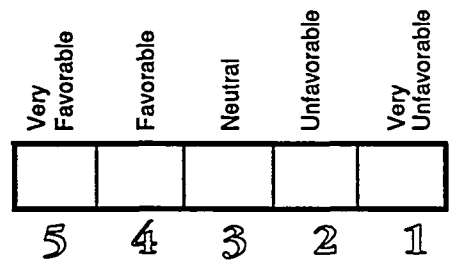


COMMENTS:

TOTAL ☐

7. Are the basic skills thoroughly taught and sequenced?

   * covers skill continuum as basal text does

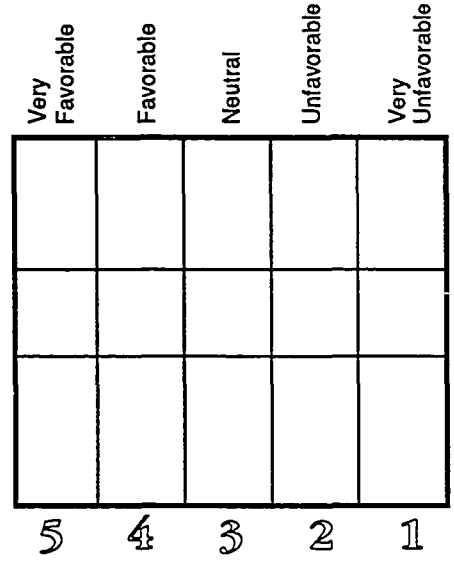


COMMENTS:

TOTAL ☐

8. Has enhanced achievement using this system been proven or documented?

   * have validated reports from school districts using system for more than one year
   * evaluation processes used were methodologically sound
   * other benefits besides enhanced achievement evident (e.g. increased attendance, decreased drop-out rate, reduced time for task completion)

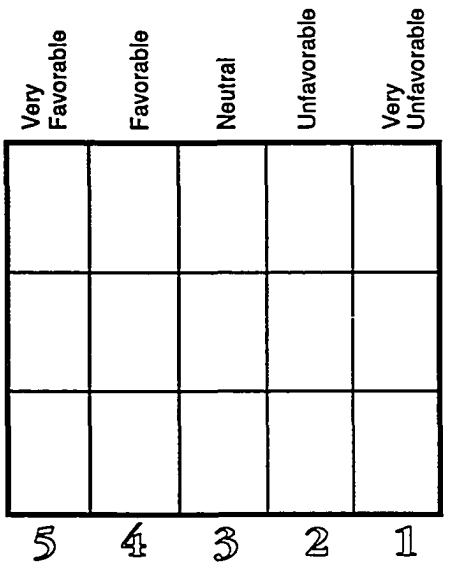


COMMENTS:

TOTAL ☐

9. Can the needs of all populations be met appropriately?

   * branching provides for remedial and enriched learning, offering multiple difficulty levels
   * attributes of courseware address different learning styles (e.g. audio, visual, tactile)
   * can be adapted for use with handicapped (physical, visual, auditory, etc.)

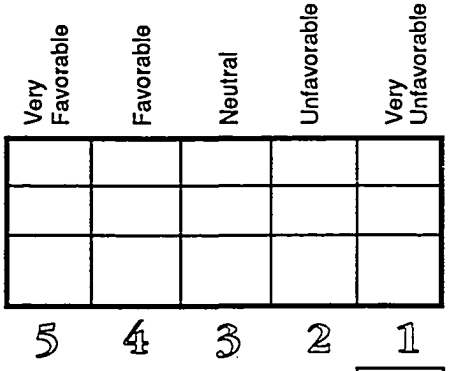


COMMENTS:

TOTAL ____

10. Are the provisions for curriculum updates appropriate and timely?

   * errors corrected immediately
   * teacher/student requests accepted
   * provides correlation for any new school curriculum

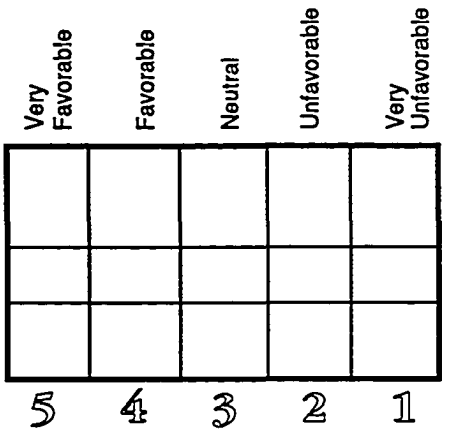


COMMENTS:

TOTAL ____

11. Is the courseware non-discriminatory?

* sex, race, culture, socioeconomic, handicapped, and language are non-discriminatory
* auditory uses male and female voices
* graphics provides equal variety of people types

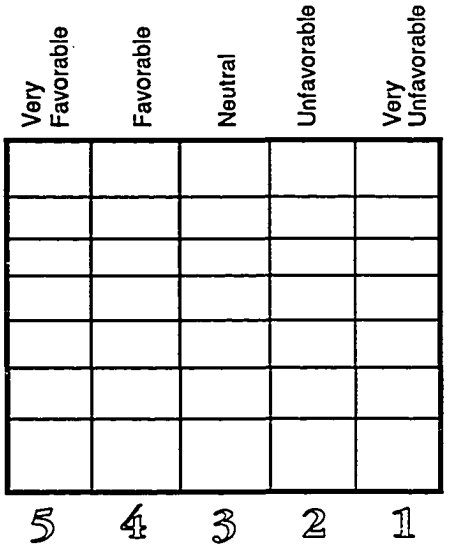


COMMENTS:

TOTAL ☐

12. Is the documentation provided organized and helpful to the user?

* has variety of support documents
* documentation is well designed
* is easy to use
* is comprehensive
* lesson descriptions are clear and useful
* lesson descriptions are concise
* contains content and prerequisite information for lessons

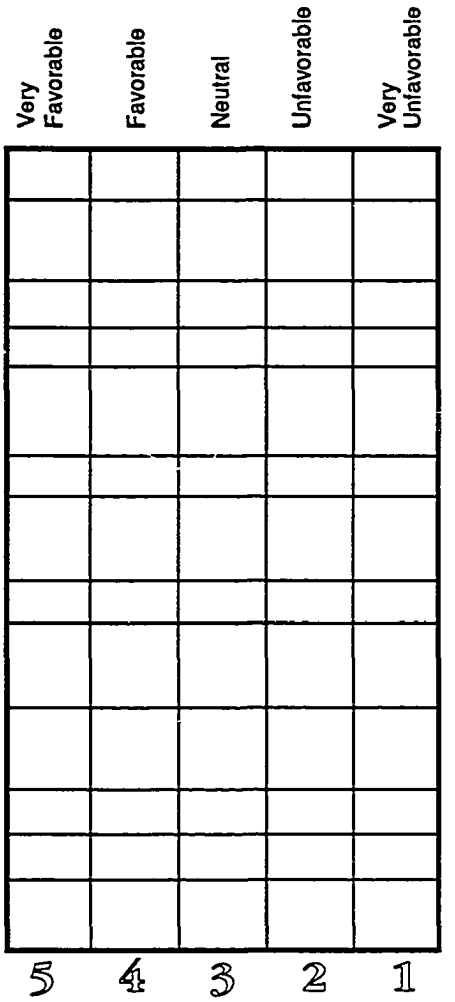


COMMENTS:

TOTAL ☐

Section II:
MANAGEMENT SYSTEM

1. Is the report feature comprehensive and useful?

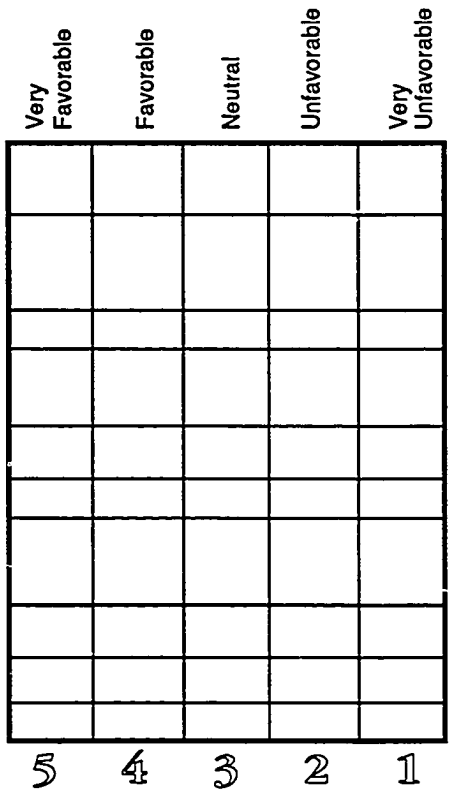


* has student, class, group reporting
* can request any period of time (report for one day, one week, etc.)
* are clear, easy to read and explain
* can be screen-displayed or printed
* has option for highlighting only students outside of range (up or down)
* can be accessed while system is in use
* provides reports specifically for parents, teachers, and students
* school can customize report forms
* variety of formats and flexibility of configurations is available
* correlated to school and district objectives
* stores student demographics
* offers security of student information
* provides school-wide progress information

COMMENTS:

TOTAL ☐

2. Do individual reports provide useful feedback to school, parents, and students?

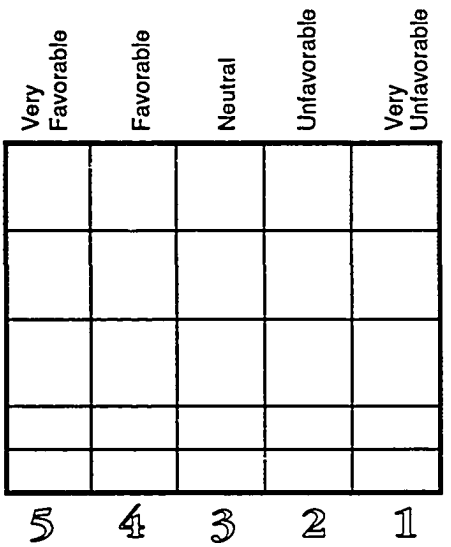


* monitors student progress towards lesson mastery
* monitors student progress towards unit mastery
* monitors time on task
* provides % correct on last lesson and current lesson
* offers detailed text of student responses
* gives date of lesson completion
* provides student performance for last 3 - 6 lessons
* provides item analysis of lessons
* provides list of mastered objectives
* lists student's most problematic objective

COMMENTS:

TOTAL ☐

3. Does the system allow for the participation of teachers in lesson management?



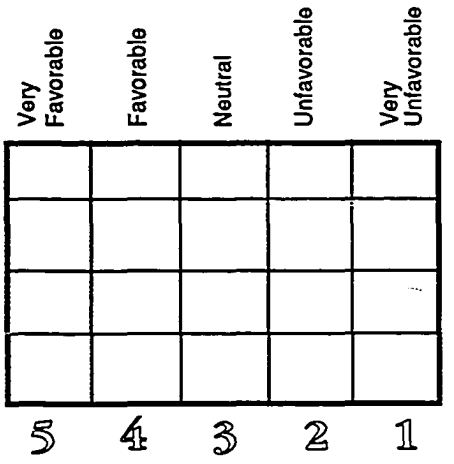
* lesson can be overridden permanently or temporarily
* groups can be placed in one lesson simultaneously
* student placement and prescriptions can be overridden
* can change mastery (%) definition
* can resequence lessons within course

COMMENTS:

TOTAL ☐

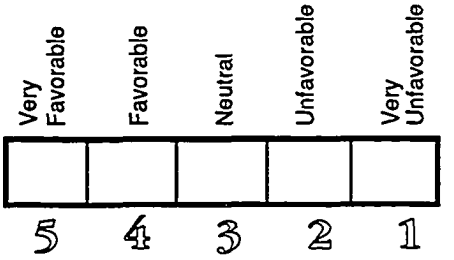
4. Does the management system allow for placing of students, based upon instructionally sound education strategies?

   * basis of placement is clearly defined
   * placement validity and reliability are described
   * placement can be automatic or manual
   * alternate strategies are available if placement is inappropriate



COMMENTS: TOTAL ☐

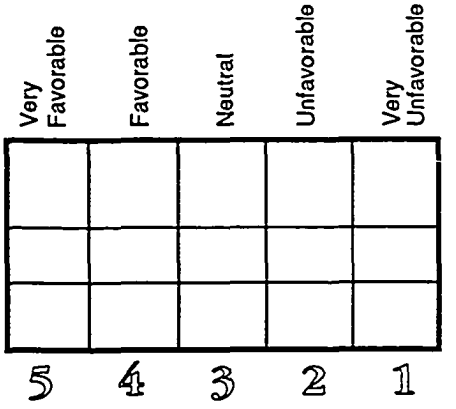
5. Are prescriptions given for students that include computer courseware as well as classroom lessons?



COMMENTS: TOTAL ☐

6. How are students evaluated for mastery of instructional content?

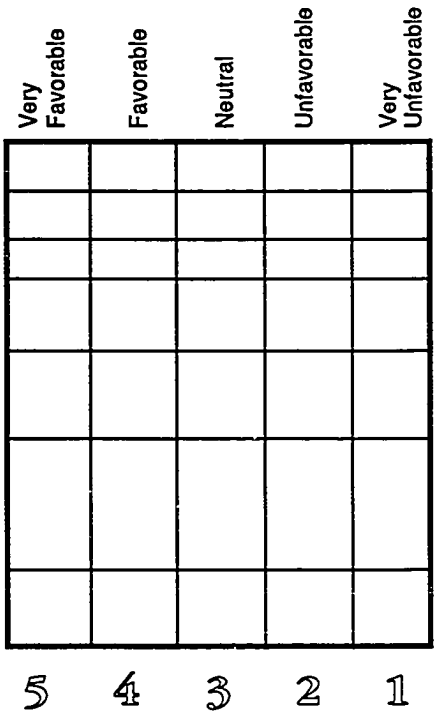
   * initial diagnostic (placement) test provided on computer
   * pre-post testing throughout courseware
   * strategies in place for reteaching if mastery not achieved



COMMENTS: TOTAL ☐

7. Can the management system be customized to meet the individual school needs?

   * no hidden costs involved
   * on-site customization available
   * completed in timely manner
   * impact on other parts of system considered
   * correlates with texts, competencies, state frameworks, standardized tests
   * separate levels of security access are available for students, teachers and system managers
   * passwords can be required, if needed by school district

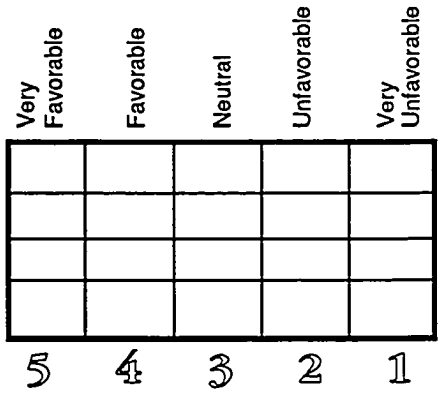


COMMENTS:

TOTAL ☐

8. Is the management system user-friendly?

   * instructions are clear and easy to read
   * is menu drive
   * no special skills required to operate
   * uses standard computer commands and strategies



COMMENTS:

TOTAL ☐

9. Is the documentation clearly organized and easy to use?

   * is professional in appearance
   * is comprehensive
   * is clear in design
   * procedural instructions are clear

Very Favorable	Favorable	Neutral	Unfavorable	Very Unfavorable
5	4	3	2	1

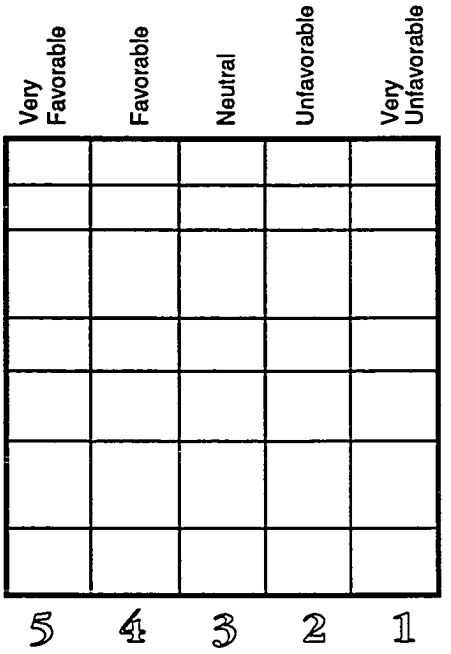
COMMENTS:

TOTAL ____

Section III:
TRAINING AND SERVICE

1. Is the breadth and depth of the initial training complete and well managed?

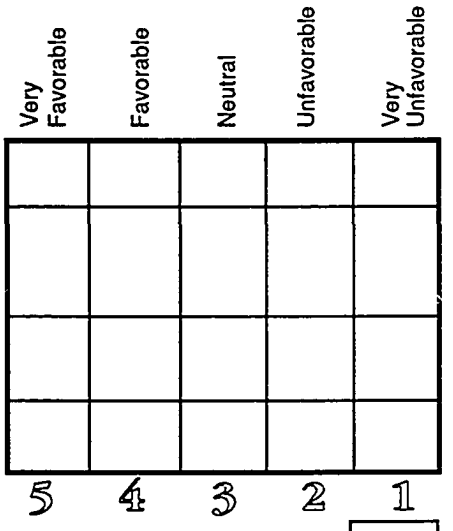
   * trainers are qualified
   * no limit to number allowed training
   * training outline and agenda available prior to training
   * training modified to fit needs of school
   * appropriate support documentation available for training session
   * content and training techniques instructionally sound
   * training takes place with system operational



COMMENTS: **TOTAL** ☐

2. Is the ongoing training and support program appropriate and necessary for the program?

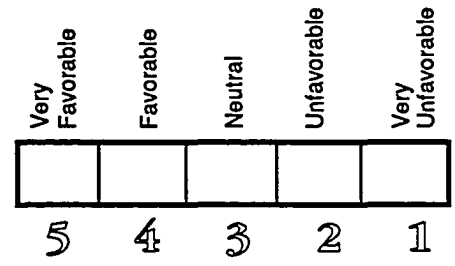
   * can be regular or as needed
   * scope and sequence of ongoing training developed with school district needs in mind
   * one individual assigned to school for support and on-going training
   * extra training and retraining available to school as needed



COMMENTS: **TOTAL** ☐

3. Is installation completely handled by vendor until system is operational and initial training complete?

   * completed installation guidelines defined prior to installation by school



TOTAL ____

COMMENTS:

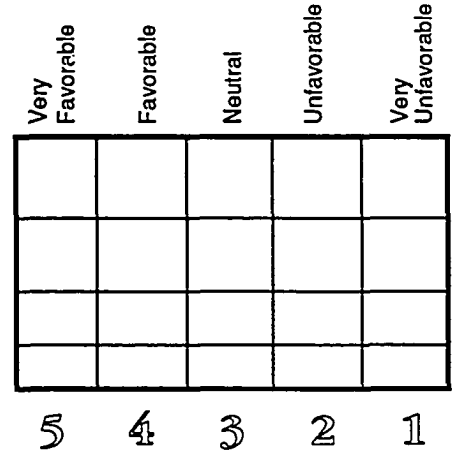
_____

_____

_____

4. Are the training materials instructionally sound, easy to use, and professionally prepared and presented?

   * training materials available for evaluation prior to training
   * materials can be edited to meet individual school needs
   * variety of materials used in training
   * take-home materials available for users



TOTAL ____

COMMENTS:

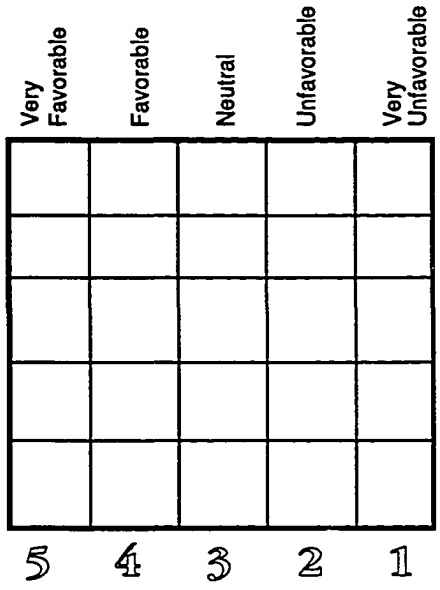
_____

_____

_____

5. Is a time-sensitive 800 hotline available to any user at no charge?

   * hotline personnel appropriately trained and knowledgeable
   * personnel friendly and helpful
   * hotline accessible during school hours in any location
   * hotline provides alternative solutions to problems
   * hotline follows up on problems and promises in timely manner

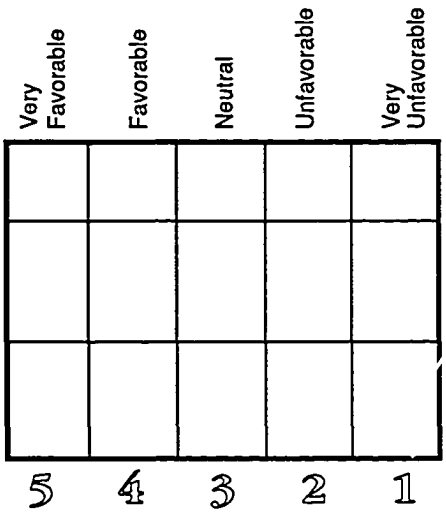


COMMENTS:

TOTAL ☐

6. Are newsletters and other kinds of correspondence provided to the users on a regular basis?

   * has monthly, quarterly, etc. communication
   * provides information to variety of audiences (for example: teachers, parents, system managers, etc.)
   * purpose of correspondence clearly stated (for example: sharing of user news, presentation of new product, etc.)

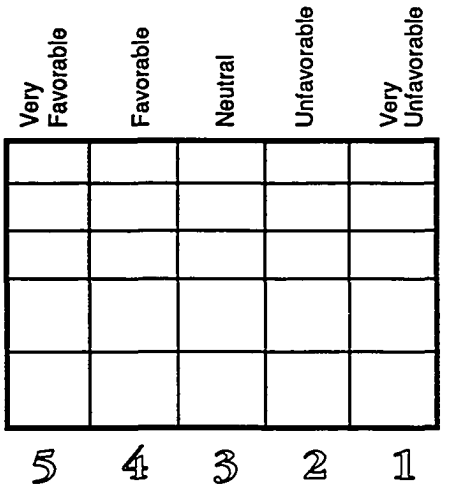


COMMENTS:

TOTAL ☐

7. Is training for curriculum and management system updates provided in a timely and organized manner?

   * instructions are written
   * takes place on-site
   * no limit to number of trainees allowed
   * training takes place quickly after update is received
   * new documentation arrives with update and training

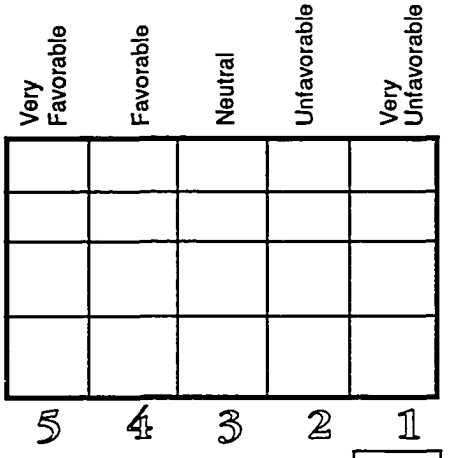


COMMENTS:

TOTAL

8. Are user groups brought together to share ideas and concerns about the system?

   * no hidden costs
   * attendees pre-defined
   * format, agenda, and purpose presented prior to meeting
   * feedback from other users shared at meeting



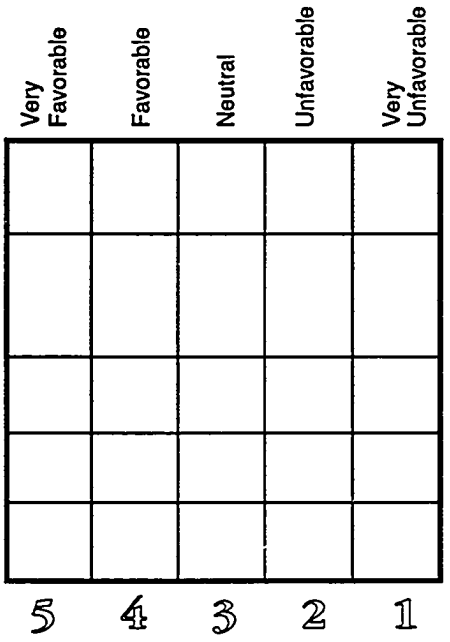
COMMENTS:

TOTAL

Section IV:
HARDWARE

1. What kind of hardware requirements are necessary for this ILS?

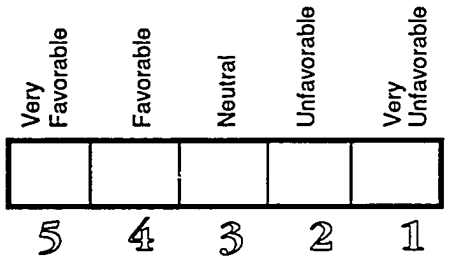
   * requires dedicated hardware (hardware that can only be used for the ILS courseware) or
   * has open architecture (hardware can be added onto, can expand, can be used for other courseware)
   * student stations may operate as stand-alone computers
   * needs no special wiring requirements
   * peripherals are needed to operate the system



COMMENTS:

TOTAL ____

2. How does speed of the network impact transfer of lessons and operation of lessons?

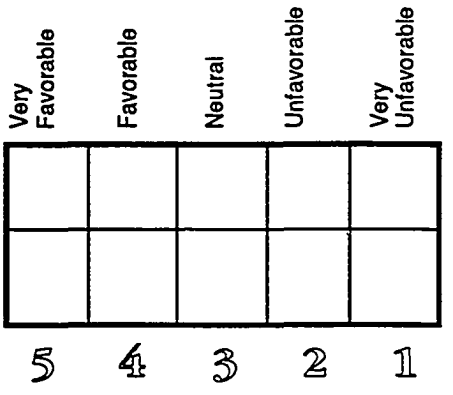


COMMENTS:

TOTAL ____

3. How flexible is the system as mandated by the hardware?

   * system operates either in lab setting or distributed in classrooms
   * hardware may be used for other networked or non-networked, third party software

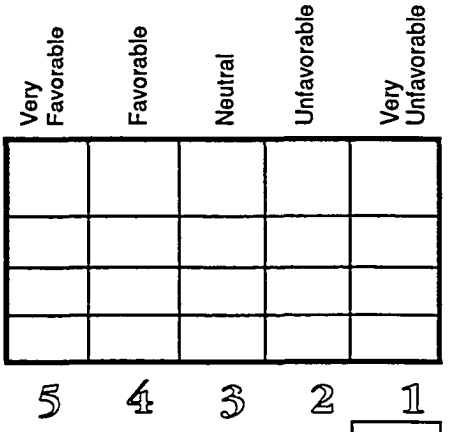


COMMENTS:

TOTAL

4. Does the hardware maximize the audio and graphics capabilities of the software?

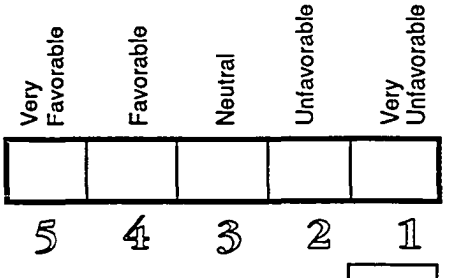
   * audio and graphics are integral part of instruction
   * quality of text fonts is superior
   * audio is clear and adjustable
   * graphics and audio motivate student



COMMENTS:

TOTAL

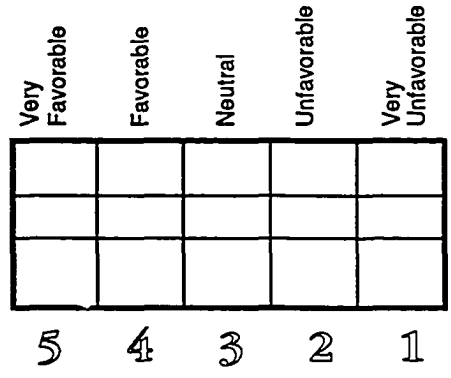
5. Does the hardware allow multi-users?



COMMENTS:

TOTAL

6. How many stations can operate off of one file-server?

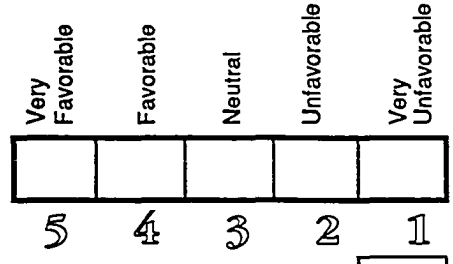


* will this number increase?
* why this parameter?
* what steps are being taken to enhance this factor?

COMMENTS:

TOTAL ☐

7. Does the ILS vendor handle hardware maintenance? If so, what are the details and if not, who does?



COMMENTS:

TOTAL ☐

* The author of this instrument welcomes comments and suggestions regarding the usefulness of the instrument. Please contact her at the following address: 550 Alameda Blvd
Coronado, CA 92118