ASSESMENT OF THE COMPUTER ASSISTED INSTRUCTION SYSTEM WITHIN THE ELECTRONICS PROGRAM AT RIDGEWATER COLLEGE

by
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ABSTRACT

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Technology has introduced many opportunities to today's learning experience. Computers have augmented the tools available to instructors giving them the potential to change the face of education. If implemented properly, computers can enhance both the learning and teaching experience. Before computers are used in the classroom, many questions need to be answered. This research paper will look at some of these questions, and try to answer some.

Many schools have computer-assisted instruction in the classroom. The purpose of this study is to analyze the current computer assisted instruction system in the Electronics program at Ridgewater College in Willmar, Minnesota. The researcher will analyze, critique, and review, current literature on computer assisted instruction. The researcher will conduct a survey and compile the data from current students at Ridgewater College to determine if computer assisted instruction is effective there.

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CHAPTER ONE

INTRODUCTION

Background

We live in the information age where technology greets us at the click of a mouse. The Internet has significantly improved our access to new information and technology. Because technology is constantly changing, today's workers need the newest, most current information they can access. Students and employees need to be able to go directly to the source for this information (Schettler, J. 2003). This is especially true in technical programs like Electronics where technology is changing at an exponential rate. Because of this, Electronics instructors need to move efficiently through basic electronics and spend more time on advanced courses. With changes happening so rapidly, instructors need to teach students more of the advanced electronic skills. In other words, the more quickly instructors can get through the basic electronics, the more time they can spend with the advanced concepts of system electronics.

If schools want to keep up with current technologies, and be part of them, they will have to pay for it. In the 2003-04 academic years, public school districts will spend $7.185 billion on technology, up from $6.45 billion in 2002-03 (DeSantis, C.J. 2003). With this increased push in technology, one has to wonder if the money is being well distributed throughout all technology related areas. With continuously shrinking budgets, administrators are always looking for ways to increase the revenue schools get from dollars invested.

Computer Assisted Instruction

A relatively new technology being used in education is computer-assisted instruction (CAI). CAI may allow students to work in a self-paced instructional program (Berry-Helmlinger, L. 2002). This may allow the instructors time and resources to be focused at higher-level

courses. Therefore, the need for an instructor at the basic level course could be reduced. There is still a significant initial investment that has to be made to get these courses started. Many electronics programs are currently using CAI in their programs. One CAI system that many colleges are using, including Ridgewater College, is the Nida system. J. Bassel (personal communication, July 22, 2003) of Nida Corporation said Ridgewater College has invested over $200,000 on Nida trainers. This money was invested between the two Ridgewater campuses.

Nida Corporation

Nida Corporation started in 1972 and has become a world leader in the development and design of electronics training systems. Nida is located in Melbourne, Florida, but the company was named after a small town in Lithuania that is enjoyed by the founder of the company. Nida is a leader in electronic training systems, being the first company to integrate computer-assisted instruction with hands-on labs in electronics. Nida systems train one hundred percent of all basic electronics learned in the Army, Navy, Marine Corps, Air Force, and Coast Guard. Nida also works with universities, technical colleges, high schools, and many companies developing computer assisted instruction and online courses in electronics (Nida, 2003). Nida is the main supplier of computer-assisted instruction at Ridgewater College.

Ridgewater College

Ridgewater College has two campuses, one located in Willmar, Minnesota and the other in Hutchinson, Minnesota. Ridgewater is one of the largest two-year colleges in outstate Minnesota with nearly 3,000 full-time students (Ridgewater, 2003). The Electronics program on the Willmar campus has approximately fifty students in the first and second year programs. Currently at Ridgewater, students can go into many different careers or branches of electronics such as: electronics technicians, wireless communication, industrial electronics, audio systems,

and measurement science. All of these programs take the same basic electronics courses the first year. About forty percent of these first year courses utilize CAI to some degree. Ridgewater uses the Nida system analogously with lecture and "hands on" labs. The question often arises as to whether or not the CAI system can be used effectively by itself. If the CAI system could be used as a "stand alone" program, Ridgewater could generate increased revenue because CAI could easily be converted to online classes. This would reduce the faculty instruction time currently required.

Online Education

Online education offers benefits to both students and instructors. An advantage to students is that courses can be taken at any time during a semester at their own pace, as opposed to lectures, which must be taken during scheduled hours. CAI and online education can be designed to be interactive, an option that a textbook does not offer. CAI and online education can also allow instructors to give immediate feedback, grade tracking, and real time comparison with other students. This allows students to learn from their mistakes and get a sense of their progress. CAI programs can direct students to special remedial sections to review topics on which they tested poorly on. Chat rooms and message boards allow students to interact with instructors and other students without feeling intimidated by their peers in the class (Sission, S.D. 2002).

Offering online courses would give students many options for learning electronics. Students could come into the traditional classroom setting, they could learn on the computers at Ridgewater College, or they could learn online. If Ridgewater offers students more options, enrollment would increase (Sung, S.T. 2002). If it is determined that CAI is a useful tool,

instructors could devote less of their time teaching the basics and more time teaching advanced concepts.

Statement of the problem

Ridgewater College needs to determine if CAI is an effective method for delivering the Electronics curriculum. Little or no research has been done at Ridgewater College to determine if CAI instruction is beneficial to the students.

The study will be done at Ridgewater College on the Willmar, Minnesota Campus. The subjects in this study will be first and second year Electronics students enrolled at Ridgewater College. About fifty students will be surveyed who have experience both in a traditional class setting and in CAI.

Purpose of the study

The purpose of this study is to determine whether or not students believe they are learning the basic electronic skills required for advanced electronics from the Nida computer assisted instruction courses offered at Ridgewater College. If it is determined that CAI instruction is effective, it could serve as an impetus for offering on-line courses at Ridgewater College.

Research Objectives

This research will address the following objectives:

1. Determine if students feel they are learning the required skills from the CAI system.
2. Determine if students feel CAI can be used as a stand-alone program when teaching basic electronics.

Justification for Research

A study of the CAI system at Ridgewater College can be justified in several ways:

1. Due to the rapid changes in the competencies needed in electronics, students need to get the basics as quickly and as efficiently as possible.
2. Data from this research will assist the Electronics department in determining whether CAI courses can be offered as a stand-alone course.
3. Data provided by this research will help determine if more funds should be allocated for development of additional CAI courses.

Significance of the Study

This study is important to the instructors and Administration at Ridgewater College for the following reasons:

1. This study can determine if CAI is an effective learning tool.
2. This study will determine if CAI can be used more extensively in the first year Electronics curriculum.
3. This study may result in alternative methods of course delivery, resulting in students having more options in class schedules.

Definition of terms

1. Computer aided instruction (CAI) – an instructional tool wherein students learn by executing a program on the computer.
2. Electronics program – a two-year degree program at Ridgewater College located on the Willmar campus.
3. On-Line learning – an instructional method that allows students to take courses over the Internet.
4. Stand alone course – a course delivery system that can be taken without any other type of instructional method.

5. Traditional instruction – instruction offered in a classroom wherein an instructor lectures and administers assignments and tests.

Limitations of the study

1. Limitations of the study include the limited number of students to be surveyed due to the class size.
2. This survey is limited to students on the Willmar campus. Therefore, the conclusions drawn by results of the survey may not readily translate to the Hutchinson campus or other campuses throughout the Minnesota Technical college system.
3. The research is limited by the needs of the Electronics program and may not reflect the effectiveness of CAI in other disciplines.
4. This survey is limited by the opinions and answers given by students in the study. Opinions influenced by factors outside of the study cannot be determined or disclosed.

Assumptions of the study

1. This study assumes students will answer honestly and that they have a general understanding of the skills needed to advance into second year Electronics.
2. This study assumes the students will have a general understanding of computer functions and students will not be influenced by the fear of technology.
3. This study assumes that the competencies of first year Electronics students at the Willmar campus are similar to the competencies of the first year Electronics students at the Hutchinson campus.
4. This study assumes that Ridgewater College has the resources to give complete courses with the CAI delivery system.

Methodology

This is a quantitative research paper. Surveys will be administered to current and past students in the Electronics programs at Ridgewater College. This technique was selected because of its affordability and the accessibility of the research subjects.

Chapter TWO

Literature Review

Introduction

History has shown that the society that is the most technologically advanced has been in control of social order, economy, and power structure. Technology is any tool or medium that helps people accomplish tasks or produce products more efficiently (Healy, 1988). Chapter two will look at one of the newest technologies called CAI. We will first look at the history of CAI, as well as current applications being used by schools and business. A review of current literature and statistics available from administrators, educators, students, and other sources will be done showing how CAI has progressed throughout the year. Both effective and ineffective CAI applications and techniques will be presented, as well as the positive and negative effects of using a technology-based curriculum. An analysis will be made of the reasons why some applications were effective while others were not. This literature review will focus on the extent to which CAI instruction is effective in helping students learn challenging subject matter and whether or not students and instructors with little technology experience and sophistication engage in the technology as well as those on the other end of the spectrum.

Development of Computer use for Instruction

From the first mainframe computer used as a flight simulator in the 1950's to the Internet, computers have made great advances in education over the years. The biggest advance in CAI has been in the past ten years. In the early 1980s, personal computers and their educational software were quite primitive. Learning on computers was essentially "drill and practice" which allowed students to learn from the process of memorizing of the questions in the program. The learning was very passive; it would not allow students to deviate from the pre-programmed

direction of the course or activity. Students were not able to concentrate on specific areas of the content; instead they had to follow the ideas and concepts of the programmer who developed the program. Often times the programmer developing the course had no background in education, but instead had a computer programming degree (Pruitt-Mentle, 2001).

The technology that allows CAI has progressed greatly since the 1980s. Computers were stand-alone desktop machines with an average of 16,000 bits of memory (North Central Regional Educational Laboratory, n.d.). Today it is not uncommon for computers to have 512,000,000 bits of memory and to be networked to other computers around the world.

Even though the capabilities of computers and technology have increased greatly, the price of these systems continues to drop. This affordability has greatly affected the use of technology in delivering instruction in both public and private education. By the year 2000, all secondary schools had Internet access, and over seventy percent of those schools had high-speed Internet access. In 2000, there were 5 students per networked computer, a significant increase over 1998 when there were 52 students per networked computer. Also in the year 2000, fifty six percent of all households had computers, of that fifty six percent; fifty percent had Internet access (U.S. Department of Commerce, 2002). Accessibility to computers in their homes allows students to get familiarized with the technology and to get a significant amount of work done outside of the classroom.

Industry has also shown great interest in CAI. "Training Magazine's" industry report for the year 2003 shows that, while corporate training has dropped (only the fourth drop in 22 years), CAI is on the rise. In 2002, traditional instructor-led classrooms accounted for the 74 percent of all industry training. In 2003, this traditional delivery method drooped to 69 percent of all courses. The greatest increase in educational delivery styles came in the form of CAI. In 2002,

CAI accounted for 12 percent of all delivered courses. Of that 12 percent, 48 percent were self-paced, distance learning Web courses. In 2003, 16 percent of all instruction was computer assisted courses, an increase of 4 percent. Of that 16 percent, 61 percent were self-paced, distance learning Web courses (Galvin, 2003).

Advantages of Computers in the Classroom

There are many uses for the computer when implemented into the classroom. Teachers can clearly demonstrate and illustrate concepts that their students might find difficult to understand. Computers save valuable time, as instructors no longer have to waste time drawing and writing information on the blackboard. Text, drawings, photographs, even animations and streaming video, can be used on the computer for demonstration in the classroom. Multimedia computers use several different electronic media, which include audio and visual presentations stored on computer hard drives or CD-ROMs. It's also possible to network computers inexpensively so that they can communicate together.

In addition to these benefits, the National Institute for Literacy has compiled over a dozen summaries outlining computer assisted instruction. Their compilation has concluded many advantages in regard to CAI instruction:

- Students usually learn more from CAI.
- CAI is efficient, usually decreasing instructional time by one-fourth to one-third the time of traditional instruction.
- Students like CAI better than traditional instruction.
- Students learn to enjoy computers more when they receive CAI.

- CAI is most effective when the computer presents material to the student, evaluates the student's response, uses this information to determine what text to present, and keeps track of the students progress (Kulik, 1994).

Additional advantages not listed in the National Institute for Literacy include the following:

- Computers are useful when tutoring individual students.
- Computers can be used to educate the disadvantaged.
- Computers are useful for educating brighter students.
- Computers eliminate prejudice.

Computer programs are able to hold students interest, challenge them, and make learning exciting. Students should not be isolated from other students and instructors because of computers. Instead, they should be encouraged and helped by them. For CAI to be successful, computers should supply the lessons and material. The instructor, on the other hand, should act like a coach or dynamic observer. (Bennet, 1999).

Disadvantages of Computers in the Classroom

There are still some disadvantages of using computers in the classroom. Many people are concerned about the "Gee whiz" or the "Wow look at what computers can do" factor when looking at this new technology. These people feel that what computers can do is impressive and fun to look at, but they also want to discuss the "why" of technology. These people feel the research done on computers in education is set up in a way to find benefits that aren't really there. They feel the research is biased toward the positive factors of computer use. In other words, they feel the research is invalid (Healy, 1998). Many people question the necessity of computers. Another issue is cost-benefit analysis. Is the benefit to the students worth the expense? Some are skeptical that companies that sell this technology are pressuring citizens and

educators, making them feel that they will be "left behind" if they don't implement it. Dougles Noble expressed this concern in his book "The overselling of educational technology" by saying:

> "Penetration of the education market with computer-based technology has depended more on effective conditioning of the market through a barrage of advertising and ideology than on the effectiveness of the technologies themselves" (Nobles, 1996).

In addition to fears of computers being more "hyped" than useful, some instructors object to extensive use of technology in education. These instructors feel their positions may be degraded and their level of importance diminished. Many instructors may also be fearful of the technology and the stresses that are sometimes associated with working with computers. On the other hand, others feel these fears are unfounded and that the instructor's role will only change not diminish (Bennet, 1999). Once again, instructors will need to become dynamic facilitators of CAI; instead of the traditional educators they are accustomed to being. For this to happen, there are certain basic skills that instructors will need to master before CAI can be truly effective in the classroom. Some of these desired skills include:

- Ability to operate a computer system and software successfully.
- Ability to evaluate and use computers and other technologies to support instruction.
- Ability to apply current instructional principles and practices computer related technology.
- Ability to demonstrate knowledge of computer use for data collection, information management, communications, presentations, and decision-making.

- Ability to develop learning activities that uses computers for a variety of learners and diverse student populations.
- Ability to demonstrate knowledge of multimedia and telecommunications tool to support instruction.
- Ability to do minor equipment maintenance to ensure instructional time is spent for the right purpose.
- Ability to demonstrate knowledge of productivity tools such as: word processing, spreadsheets, database management, and graphics utilities.
- Ability to identify resources to keep current in applications of computer related technologies in education.
- Ability to access information to enhance professional productivity and knowledge (Pruitt-Mentle, 2001).

Schools and Computers in the Classroom

Many schools now have specific classrooms for computers called computer laboratories. Computer laboratories ensure the best use of resources by allowing computers to be in constant use for most of the day. Placing computers in a classroom, instead of a computer laboratory, will in most cases limit the amount of computer use because of the nature of classroom instruction. If computers in laboratories are networked together, they can access a central computer called a server. This server can have all the programs necessary to offer the desired course content. The course or software can be loaded onto one central location the server and be shared by all the computers connected to that network. Tests, grading, assignments, and lab activities can be all administered from one central point.

Whether using a server or net, many instructional software programs come with integrated learning systems (IMS). Programs with IMS built into them help guide students through the software at a pace the students can understand. Students can work at their own pace, and move onto the next learning activity when they are ready instead of when the teacher decides it's time. IMS often allow pre-tests to determine which content the students need to concentrate on and which sections they can omit. In addition to pre- test, post-test are also available to the student. Post-tests allow students to determine whether they need to review a section, or if they can move on to the next level. IMS can save an instructor's time by monitory the students' progress and maintaining a grade book (Smith, 1995). IMS can also monitor how much time the students spend in each section and to how well the student did in each section.

When the full potential of computers is learned, teachers will happily integrate them into the instructional process by incorporating them into the normal flow of classroom activities (Smith, 1995).

On-line Education

The Internet has started a new trend in education by offering students the ability to learn on their own schedule, in their own home. The Internet was created by the United States Government and is available to the general public. Many two and four year colleges now offer courses, or even complete degree or certificate programs through online learning. The first completely online course was funded in 1996 by the Alfred P. Sloan Foundation and was offered in the fall of 1997 through the University of Hawaii. Online distance education is necessary on the islands of Hawaii because of the span between islands and the lack of colleges on all islands. Online courses give all the students on all islands the same opportunities to take college courses. Now all students in Hawaii can have the same instruction even though a qualified teacher may

not be locally available to teach a particular subject. Due to the success of this first online pilot project, the University of Hawaii received a second grant from the Sloan Foundation in 1999. As a result, the University now offers three degree programs and one certificate program: an M.S. and B.A. in Computer Science, a B.A. in Liberal Studies, and a certificate in data Base Management (Odin, 2002).

Many colleges have now followed the lead of the University of Hawaii. Currently, most colleges offer online courses for programs that most students are interested in. In addition to more courses, colleges are offering complete online degrees in many different subject areas.

Benefits of Online Education

Multimedia communication devices have improved greatly over the years. Data transfer in electronic communications has increased in speed as well as dependability. Multimedia programs have become more user friendly for both instructors and students. Convenience and user friendliness will cause online education to continue growing over the next decade. Computers and networking devices have dropped significantly in cost over the last ten years, making it easier for many schools to offer online courses.

With online education it is now possible for students to talk directly to teachers and fellow students in classrooms at other geographical locations. Groups of students can talk together "real time" in chat rooms for class discussions. This can all be done in the privacy of the student's own home. The instructor can pose a question to the students who are viewing the text on their computers. The students can then answer the questions for fellow students to see. This type of activity allows the student to be somewhat anonymous, even though the other students see the name of the person responding. Because of this, students tend to be more active in classroom discussion, answering questions they may not otherwise be comfortable answering.

Discussion boards are also a useful tool for online learning. With discussion boards, student can log onto the network at their own leisure. Students can look at the daily assignments, post questions for the instructor, and post questions or answer other students' questions.

Voice mail feedback is another way instructors can communicate with the student. If an instructor is reviewing a student's assignment, rather than typing a response on the computer, he or she can dial a local phone number and record a voice message. The voice message is then converted to an audio file and sent to the student's e-mail address. The student then accesses their e-mail to hear what the instructor has to say. This makes contact more personal. It allows for some of the classroom subtleties like hearing the tone of the instructor's voice (Mariani, 2001).

Yet another means of communication from instructors to students is through streaming technologies. Streaming data is any information that is delivered from one computer to another where data is delivered real time. This could include video, audio, slide shows, graphics, web tours, or any combination of these. The instructor can stream previously recorded lectures and other information that may be difficult to communicate in text (Utah Educational Network, n.d.).

There are many additional benefits and high expectations associated with the online education:

- Programs are scientifically studied and refined over time, which should assure that each learner receives the best instruction available.
- Programs take into account various learning styles, abilities, and level of readiness. Using pre-test and post-test, the programs will adjust to each learner's needs.
- Multimedia capabilities tend to make the learning experiences more exciting, resulting in enthusiastic learners.

- Learner's study at a pace best suited for their individual learning abilities.
- Students study at times, when their jobs and lives allow them to study, such as between appointments or on nights and weekends (Allen, 2003).

Conclusion

This literature review points out both desirable reasons for using computers in the classroom and some criticisms of computer use. There has been a significant increase in computer usage in the last few years, which for the most part has produced favorable results. With the increasing affordability and accessibility of technology, the decision to use computers in the classroom is more and more attractive. Internet accessibility is also becoming an attractive resource for educators and students alike. Computers have a multitude of uses in the classroom. It is the responsibility of instructors and administration to determine if computers can enhance the learning experience.

Chapter Three

Methodology

Introduction

Chapter Three will identify the research method used to collect data. It will look at the focus group of the study. It will also examine specific aspects of the research such as the method used to contact the subjects, how the subjects were chosen, and the subjects' experience level with Nida.

Subject Selection

This research was done at the Ridgewater College in Willmar, Minnesota. The survey was distributed during a class period in the 2003/2004 school year. The subjects were both male and female, ranging in age from eighteen to fifty four. The subjects of this research included students from first and second year electronics. The students from first year Electronics had a half - year experience with Nida trainers, the other half being traditional instruction. The second year students had one and a half years of experience with the Nida system. There were approximately 30 students surveyed from the first year Electronics class and 25 students from the second year class. All students had the same instructors for the courses in question. The exercises done by students in both first and second year were very similar, the only difference being that second year students had more experience with the Nida trainers.

Cover Letter

A cover letter accompanied the questionnaire explaining the topic, stating the significance of the study to the researcher and to the participants in the study. It identified the researcher and his advisor, as well as information about how to contact the researcher and his advisor for questions or concerns associated with the research. The letter requested complete honesty from

the participant. It stated that participation in the study was strictly voluntary and that participants had the right to refuse participation at any time of the study. Participants were assured that individual responses would not be identified and that they were guaranteed confidentiality. Lastly, the survey informed participants where they could obtain the results of the survey.

Survey Instrument Development

Questions for the survey instrument were developed in a three-step process. The first step was a brainstorming session with peer groups at the University of Wisconsin Stout. The second step consisted of a peer review and modifications from the Electronics staff at Ridgewater College. The third step involved a review of the survey by a focus group consisting of administration and instructors. The survey instrument consisted of a two-page questionnaire designed to compare CAI to traditional education. It had questions asking for the student's opinion to whether or not CAI could be used effectively as an instructional tool without any other instructional contribution. The survey had demographical questions to categorize the population as well as subjective questions based on the Likert scale. Using results of the demographic information and the Likert scale, the mean response was calculated and analyzed.

Limitations of the study

Limitations of the study include the following:

1. The research was limited to the number of students in the class.
2. The research was limited to students on the Willmar campus of Ridgewater College. Therefore, the results of the survey may be limited to the Willmar campus and may not readily translate to Ridgewater's Hutchinson campus or other colleges throughout the Minnesota Technical College system.

3. The research was limited by need of the Electronics program and may not reflect the effectiveness of CAI in other disciplines.
4. The research was limited by the amount of experience the first year students had with CAI.
5. The research was limited by the amount of experience the second year students had working with CAI.
6. This research was limited by the opinions and answers given by students in the study. Opinions influenced by factors outside of the study cannot be determined or disclosed.
7. The research was limited by differing instructors for electronic labs and lectures.

Data Analysis

The data was analyzed using the mean and standard deviation to determine how students felt about Ridgewater's CAI system. The researcher had percentages recorded for each number on the Likert scale, but chose to put the mean and standard deviation on the results tables (chapter four) to formulate data that is easier to understand. The data was analyzed to determine if there is a significant difference between gender and age. Data analysis compared the different disciplines in electronics to determine if the CAI system is consistent in the course material it offers. Some research questions were worded differently, to ensure consistency in the study. These responses of these questions were then compared to ensure consistency in the subject's responses.

Summary

This research was conducted with students in the Electronics program at Ridgewater College in Willmar, Minnesota. The students received a cover letter explaining the research before they were given survey questions. The survey questions were developed by the researcher and his peers at the University of Wisconsin Stout and at Ridgewater College. There were some limitations to the research. The most notable limitation was that the results of the survey are the opinions of the students. There was no comparison made of students' grades in courses taught exclusively by traditional instruction methods as opposed to those courses taught exclusively by CAI. This comparison of grades was not possible because students do not have the option of taking exclusively traditional or exclusively CAI courses at Ridgewater College.

Chapter Four

Results

Introduction

The results of this research were based on the responses of Electronics students at Ridgewater College in Willmar, Minnesota. The students were surveyed near the end of the fall semester 2003. All first and second year students were included in the survey. Surveys were handed out to a cluster of 53 students. Usable responses were obtained from all 53 for a rate of response of 100% (N=53). Of the subjects surveyed, the average age was 25 years old. There were three females were in the survey group, the rest were males. Approximately half of the students surveyed were first year students and half were second year students. The students had electronics experience in direct current, alternating current, semi-conductors, and digital electronics. They worked concurrently with CAI and traditional instruction. CAI instruction at Ridgewater College was used primarily for electronic labs. Of these labs, students spent about forty percent of their time using CAI and sixty percent in a traditional lab environment.

Two research questions were looked at in the study: 1. Do students feel they are learning the required skills from the CAI system? 2. Do students feel CAI can be used as a stand-alone program when teaching basic electronics? The items of the survey were scored on the 5-point Likert scale of agreement (1= Strongly Disagree, 5=Strongly Agree), creating data at the interval scale of measurement. Tables 3 through 13 report the mean and standard deviation from the student's rating their satisfaction with the Nida trainers.

Demographics

Respondents were asked to indicate several demographics in the questionnaire. Gender was requested in a multiple-choice item, yielding data at the nominal scale measurement. The responses from male and female students were not significantly different. Also, the sample size of the female population in the electronics program was not large enough to give good statistical results. For these reasons, no comparisons of the data will be done based on gender.

Although a comparison of responses between male and female students will not be made, table 1 reports the percentages of male and female students.

Table 1

Percentage of male and female students

	Total	Percentage
Male students	50	94.3%
Female students	3	5.7%
Total	53	100%

Age was another demographic studied in the survey. Subjects represented a wide range of ages, but the responses given from subjects of different age were not significantly different. Age is an important demographic to point out because many people have the misconception that older students cannot and will not work with computers like younger students. The researcher's theory is that electronics students enjoy working with many different types of technology and computers are one of these technologies. Therefore, age data will be given in table 2.

Even though age data is shown, it will not be used in the comparison of survey questions.

Table 2

Ages of Male and Female students

	Mean	High	Low
Male	25.4	44	18
Female	37.6	53	22

Students' comfort level with computers

Although it was not one of the research questions, it was necessary to determine if students were intimidated by computers before coming to Ridgewater College. Because of this, students were asked this question. As Chapter Two pointed out, one problem associated with CAI is the lack of skills the student needs to perform basic computer functions. When students do not have these basic skills, they struggle more with the computer than they do with the CAI program. The data in table 3 shows that students felt comfortable working with computers before coming to Ridgewater College. This data allows us to disregard this as a reason students do not like the CAI system.

Table 3 gives the mean and standard deviation from the responses of the first and second year students.

Table 3

I was comfortable working with computers before coming to Ridgewater

	Mean	S. D.
First year students	4.36	.67
Second year students	4.12	.68

On a related issue, the survey shows that students feel comfortable working with the Nida system. Comments like "easy to use" and "a nice system to work with" were often heard when students were referring to the Nida system. Table 4 shows the results of the data obtained by asking students if they are comfortable working with Nida. I feel it is important to include this data because, as Chapter Two stated, it is extremely important for a system to be user friendly if CAI is to be effective.

Table 4

I am comfortable working with the Nida system.

	Mean	S.D.
First year students	3.86	.72
Second year students	4.12	.64

Research Question Number One

Research question one tried to determine if students feel they are learning the required skills from the CAI system. Three questions were formulated to help determine this issue. Each question was specific to a particular electronics discipline. Even though the questions were

asked about the three different disciplines of electronics, the responses were very consistent with each other. This is significant because it shows uniformity in the Nida system. If the students like one module offered by Nida, we can be assured they will like the other modules.

Tables 5 through 7 show the results of the research questions. The responses from the survey were very positive, supporting Nida's CAI system. It should be noted, however, that the research questions use the words "instructional aid" which implies that the trainers will be used with other types of instruction.

Table 5

I feel Nida is a good instructional aid for learning basic A.C. circuits.

	Mean	S.D.
First year students	3.86	.65
Second year students	3.80	.73

Table 6

I feel Nida is a good instructional aid for learning basic D.C. circuits.

	Mean	S.D.
First year students	3.93	.52
Second year students	3.92	.58

Table 7

I feel Nida is a good instructional aid for learning basic digital circuits.

	Mean	S.D.
First year students	3.46	.75
Second year students	3.84	.69

Based on the data of tables 5, 6, and 7, it can be concluded that the Nida CAI system is a good instrument for learning the required skills for basic electronics. On the other hand, it cannot be concluded that Nida's CAI system is a good enough instrument to be used as a stand-alone program. Research question two tries to answer the question of whether or not students can learn from Nida as a stand-alone program.

Research Question Number Two

The second research question asked students if they could learn electronics from CAI as a stand-alone program. Four questions were formulated to help determine this issue. Tables 8 through 11 show the questions and responses. It should be noted that some questions were only slight variations of another question. This was done to ensure consistency of the responses. As you will see, responses to these similar questions were very consistent.

The data on table 8 shows the results of the question "I feel I could learn most effectively from Nida as a stand-alone system".

Table 8

I feel I could learn most effectively from Nida as a stand-alone system.

	Mean	S.D.
First year students	2.36	.75
Second year students	2.08	.71

For the question on table 8, the majority of the student responses were in the "no-opinion" to "disagree" range on the Likert scale. Conclusion of this data will be studied after all four questions are looked at.

The next question on table 9 (which was very similar to the question on table 8) asked if the subject felt they could learn from the Nida system without any additional instruction.

Table 9

I could learn from the NIDA system without any additional instruction.

	Mean	S.D.
First year students	2.64	.80
Second year students	2.24	.82

Once again, the mean response was between the "no-opinion" to the "disagree" range of the Likert scale.

Question 10 asks the subjects if they would rather learn from the Nida system than from traditional lectures and labs. This question is the first question that makes a direct comparison of traditional instruction and the CAI system.

Table 10

I would rather learn from the Nida system than from traditional lectures and labs.

	Mean	S.D.
First year students	2.43	.79
Second year students	2.04	.84

Once again, the mean response was between the "no-opinion" to the "disagree" range of the Likert scale.

The last question that implies the use of Nida as a stand-alone system is on table 11. It asks the subjects if they could learn from Nida if a course was offered over the Internet. For this question it should be noted that the Nida system has many hands-on labs that would not be able to be done on-line.

Table 11

I feel I could effectively learn electronics from Nida system if a course was offered over the Internet

	Mean	S.D.
First year students	2.46	.81
Second year students	2.32	.79

Once again, the mean response was between the "no-opinion" to the "disagree" range of the Likert scale. The last four questions were all variations of the question of whether or not is Nida useful as a stand-alone program. The results of these questions were very consistent with

each other. The data clearly shows that students feel they need additional help beyond what the Nida system offers. Based on the data, it is my conclusion that the CAI system should be supplemented with other instructional aids.

The last two questions ask about traditional instruction with Nida supplementation and traditional instruction without Nida supplementation. Question 12 asks for student opinions based on traditional lectures, labs and Nida.

Table 12

I feel I would learn most effectively from a combination of traditional lectures, labs, and Nida.

	Mean	S.D.
First year students	4.14	.62
Second year students	4.08	.75

The data shows that students "agree" to "strongly agree" with the concept of traditional instruction and Nida being used concurrently. From this data, we can conclude that Nida's CAI and traditional instruction is most effective when used simultaneously.

Question 13 asks if students feel traditional instruction would be the most effective without supplementation from Nida.

Table 13

I feel I would learn most effectively from traditional lectures and labs without any Nida.

	Mean	S.D.
First year students	3.64	.85
Second year students	3.72	.71

The response to question 13 was from "no-opinion" to "agree". This appears to be somewhat conflicting data with the results of question 12, but it should be noted that the response was closest to agreeing with the statement. For this reason, I must conclude that traditional education and Nida's CAI work best when they are being used simultaneously. On the other hand, it could be argued that these questions warrant further research.

Chapter 5

Summary of Study

Introduction

Chapter 5 will give an overview of the chapters 1 through 4. A brief critique of the previous chapters will outline and review the purpose of the study. Chapter five will present a conclusion and give recommendations based on that conclusion. Recommendations and conclusions will be made based on two factors: 1. The data from the researcher's statistical analysis of the survey; and 2. The information learned in the literature review.

Study overview

Instructors have a new instrument to help them increase the learning potential of their students. Computer assisted instruction (CAI) gives the instructor and the student another option or tool for learning. Based on the literature review, it is obvious that there are many benefits of CAI. The effectiveness of CAI is dependent on many variables. When done correctly, it appears to make the learning experience more efficient and enjoyable for the student. Using CAI, students can learn at their own pace and on their own schedule. Many CAI systems were developed using the input of instructors and industry experts to create the best instructional course possible. It is a new technology that many schools are embracing with open arms. There are many good CAI systems for education, but there are also some bad ones.

It is the job of the instructors and administration to determine which systems are useful and which ones should be avoided. They need to look critically at CAI to determine if it's a good learning tool or just another educational trend. They need to realize that a system that works for one discipline may not work for another. The purpose of this research paper is to determine if

the CAI system used in the Electronics program at Ridgewater College is an effective learning tool, or is it just part of a new trend.

For CAI to be an effective learning tool, students first have to possess some basic computer skills. As the literature review points out, if the subject doesn't have the basic computer skills required to run a CAI program, they will spend more time trying to manage the computer then they do learning the subject material. For this reason, the first variable the researcher needed to determine was the subject's previous experience with computers.

The subject's previous experience

The first variable that the researcher needed to determine is the subjects' previous experience with computers. As the literature review points out, if the subjects do not have the basic skills required to run a CAI program, they will spend more time trying to manage the computer then they do actually learning the subject material.

Subjects were asked if they felt comfortable working with computers before coming to Ridgewater College. The average response of both first and second year students was 4.24 (Agree to strongly agree on the Likert scale) with a standard deviation of .675. I feel that this data allows us to disregard the lack of computer skills as a reason why the subjects do not like the CAI system at Ridgewater College.

This researcher's theory is that electronics students enjoy working with many different types of technology, and computers are one of these technologies. Therefore, computer skills are not an issue when using CAI in electronics. On the other hand, it is possible that this is an extraordinary group of students. As a preventative measure, this researcher recommends that a future study be done to determine the minimum computer skills that should be required before entering the program.

On a related issue, the survey shows that students feel comfortable working with the Nida system. When subjects were asked if they are comfortable working with Nida the response average between first and second year subjects was 4 on the Likert scale. I feel it is important to include this data because, as Chapter Two stated, it is extremely important for a system to be easy to work with if CAI is to be effective. This indirectly starts to answer the first research question: Do students feel they are learning the required skills from the CAI system at Ridgewater College. Once again, as much of the literature states, CAI systems are not as useful if students are trying to struggle with CAI program instead of learning the required subjects. Students are happy with the CAI system at Ridgewater College. Therefore, this researcher concludes that it is a good learning experience for the students.

Research question number one

When implementing a CAI system, it's important to monitor how the system is working. One must determine if it is an effective tool for teaching the subject at hand. One way of doing this is by asking the students how they feel about the CAI system. This was done at Ridgewater College with favorable results. Research objective number one was to determine whether or not the students felt they were learning the required skills from the CAI system. Questions were asked if the subjects felt that Nida's CAI is a good instructional aid. Three questions were formulated to determine this issue. Each question was specific to the three following electronics disciplines: A.C. circuits, D.C. circuits, and digital electronics. Although the questions were asked about the three different electronics subjects, the responses of all three questions were very positive toward Nida's CAI system. The range of the responses to the questions was as follows: The lowest rating on the Likert scale was 3.46 with a standard deviation of .75. This response

was given by the first year students when asked about the digital electronics CAI curriculum. The highest response was 3.93 with a standard deviation of .52. This response was also given by the first year students except this time the subject were asked about D.C. circuits CAI curriculum. This researcher feels that the difference between the two ratings can be associated with the experience the students have in the two different subjects. First year students have not used the digital labs in the CAI system as frequently as they have used the D.C. circuit labs. For this reason, they rated the digital electronics lab slightly closer to the "no opinion" range of the Likert scale. The D.C. electronics labs were rated much closer to the "agree" range of the Likert scale because students have more experience, and therefore a higher comfort level, with those labs.

Between first and second year students, all the responses were between 3.46 and 3.93 on the Likert scale with all having a standard deviation of less than 1. Based on this data, the researcher can conclude that the Nida CAI system is a good "instructional aid" for learning the required skills in basic electronics. The Nida CAI system is informative and easy to work with. On the other hand, the researcher cannot yet conclude if Nida's CAI system is a good enough instrument to be used as a stand-alone program.

Research question number two tried to answer the question of whether or not students can learn from Nida's CAI as a stand-alone program.

Research question number two

Even though it has been determined that the CAI system at Ridgewater College is a good learning instrument, it must still be determined whether or not students feel it can be used as a stand alone system. The second research objective is to determine whether or not students feel they could learn electronics from CAI as a stand-alone program. Four different questions

were asked to help determine this issue and to ensure consistency of responses. Responses to the different questions were indeed very consistent.

The first of these questions asks if subjects feel they could learn effectively from Nida as a stand-alone system. The majority of the student responses were in the "no- opinion" to "disagree" range; with a rating of 2.22 with standard deviation of .73 the Likert scale. The second of these question asked if the subject felt they could learn from the Nida system without any additional instruction. Once again, the majority of the student responses was in the "no-opinion" to "disagree" range; with a rating of 2.44 with standard deviation of .81 on the Likert scale. The third question asked the subjects if they would rather learn from the Nida system than from traditional lectures and labs. This question is the first question that makes a direct comparison of traditional instruction and the CAI system. Once again, the majority of the student responses was in the "no- opinion" to "disagree" range; with a rating of 2.23 with standard deviation of .81 on the Likert scale.

All three of these questions imply that the students feel they need additional instruction beyond what the CAI system has to offer. A fourth question also leads the results of the research in the same direction. The fourth questions asked if the subjects felt they could effectively learn electronics from Nida system if a course was offered over the Internet. The response to this was 2.39 with a standard deviation of .80 on the Likert scale. Once again, the results show that the Nida system at Ridgewater College should not be used as a stand-alone course.

Conclusion

It is this researcher's conclusion that the Nida CAI system at Ridgewater College should not be used as a stand-alone system, but instead it should be used to supplement the instruction that is currently available at Ridgewater. The results of the survey suggest that the Nida CAI system is an effective and useful instructional aid when it is used with traditional instruction.

REFERENCES

Bennett, F. (1999). Computers as Tutors: Solving the Crisis in Education. *Fabin incorporated.* Retrieved November 23, 2003, from http://www.cris.com/Fabin1

Berry-Helmlinger, L. (2002). Online University offers bachelor degree [Electronic version]. *Denver Business Journal.* Retrieved July 18, 2003, from http://Denver.bizjournals.com/Denver/stories/2002/04/08/story8.html

DeSantis, C.J. (2003). What are pros and cons of e-Learning [Electronic version]. *eLearners.com.* Retrieved June 16, 2002, from http://www.elearners.com/services/faq/q2b.asp

Galvin, T. (2003). Industry report: 22nd annual comprehensive analysis of employee sponsored training in the United States. *Training magazine,* 40 (9), 21-25.

Healy, J. (1998). *Failure to Connect: how computers affect our children's minds for better and worse.* New York: Simon & Shuster.

Kulik, T. (1994). Why use Computers to Teach Reading. *The Partnership for Reading.* Retrieved November 28, 2003, from http://www.nifl.gov/partnershipforrreading/ adult_reading/computer/computer3.html

Mariani, M. (2001). Distance Learning in Postsecondary Education. *Occupational Outlook Quarterly.* 15 (7), 2-10.

Nida Corporation (n. d.). Retrieved July 22, 2003, from http:/www.nida.com.about/history.html

North Central Regional Educational Laboratory, (n.d.). *The behavioral learning approach.* Retrieved October 5, 2003, from: http://www.ncrel.org/tplan/cbtl/phase1.htm

Odin, J. (2002). Implementing the UH Asynchronous Learning Network: Practices, Issues and Challenges. *Educational Perspective.* 35(1), 12-19.

Nobles, D. (1996). The Overselling if Educational technology. *Educational Leadership.* 12(4), 19-20.

Pruitt-Mentle, D. (2001). *Satallite Acadeny presentation.* University of Maryland Partnership, retrieved March 31, 2003, from: http://edtechoutreach.umd.edu/Presentations/Frederick/Satellite2001_Aug1.ppt

Ridgewater College (n. d.). Retrieved July 22, 2003, from http://Ridgewater.mnscu.edu/introduction/intro.html

Schettler, J. (2003). Cisco's Kelly: it's more than training. *Training Magazine,* 25 (7), 24-26.

Sission, S.D. (2002). Online instruction: time to grow. *Journal of General Internal Medicine* 17 (7), 15-21.

Smith, R. (1995). How Computers Can be Used in Schools: A Parents Guide. *The Computing Teacher.* 22(6), 7-11.

Statistical Abstract of the United States: 2002 (122th ed.). December 2002. United States Department of Commerce.

Sung, W.T. (2002) Web based learning in the computer aided design curriculum. *Journal of Computer Assisted learning* 18(2), 175-87.

Utah Educational Network. (n.d.). *Streaming FAQ.* Retrieved November 10. 2003, from http://www.uen.org/technical/pdf/Streaming.pdf