Comparison of the Effectiveness of Computer Based Instruction with Video Cassette Instruction for Cardio-Pulmonary Resuscitation

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LOYOLA UNIVERSITY CHICAGO

COMPARISON OF THE EFFECTIVENESS OF
COMPUTER BASED INSTRUCTION WITH
VIDEO CASSETTE INSTRUCTION FOR
CARDIO-PULMONARY RESUSCITATION

A THESIS SUBMITTED TO
THE FACULTY OF THE GRADUATE SCHOOL
IN CANDIDACY FOR THE DEGREE OF
MASTER OF ARTS

DEPARTMENT OF CURRICULUM INSTRUCTION
AND EDUCATIONAL PSYCHOLOGY

BY
JANINE RICKETTS-BYRNE

CHICAGO, ILLINOIS
JANUARY, 1996
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ACKNOWLEDGMENTS

I appreciate the guidance, support and expertise received from Todd Hoover, PhD, and Victor Edmonds, PhD, member of the thesis committee. I am also indebted to Jackie Bauer, MEd, instructor of Computer Based Training Class and Roger Doore, PhD, instructor of the Instructional Methods Class and the graduate students at the ACIM program for their participation in this thesis.

I thank my husband Greg and my good friend Laura Miller as they both stood by me through my college years, my son Brian who is my inspiration. I am also forever grateful to my mother Margaret for her continuous encouragement to take the "path less traveled" and pursue graduate education and for being the catalyst of creative thinking during my early years.
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LIST OF ABBREVIATIONS

ACIM  Adult corporate instructional management
CAI   Computer assisted instruction
CMI   Computer managed instruction
CBI   Computer based instruction
CAL   Computer assisted learning
CD-ROM Compact disk - read only memory
CPR   Cardio-pulmonary resuscitation
CQP   Center for Quality Performance
MNAP  Mean cosmetic acceptance of educational tool
MNAC  Mean content acceptance of educational tool
MNMI  Mean of learner wishing more experience on this educational tool
MNREAC Mean results of total reactionnaire results of educational tool
PC    Personal computer
LU    Loyola University
VCR   Video cassette recorder
VD    Video disk
WTC   Water Tower Campus
CHAPTER I
INTRODUCTION

The objective of this thesis was to compare the efficacy in learning retention and learner acceptability between two self-instructional modalities: computer based instruction (CBI) and video cassette. This would be accomplished by conducting a comparative study utilizing graduate students pursuing a non-medical degree. The effectiveness was defined based on whether there was a difference in cognitive learning retention when using a pre and post-test evaluation tool. Acceptability was determined according to the extent to which learners responded to these two educational methods. The study highlighted the benefits and drawbacks of each of these instructional methods.

The topic of cardio-pulmonary resuscitation (CPR) was selected for this study because it was practical, of general interest to this age population, and it lends itself to employ a problem-oriented approach and test the learners' retention of qualitative and quantitative data.

An extensive review of literature led to a summary view of studies related to CBI. There have been limited investigations conducted specific to graduate students in a
non-health curriculum regarding a health related topic of general interest such as CPR. However, many articles compare the efficacy of two variables within the same tool such as different types of feedback. The information comparing video cassettes with CBI among graduate student populations and on this theme (CPR) is sparse. The literature summarized the challenges, dilemmas and aspects of instructional effectiveness facing CBI research.

A low cost CBI software program utilizing the guidelines provided in the literature was used exclusively for this thesis. There were many technical considerations that were included in CBI development of the tool for this study. These included the steps to develop, implement, analyze and evaluate a computer-based software program. It also included components of CBI development which stressed the benefits and importance of utilizing multiple disciplines, and the implications and advantages of utilizing authoring systems.

Also, this thesis explored in more detail the guidelines presented in the literature related to screen design, sequencing techniques and branching design. The elements of interactivity and feedback recommended to increase the learning curve of learners (i.e. appropriate question format and content selection for CAI) were discussed in the literature.

The literature also explored the instructional methods
techniques that should be incorporated into a CBI program in order to present content similar to that of a pre-selected video cassette program. The video cassette tape used in this study was carefully selected for its content accuracy, technical level and relevancy to adult learners.

This thesis briefly identified CBI software that could run on computer hardware systems readily available through most small organizations today. For example, most clinics and small organizations have not invested in computer hardware that would operate features like CD-ROM, and sound boards. Therefore, software selection and design must fall within the appropriate hardware capabilities.

There was minimal evaluation of the development of the video cassette because this tool was commercially developed without the investigator's input on the creation of the video cassette tape.

The thinking process of participants was further investigated as there was an opportunity for them to express their opinions. The investigator reviewed educational theories and how they can be integrated in the CBT development process. The relevance of learning states and the value of CBT on populations with special learning needs were also discussed.

The evaluation tools were designed following acceptable professional testing standards such as American Heart Association CPR certification exam, since the topic
selected on this study was cardio-pulmonary resuscitation (CPR).

All reliable CPR programs must be approved by the American Heart Association before they become part of the CPR certification course. It is most likely that commercially developed software programs on CPR would be submitted to the American Heart Association (AHA) for their endorsement. The AHA was not aware of any software package on CPR available for the lay person. Therefore, at the time of this study, it was reasonable to assume that there were no accredited software packages exclusively devoted to CPR training developed for basic or elementary knowledge level.

There are commercially available CBI programs on CPR these are geared to health professionals, and their cost is approximately $10,000. This sum would probably make these CBI programs economically unfeasible for a small organization.

This thesis described the challenges encountered during the implementation phase of the study and potential recommendations for future studies. Also, the data collected was used to discern and raise arguments which may serve as guides to future studies related to these teaching modalities tested among this population of students. This will be discussed in more detail in the results and discussion chapters of this thesis.
Purpose

The purpose of this thesis was to determine the efficacy of two self-study instructional modalities: computer based instruction and video cassette. The study also analyzed the design process of developing, implementing, analyzing and evaluating a computer-based program. The study protocol was approved the Internal Review Board of Loyola University.

Research Questions

The research questions posed in this study were:

Was there a difference between CBT and video group in demographic variables such as: age, computer experience, having previous instruction on the subject matter, being interested in the subject matter, and being a health professional?

Which tool, CBI or video cassette appeared to be a more effective self-instruction method for adults in this population of students? This was based on whether there was a difference in retention of knowledge between learners instructed by CBI and those instructed by video cassette. Another approach was based on whether there was a significant difference in learner's attitudes toward the respective tool (video or CBI) used for instruction in this study. If there is a significant difference, which tool received higher acceptance? Also, was there a statistically significant difference in retention of
knowledge within the respective study group?

Was there a statistically significant difference in the amount of time spent utilizing the respective educational tool between the CBT and the video group?

The following variables were utilized in this study to answer the above questions. The nine independent variables included: acceptance of method, acceptance of content, desire to get more instruction on a specific technology, "total reactionnaire" (the sum of all reactionnaire variables). The subjects' demographics such as age, computer experience, profession, perceived relevancy of subject matter by learner, and whether the learner received former instruction on CPR.

The four dependent variables included: pre-test scores, post-test scores, gain scores for both study groups, and time spent on CBI (CBI group only).

Limitations of the Study

The major limitation of the study was small sample size. The selective subject pool was also a limitation, as the results of this study cannot be generalized to other types of learners or other content areas. The short length of the pre-test and post-test also limited the ability to compare the CPR test in this study with the results of national CPR exams.

The validity of the pre and post-tests was not independently evaluated by this investigator, as it was
determined that, for purposes of this study, these tests were acceptable tools based on the approval and endorsement of the American Heart Association.

This study did not methodically compare the CBI tool developed specifically for this study with commercially created CBI programs except for using them as reference (i.e. generic guidelines, examples). Also, the CBT program was limited to using computer equipment available at most organizations at the time of this study (i.e. IBM 486, standard size color monitor, mouse, no video disc, no sound card).

The study did not attempt to evaluate whether there were behavior changes among learners regarding CPR as a result of the two educational tools utilized. Also, it did not aspire to prepare learners to take the CPR certification exam. The topic and educational tools were utilized merely to objectively answer the research questions posed in this study.

The advantages of CBI in populations with special needs such as disabled, gifted or mentally retarded individuals have briefly been presented in the review of the literature, but have not been analyzed in this study (Conners, 1990).

Studies such as Landeen (1988), Matthews and Wolf (1983) addressed the issue of gender equality in computer learning; however, the gender variable was not measured in
this study.

A comparative analysis of the cost-effectiveness of CBT self-learning with other educational tools was not methodically calculated in this study. Cost issues were briefly mentioned as they related to the need to develop a tailored low-cost CPR software program to be utilized in this comparative study of two educational tools.

This study did not try to determine the effects on variables that were imbedded in the educational tools. For instance, there was no evaluation on preference of the type of feedback or appropriateness of learner control features. Also, no analysis was attempted on specific screen design criteria such as the effect of color or print size on the preferences, or learner's retention level.
CHAPTER II
REVIEW OF RELATED LITERATURE

A wealth of potential applications of computer based instruction (CBI) among students in academic settings have been described in previous literature. However, not much investigation has been conducted specific to graduate students in a non-health profession regarding a health related topic. The information is even more sparse when comparing video cassettes with CBI among this particular graduate student population and on this theme of cardio-pulmonary resuscitation (CPR). Many studies compare the efficacy of variables (i.e. type of feedback) within CBT alone. This information was used in this study as guidelines to create the CBT program developed specifically for this study.

Summary of CBI Research

CBI's Instructional Effectiveness

The literature presents data in support of the effectiveness of CBI. Belfry and Wince (1988a) compared CBT with tutors and did a review of the literature; Reynolds and Pontius (1986) reviewed eleven independent studies on nursing students. The findings support the idea that CBI appears to be more effective than educational
strategies such as individual faculty conferences, simulation laboratory sessions and peer tutoring used with diploma or baccalaureate students. Similarly, Carew, Elvin, Yon and Alster (1985a), reported these conclusion in studies done on sophomore, and freshman students using CAI to teach nutrition on diploma baccalaureate students. They found CBT to be highly advantageous compared to an auto-tutorial workbook in the areas of acceptance and test scores in users versus non-users of CBT. Parry-Bush (1993) wrote a commentary advocating the use of CBT as an educational alternative in health care settings.

These studies, however, did not include a comparison of video cassette with CBI. A suggested study design flaw in the articles above indicate that the results may have been "influenced by a halo effect", meaning that learners performed better since they knew that people observed their performance. Subjects who selected CBI may have been more biased and self-motivated towards CBI (Belfry & Wince, 1988b).

Very few publications such as the study conducted by Ellis, Raines and Hakanson (1982), referred to video cassettes versus CBI in a health clinic utilizing a general population (n=1600) and found that CBT "proved to be cost effective". That study was concerned with attempts to get patients to view the video cassettes. When patients did not view the tapes voluntarily, a CBI alternative was
offered to them. The study evaluated patients' acceptance of CBI, but it is not a true comparison of the educational effectiveness of two educational tools.

Luker and Caress (1992) compared CBT with the preferred source of information (i.e. books, leaflets, personal contact or a combination of the three) on renal patients (n=30). This evaluated the usefulness and acceptability of CAI for education of renal patients who were on dialysis. The study explained the difficulties encountered. The interpretation of the objective data was inconclusive due to the multiple inconsistencies of the variables analyzed (i.e. biochemical laboratory data, educational level of patients).

Other studies such as Chen, Houston, and Burson (1983) analyzed the effectiveness of CBI programs in health education. However, they were descriptive studies that focused on the delivery of CBT to patients, but were not necessarily comparative studies of two educational tools.

Rasheed and Cohen (1990) compared self-paced educational tools: CBI and printed study guides. It showed both tools to be equally effective based on test score results of baccalaureate dental students. The investigators concluded that "self-paced instruction combined with CBT could be adaptable for the benefit of different type of learners".

Investigators who found no difference in test scores
between CBI learners and classroom instructed learners included: Day and Paine (1984) using Plato in college students, and Gaston (1988); Orlin (1991) compared the two tools in a manufacturing classroom setting at Northern Telecom Electronics (n= n/a); Krein and Mahlon (1990) reviewed the literature and suggested that CBT is more effective as evidenced by higher test scores. Shannon (1990) analyzed small group interactive computer assisted teaching. This study endorsed CBT as a viable teaching option in medicine for patient management problem solving with software programs. It would show small groups of students how to immediately solve a problem. At any rate, the above studies did not address video cassette versus CBI, so the usefulness of these articles for purpose of this study was limited.

Similar to the above investigations were conducted in the area of Cardio-Pulmonary Resuscitation (CPR) among health professionals: Messmer, Meehan, Gallium, White and Donaldson (1993) compared classroom instruction with CBT and found "a significant improvement in learning with CBT"; Umlauf (1990) compared CBT with lecture and interactive video simulation on nursing staff (n=30); Henry and Waltmire (1992) compared on-the-job training of nursing staff on advanced cardiac life support using CBT versus traditional CPR training classroom instruction, simulation and video.
Keane Norman and Vickers (1991) concluded that based on the literature review on information specific to health science at the time the article was published there was sparse, if any, convincing evidence in the CAI literature indicating that "learning with computer aided instruction (CAI) was, as a type, inherently more effective than learning with a non-computer-dependent resource." Also, they suggested that "the effectiveness of specific CAI resources was due primarily to features unique to the resource's hardware or software components." (Keane, 1991b).

Brudenell and Stewart-Carpenter (1990) found an escalating negative attitude toward CAI in his study of nursing students. They attributed it to subject expectation of the CAI software that were not met.

Ellis and Raines (1981) summarized various studies on personal computers (PC) which have been conducted to ascertain their acceptability for patient health education. However, rather than comparing PC programs with other traditional audiovisual methods, this study discussed the cost of developing CBT.

Other studies related to CBI development were reviewed by Sawyer (1985). They focused on the human factors and on the development of CBI. The recommendations provided in this descriptive study were taken into consideration in the development of the CBI program for this thesis (i.e.
Chambers and Sprecher (1980) presented an overview of 25 published articles regarding CBI. Their conclusions pointed to the following differences between the use of CAI and traditional instructional approaches such as classroom instruction:

1. The use of CAI either improved learning or showed no difference when compared to the traditional classroom approach (8 studies). Vinsonhaler and Bass (1972), found an increased performance on one to eight months over primary school children receiving classroom instruction. Furthermore, Kulik et al., (1985), found a significant improvement in both "hard" and "soft" subject matters in college students -- Computer Assisted Learning (CAL) students had increased by approximately 3% (or 1/4 standard deviation).

2. The use of CAI reduced learning time when compared to the regular classroom instruction (7 studies). Kulik (1985), according to Chambers and Sprecher (1980) found that CAL was substantially faster or approximately 2/3 of the time spent in traditional instruction.

3. The use of CAI improved student attitudes toward the use of computers in the learning situation (6 studies).

4. The development of CAI courseware following specified guidelines can result in portability and their acceptance and use by other faculty. (4 studies).
Hannum (1986a) reviewed the literature and indicated that the overall trend favors CBI. He summarized that "learners are successful in acquiring a variety of subject matter knowledge via CBI as concurred by several researchers (e.g., Bangert-Drowns, Kulik & Kulik, 1985; Kearsley, Junter, & Seidel, 1983; Kulik Bangert & Williams, 1983; Kulik, J.A., Kulik, & Cohen, 1980; Roblyer, 1985; Thomas, 1979)."

Inadequacies of CBI Comparative Research

The vast majority of articles reviewed treated CBI as an educational entity in itself. It was compared with classroom instruction, and not as an educational tool or a medium that presents an educational lesson plan. The literature has, however, strongly emphasized the importance of developing software which is supported with sound instructional design methodology from both a content and a technical standpoint (Pusack, 1991).

The process of engineering a design model for a program must contain the principles of traditional instructional methodologies. As Yordy and Nelson (1991) suggested, "instructional effectiveness comes not from the technology, but from the instructional design that technology implements".

Haggler and Knowlton (1987a) reviewed the literature and made an important observation regarding the history of education research by referring to Nievergelts (1980)
comment: "while education makes use of many tools and techniques, none of them has been dignified with a new name, until the computer came along. Researchers never spoke of book-assisted instruction or blackboard-assisted instruction. Why do we speak of Computer Assisted Instruction?" These remarks are simplistic and disregard the many instructional innovations that were envisioned to energize the field, they remain as "food for thought".

For purposes of historical comparison of two electronic educational tools (video and CBT), let us go back to the nineteen sixties. At that time, television was thought of as the "medium with the capacity to transform education". Television was potentially available to educators and learners. It was inexpensive to students. However, television (like VCR) tends to be a passive medium; indeed, some suggest that it is more passive than the lecture. It is now posed that computers, assuming the program is appropriately designed, are much more interactive as they engage the learner in the operations of drill and practice (Piemme, 1988). Interactive learning is more effective than passive learning because it keeps the learner actively involved through the learning process.

Haggler and Knowlton (1987b) indicated that Neiberget (1980) was on target in his conclusion that: "the computer-driven screen should be viewed simply as another medium available to the teacher and capable of doing
certain things well, and others poorly - or not at all!"

In summary, it is not comparison studies that are not recommended; the problem is the studies purporting to compare media but are confounded by other variables that do not apply. Also, Gilbert (1993) recommended that comparison studies aimed at equal learning outcome should have the same number of instructional events, then the effectiveness of the two instructional strategies could be compared.

After reviewing the literature, Schwirian's (1987a) insights brought another important view to the evaluation research process of CBI. Her opinion was that the right questions about the effectiveness of instructional technology are not asked. She believed that the questions educators have about the technology follow the frame of traditional education. The focus has been in content and skills rather than on learning. It is known that "approximately 40-60% of what is taught to today's learners will be outdated (even untrue) in a few years". She contends that the emphasis should be on the process of learning, and on teaching how helpful technology such as CBI can improve and fortify the learning techniques for both learners and teachers. These thoughts will be expanded in the adult learning theories section of this paper.
Perhaps this is one reason why researchers in the above studies did not compare two teaching tools (i.e. video cassette with CBT). Instead, they compared a teaching tool (computers) with instructional methods (classroom instruction).

Subject Matter Background (CPR)

The CPR topic was selected for this study because it was practical, of general interest to this age population, and it lends itself to employ a problem-oriented approach and test the learners' retention of qualitative and quantitative data. The importance for lay people to know CPR cannot be disputed. It would be pertinent to summarize the history of how CPR education has progressed in the past four decades. CPR was initially conducted for health professionals only. In the 1960's the AHA decided that the lay person could also benefit from this information to assist in emergency cases when a certified health professional was not available.

Since the 1960's, video cassette tapes have been developed at affordable prices. There increasingly appears to be a need for the development of CBI programs on CPR that are affordable for small organizations. There were two CBI programs identified in the literature at an approximate cost of $10,000 (AHA Actronics, Inc., 1986). One software package was identified at $190, but it focused primarily on first aid.
Fancy versus Practical Technology

The review of the literature revealed the following discussion of CBI and video cassette. There is a demand to create CBI programs that are more "people literate". This way learners can focus on the content and minimize the negative distractors resulting from faulty or cumbersome program development. Frequently we hear about making people "computer literate". The success of CBI is partly dependent on the mechanics of the software.

Aside from the elevated cost of sophisticated software programs, more expensive hardware equipment may be required for some CBI. Fancy features, such as multimedia, and elaborate graphics, sound attractive; however, they also limit the audience who would be able to view the program because at the time of this study specific hardware set-ups such as CD-ROM and sound boards (Okonski, 1992) were not as commonly available at most office settings.

The positive side of computers is that computer platforms are more compatible now than they were in the 1980's (i.e. IBM, Apple, Commodore, Adam, Tandy 2000). This makes it easier for the software program developed for this thesis to be used in a variety of settings where a PC is available.

As technology advances, so does the speed, quality, and creativity of software packages and personal computers (PC’s). The CBI developer may "only be as good as the
authoring tool at his or her disposal" (Albin, 1991).

Video cassette technology may not be as favored as other technology such as video disc because it does not offer easy access to specific portions of the tape without having to rewind or fast forward the tape. Video disc (VD) players that can access at any part of the disc within a few seconds and show a crisper image are now available (Wheeler, L.A., Wheeler, M.L., Ours & Swider, 1983). However, VD players are still rare at most facilities compared to the availability of video cassette recorders (VCR).

Components of CBI Development

CBI: a Multidisciplinary Effort

Development of computer software usually requires a multidisciplinary team and can become costly. The use of an authoring system would allow a non-computer professional to develop a program that would enhance the learning experience.

Spector, Muraida and Parlino (1992a) remarked that automated instructional design systems try to aid subject-matter experts to develop CBI. Nevertheless, an analysis of "the interplay of user characteristics, the authoring environment, and the resulting quality of CBI are issues that need to be considered in CBI development". Cognitive science provides a "general information-processing framework for the modelling process of instructional
design." Cognitive science can also "recommend which elements relate to the courseware design process" (Spector, 1992b).

There seems to be a sharper focus on "authoring CAI programs" than on "designing instructional courseware". These concerns are about the inexperienced course designers who get excited about computer technology and who may put instructional design as second priority. The point this article made is that "it does not matter which authoring tool you intend to use because you still need to study the quite different skills associated with instructional design before you start using the tool" (Spence, 1991).

Many authors of CBI have limited or no academic training in educational theories. Functional communication techniques, both verbal and visual, are as important in computer modules as they are in one-on-one personal instruction (Jelovsek, Catanzarite, Price & Stull, 1989a).

Farabaugh (1990a) concluded that learning occurs best when goals and objectives are identified. He cited Pritchard, Micceri and Barrett (1989) who found that only eight percent of the 213 CAI programs reviewed included educational objectives. These findings highlight the need for instructional design. Chase (1985) provided specific guidelines and checklists pertaining the design of software courseware.
Educational Theories Applied to CBI

Learning theorists have defined the learning process by dividing it into categories which apply to the process of CBI learning. Jonassen (1988) referred to Fitts and Posner's (1967) three stages of skill learning. The first is the cognitive stage, where the learner receives or studies information or instructions about the skill. This is followed by the associative stage when the learner tries to perform the skill based on the knowledge obtained in the cognitive stage. Finally, at the autonomous stage the learner can perform the skill more automatically and speadily.

Another view of educational theory was posed by Carlson-Perez and White (1985) who studied sixth grade children. He determined a method of identifying the motivational qualities and educational value of microcomputer software from the student's view point. They found that greater number of motivational attributes were given to a topic such as mathematics, "while qualities identified in the computer setting pertained to the characteristics of the technology such as animation." For this reason, the pre and post-test questions in this CPR study were selected to test qualitative and quantitative knowledge.

Authoring software packages also enable the software developer to meet a variety of learning and teaching style
by enhancing the quality of technology-based software. Educational psychology relates the characteristics of learning to the "cognitive, affective and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (Powell & Okey, 1994).

Information from the environment is received by sensory receptors and is selectively stored in short-term memory. "Semantic encoding transforms the information into a meaningful form for storage in long-term memory. The retrieval process of information from memory leads to performance that verifies that learning has taken place (Gagne, 1977), (Gagne, Briggs & Wagner, 1988) and (Gagne, Wagner & Rojas, 1981). Schwirian (1987b) proposed four "truths of learning" that apply to CBI. They include: "(1) learning is an innately pleasurable activity; (2) learning is active and ultimately self directed; (3) there is no one right way to learn; (4) most of us only know how to be taught and not how to learn. CBI promotes independence of the learner, and it is particularly helpful to the self-directed learner."

Traditional educational methods, on the other hand, tend to resist these learning truths. These thoughts can be helpful to aid us in asking "bigger, better and more exciting questions" regarding the development and evaluation of CBI materials.
From an educational perspective, this followed the andragogical model of adult learning theories which emphasizes the "need for adults to know" the reason why the subject matter would be beneficial to them. Also, adults would know the potential of undesirable consequences if they do not learn the material. That is to say if in the case of CPR, a learner found himself in a situation where he would be unable to help a victim in need of CPR.

The CPR topic was selected because the literature indicates that "heart disease is the second leading cause of death (after cancer) to those aged 35-64 years old (Harmon, Somogyi, Biro & Hotzel, 1992). Therefore, the potential for cardiac related problems falls in the age range of the participants in these study groups. Thus, it would be reasonable to hypothesize that this topic would be relevant and interesting to this population. The demographic survey asked the subjects whether or not they found the topic relevant.

The topic meets the adult "learner's self concept" as being responsible for making decisions that will impact his or her life. Adults "readiness to learn" and a high "orientation to learning" the "life-centered" topics put the CPR information in the category of material appropriate to the targeted adult learner (Knowles, 1990). The "motivation" element lies in the ability gained through CPR skills to prevent the harmful consequences derived from a
heart attack.

CBI Applications for Specific Populations

Studies exploring the potential of CBI training for populations with special needs ranging from hearing impaired, impulsive students, or learners with drug addictions to special education and main streamed academically handicapped students have been completed. They included: Campbell, Neill and Dudley's (1989) study on adolescent students with a hearing impairment (n=30) showed that learners "significantly improved their problem solving ability"; the Slavin, Madden and Leavey (1984) study on children in grades 3, 4 and 5 comparing handicapped with non-handicapped children (n=504) and found no achievement test differences; Mertens and Rabiu (1992) studied undergraduate junior and senior deaf students (n=19). Overall, the results of these investigators favored the use of computers among these populations.

Using CBI in substance abuse populations has provided more reliable self-reports of alcohol intake than the person-to-person interviewing process. Heavy drinkers appear more calm about offering information regarding their drinking habits to a computer than to an interviewer according to Skinner, Allen, McIntosh and Palmer (1985) who compared personal interviews with CBT. They concluded that "CBT can help increase the amount of information on a health assessment questionnaire". Barber (1990) reviewed
the literature and derived to similar conclusions regarding the willingness of substance abusers to provide valuable information to CBI rather than to another person. This suggests that CAI may have a great potential in drug-prevention programs.

The premises for promoting CBI as an alternative method in these populations go in synchrony with the advantages and disadvantages described by Kleiman and Humphrey (1984). The acceptance of CBT in the disabled population with special needs is an important consideration. This holds stronger ground now that organizations and learning settings have to comply with the American Disabilities Act regulations to provide learning alternatives for disabled individuals; however, this is beyond the scope of this study.

CBI Technology versus Instructional Design

According to Gillingham and Guthrie (1987), at the close of a conference of twenty experts, the participants concurred that "exemplary educational software" should include a minimum of three general components: it should conform to specific software design features, for example, an appropriate amount of text on a screen; systems of software must fulfill a purpose and fit into existing curricula; and they must get the learner actively involved.

However, Ware and Williams (1975), studied 207 college freshmen and sophomore students to compare lecture versus
CBT. Their findings indicated that "high-seduction, mediocre-content teaching gives the same retention as low-seduction, outstanding-content teaching". They suggested that technological attention grabbers such as graphics, cartoons, animated images, arrows in boxes and flashing or blinking keywords may have an enhancing effect on the learning process and the quality of instruction assuming that there is a real focus on the subject matter and that sound instructional design methods are imbedded into them.

Black (1987) suggested that the increased adaptability of CBI should expand the application of CBI to a larger variety of educational objectives, as well as promote the attractiveness of visuals in learning tools.

It is well recognized in the field of psychology that "experts perform differently than novices. Experts achieve levels of automaticity with regard to common procedures". Also...."experts chunk problems much differently from novices". Consequently, "novice designers are more likely to implement instructional designs at a superficial level, failing to address subtle instructional issues." (Nelson, Magliaro & Sherman, 1988).

McDermott (1990) cited Larkin, McDermott, D. Simon, and H. Simon (1980), compared variables within CBT alone. The study noted that novice learners best benefit from the inclusion of goals and objectives in the material. Many CBT programs lack these components.
Roblyer (1983) and Billings (1985) suggested there was a direct correlation between the lack of systematic design methods during courseware development and the low quality and effectiveness of many products. Incorporating sound instructional design methods would increase the usefulness of the CBI tool. Therefore, the CBI tool designed for this study has incorporated as much as possible various aspects of instruction strategy ranging from the basics of instruction to the technological development.

Authoring Systems

An authoring system is a set of computer programs designed to make it possible to create a CBI lesson without having to create a programming code. Authoring systems create computer coding based on the data provided by the instructor and are easier to use than programming languages (Hodges, 1985) and (Maddux, 1992).

Menu driven editors reduce the amount of programming required, and they allow the course developer to program attractive features without requiring the expertise of a professional programmer. They enable the author to maximize interface design to create attractive computer screens that "connect mind and the medium" (Archibald, 1990).

Utilizing authoring systems to develop CBI programs related to CPR may enhance the dissemination of CPR information for the lay person. The literature offers a
variety of checklists and guidelines for software development (Jeiven, 1994).

According to Merrill (1985) and Locatis and Carr (1985), the main disadvantages of authoring systems were in the frame-based branching-programmed instruction model on which most of these systems are built. The authoring systems provide a blue-print but, overall, they do not tend to assist in the instructional design process.

Authoring systems have been divided into three levels or categories: the "first, or lowest level, are more limited or restricted in conceptualization than those lessons that can be created by the second and third level authoring systems." The first level of authoring systems favors the development of CBI instructions that are primarily drill and practice (testing and scoring).

The second level supports the development of CBI lessons that tend to be more tutorial in nature (provide additional instructional text and/or graphic material). The third level of authoring systems support the development of CBI lessons that are not so rigidly structured in a prescriptive fashion but that allow the presentation of a variety of instructional events or screen displays. "The displays in level three include purpose of intent, descriptions, concepts, rules, examples of instances of concepts, glossaries of key terms, content maps to show the organization structure of the lesson"
(Hannum, 1986b). The CPR CBI process developed for this thesis would fall in the third level as it is designed to create CBI lessons that target a cognitive direction of instruction.

Fritz' (1993) opinion was that as authoring systems become simpler to use, their instructional design has declined due to the lack of qualified designers who are developing CBI. He points out that "just as word processors haven't really improved the quality of writing, authoring systems haven't improved instructional design".

Many studies agree that there are limitations to authoring systems. They include: "predefined instructional logic built into them... which can amount to little more than automated flash cards of programmed text".

Recommendations for categorizing / rating text included: structure, coherence, unity and audience appropriateness. Research in cognitive psychology suggests using objectives and headings, concretize with examples, analogies, metaphors, illustrations, flowcharts and algorithms. Finally, the system should cause learners to meaningfully interact with the text through activities that require active learner response (Carter, 1985).

Generally speaking, the best choice would be to utilize the highest level of an authoring system that meets the needs of program design and content (Jensen, 1982).
CBI Software Development Guidelines

The literature included various publications concerned with CBI development guidelines. These covered guidelines about screen display design, CBI interactivity, user acceptance, learner instructions, question selection of CBI and utilization of interfaces incorporated in creating CBI. These concerns will be explained in detail in the following sections.

Merrill, Zhongmin and Jones (1992), reminded software developers about the four responsibilities that must be considered when developing CBI. They list: "knowledge selection (using techniques to outline the material); knowledge sequencing (to route the student across the knowledge selected); interaction management (techniques to prioritize interaction and accelerate receiving the information); and interaction enactment (techniques to overview, present and provide the opportunity to practice and evaluate knowledge acquisition). These were accomplished in the CBI program developed for this thesis by incorporating features such as overview of content, software instructions, question and answer, and a practice section on CPR.

Yordy and Nelson (1991) suggested guidelines for the selection of audio visual and computer delivery systems. They included: review of existing titles and other materials, design of the program through flowcharts, design
of visuals for graphic and animated sequences, development of text for the program, testing of the materials, and finally, implementation and evaluation of the session. Hill-Duin (1988) studied junior and senior college students (n=116) to compare the effectiveness of CAI within text. Her findings showed a positive acceptance on CAI. The article provided guidelines for software development that addressed conceptual, linguistic, visual and movement issues.

CBI Screen Design

Investigations of the effects of screen design upon effectiveness of learning were limited. Aspillaga (1991-1992a) compared screen design variables within CBI alone. Based on her findings, she listed some recommendations: being consistent in the presentation, preventing clutter and avoiding scroll, using capital versus lower case, using screen page as a unit, and using consistent margins.

Other recommendations given by Carter, Day and Meggs (1985) included: the screen should not be produced as a printed page; a constant screen format should be utilized. Color usage should have an instructional purpose. The text layout should be legible by using "white space" and fonts, double spacing, left to right format, creating windows, sectioning functional screen areas and graphics. Unjustified right margins provide visual reference points that guide the eye smoothly down the page.
Farabaugh (1990b) suggested avoidance of cliches and acronyms with which the learner is unfamiliar with and use of consistent "voice" throughout the program. Regarding color usage, white and green light have the highest acuity while red and blue have a much lower acuity. Text written in italics does not interfere with the reading rhythm; thus, italics are preferred to bright pounding colors such as magenta or pink (MacLahlan, 1986) and (Isaacs, 1987). Also, highlighting techniques should be used with discretion.

Kruk and Muter (1984) studied 25 undergraduate students to compare the video screen text with written text. Among their conclusions were these findings: the arrangement employed in a video (39 characters per line and 20 lines per page) produced slower reading than did a format typical of books (60 character per line and 40 lines per page). This indicated that reading a screen text is 24–29% slower than reading regular text and that single spaced text on screens were read 11% slower than double spaced text. These screen design guidelines were applied to the development of the CBI program as explained in chapter 3.

The literature presented four computer-learner interfaces in a CBI program to allow quality communication between the computer and the learner. Each interface had the recognizable characteristics of presentation, that is
to say familiarity, transparency, and consistency.
Conversational clarity, feedback, flexibility, was another of these characteristics. Visibility, marked exits, and shortcuts facilitate navigation, while explanation consists of protection, forgiveness, and on-line help (Weiss, 1994) and (Lucas, 1991).

Branching, Sequencing, CBI Interactivity, Feedback and User Acceptance

Jih and Reeves (1992) indicate that in order for learners to understand a software program, they need to "cope and integrate three types of cognitive load: the content of information -- what am I learning about? the structure of the program -- where in the program am I? and how do I operate it?; and the response of strategies available -- how did I make it happen and how am I being evaluated?"

Access to information on different screens should be easy to promote learner control over the lesson. It should be possible for the user to move around the screens at any time on demand by utilizing flow control options. Schuerman and Peck (1991) discussed menus as lesson structuring devices and recommend the use of menus for providing sequential choices to the learner. Automatic branching tends to be frustrating when the user misspells a word and the computer identifies the answer as a content error, and not simply as a spelling error (Clausing, 1987)
According to Steinberg (1992), one of the criticisms of audio visual media is the absence of two important components of learning: interaction and feedback. "Interactive" has become a buzz word in CBI development referring to active student learning. However, the concept has been related to actions that range from moving a screen by using a space bar to more complex interactions such that the user can feel as though he/she has an expert patiently walking them through each step of the material.

The material in this thesis was selected and organized to simplify learning. In addition, to ensure interactivity there were opportunities incorporated in the CBI for the learner to communicate with the computer, and vice versa. The learner was able to get immediate feedback, explanations, and help as suggested by Zemke (1984).

CBI can be modified to different levels of learner's involvement. Li (1993a), has identified four levels of interaction. The most basic is "page turning" where the learner controls the pace and can move ahead or go back by selecting a key (press bar or arrows). At this level the learner receives the material through observation, but seldom processes the information while going through the program.

The second level of interaction, according to Li (1993b), is "optimizing". The program can somewhat predict
the user's possible subject matter gaps and learning procedures, and it can incorporate some solutions, such as more examples. The third level is "cognitive processing". At this level the user can actively process the information. The program is set up with questions to be answered by the learner.

The fourth, and highest, level of CBI interaction is "simulating", or problem solving. At this level the computer and user can define or establish a present situation, and the learner solves the problem. This level was briefly incorporated to the CPR software program, but it was somewhat restricted as the program needed to be limited to maintain consistency on the amount of time allocated for both groups in the study and cover the same amount of material.

In this study, the level of interactivity with the computer was not as free as in true self-paced CBT sessions. The answers were limited to multiple choice questions. Also, interactivity was promoted by allowing the learner to have ready access to the various sections of the software program by using the mouse or the "enter" key. Despite the restrictions indicated above, approximately 60% of the screens on this program were devoted to user interactivity through questions, answers and practice scenarios.
Selecting an appropriate feedback mechanism was important. "The software should avoid formation of endless loops where the lesson will not move forward until the learner's answers are correct. This can lead to "ignorance loops" because the learner does not know the answer. Furthermore, the guidelines for learning reinforcement and feedback which were included in CBI developed for this thesis are described in the citations presented below.

Burchard and Draggs (1989) recommended restricting the feedback to simple responses of "correct", "incorrect"; and or to reasonable praise like "excellent" or "good" to reward appropriate responses during the first attempt. This study found that students preferred responses that "sounded professional" and did not "accuse or patronize the user." Hunka (1988) suggested avoidance of getting "chummy with pseudo-personal greetings".

In the case of a correct response, extended feedback can be given as to why the response is correct. In the case of an incorrect response, extended feedback can be given as to why the response is incorrect and provide not only the correct response, but also additional examples of the principle being discussed. Every feedback frame should maintain learner interest in "what's coming next" and tailor feedback to the individual (Waldrop, 1984).

Pridemore and Klein (1991) investigated the effects of two types of feedback within CBT alone on 100 undergraduate
students. They found that learners who received elaboration feedback (explanations of correct or incorrect responses), had better results than students who received simple right/wrong verification of answers. Colvin-Clark (1989) suggested using supportive remarks (i.e. absolutely) to integrate a "motivational element" into the correct answer. Studies on this issue were conducted by Bangert-Drow, C.C. Kulik, J.A. Kulik, and Morgan (1991).

There are two alternatives for selecting CBI questions according to Jelovsek, Catanzarite, Price and Stull, (1989b): alternative choice (true or false, multiple choice, or matching questions), and constructed response (fill-in-the-blank, short answer or essay questions). True and false questions may not be valid because there is a potential for guessing the correct answer. Essay questions tend to be harder to evaluate through CBI as they require a complex "natural-language" interface. Fill-in-the-blank questions can be tricky because the blank must be well positioned for understanding the question. It is best to put the blank in the middle or at the end of the question. Health care students, it was noted, are often reluctant to answer essay questions. It would be reasonable to hypothesize this would also apply to any person learning a medical topic. For this reason, multiple choice questions were incorporated into the software package.
The program developer should be able to import graphics and clip art from other programs and be able to edit them at the pixel stage according to Collins, Carnine and Gersten (1987). They studied remedial and learning disabled high school students (n=28) and found that in their CBT tool, "the time to complete the program did not differ significantly for the two groups" (tutorial, simulation and drill-and-practice programs versus CBT). Creating CBI that includes animated graphics can enhance instruction using methods that motionless graphic formats cannot (Baek & Layne, 1988). The CBI program produced for this study utilized three software packages to create a more effective product.

CBI Advantages and Disadvantages

Many studies delineate the advantages and disadvantages if CBI compared to other instructional methods. One advantage commonly cited was student accessibility to a tutor. Computers are available to learners for more hours than instructors are. CBI gives learners greater educational opportunity and flexibility in choosing when and how long to study the material. One may question the "Hawthorne effect" of computers working on a one-to-one basis with the user. That is the feeling that "I am special, I get to work exclusively with the computer program" and not having the impersonal sensation of being one of many individuals in a large lecture hall.
Learning is affected by stress levels. Too little, or too much, stress can be counter-productive. When the learner is unprepared, or when questioning is too difficult, stress can overpower the learning moment. Assuming the program is user friendly, CAI modules are unlikely to create too much stress. Phillips (1988) studied 34 nursing students and found that CBI learners had a lower anxiety level, and retained the subject matter better, than the non-CBI group using classroom instruction. This relative freedom from stress was reflected in higher test scores.

CBI is self-paced. Individuals can select the preferred speed, and they can obtain individual help by branching within the program. The computer can automatically start the user at the place he or she left off at a previous sitting. The learner can move on to a more advanced track, or can back track to more basic information for review. This can promote self-esteem as it allows the student to be in control of his or her learning pace (DeYoung, 1990). The computer allows for remedial work, and it allows users to explore situations on their own. Miller (1989) reinforced the idea that learners must assume responsibility, as in any self-learning method in order for it to be effective.

The computer tends to be non-judgmental. A learner can input the wrong answer several times without feeling
threatened by failure in front of peers, which can happen in group learning situations. From the slow to the accomplished learner, computers can mean relief from group pressures.

Beach (1993) pointed out a CBT advantage that learners "cannot really fail" in "software designed worlds" like one could in the real world. For instance, a computer simulated surgery or a flight simulator will not hurt anyone, yet the individual can gain knowledge from the experience. The above CBT features promote mastery learning (Sinclair, 1985). This would be true in the case of applying a poor CPR technique when doing CPR on a heart attack victim, as some of the complications of CPR can be fractured ribs and a lacerated liver.

Carew et al., (1985b) reported a study in which baccalaureate students (n=250) found the CBT program they used to be "highly advantageous for testing comprehension, for reviewing and reinforcing lectures, improving their concentration, adding enjoyment and interest to studying and improving their spelling".

Computer technology and education are here to stay. Educators have to assume the responsibility of being role models in the computer learning process. From an educator’s standpoint, teachers can learn to generate their lesson plans. Perhaps one of the reasons why the early promise of computers in the past decades did not surface
was because educators were never adequately trained to work on computers. Computers were introduced as technology that would lessen the teachers' work load, perhaps even replace them (Ornstein, 1992). Once educators become comfortable with utilizing computers, they will realize that fears of being displaced are unfounded, and they will be ready to maximize the benefits computers and CBI have to offer.

Studies such as Lee, Watson, Argo, Kalish and Catlin (1982) have researched the potential use of CBI over other traditional education methods (i.e. lecture alone). They support the cost effectiveness of computers as an educational tool. They indicated that computers are one area where, as technology improves, the price of technology decreases at the same time that the cost of human resources increases.

One of the main disadvantages according to Carew et al., (1985c) was the amount of time required to develop a CBT program. Depending on each particular CBI program, other disadvantages may include: cost of development of CBT, the need to know CBT technology and have qualified computer personnel to set up and maintain the computer system. Another hinderance of CBT may be the limited acceptability and comfort level of users to CBT compared to traditional educational methods. CBT programs may be prone to failure of instructional and computer programming design. It may take longer for a learner to go through a
CBT program than a video program because the computer format includes program instructions and more reading than most video formats. Frequently there are a limited number of hardware and computer terminals at a site. This limits the number of people that can be trained at one time. Whereas the ratio of student to instructor can be larger. For the above reasons, it may be difficult to convince a short-term budget minded management to make a long-term investment in the purchase or development of a new educational medium such as CBT technology.
CHAPTER III
METHODOLOGY

Population Selection

At the present time, Adult Corporate Instructional Management (ACIM) classes include the analysis of training/education methodologies as part of the curriculum. The recruitment of subjects for this study was limited to Loyola University (LU) students enrolled in the Spring 1994-1995 Computer-Based Training and Instructional Methods ACIM classes.

Inclusion criteria were: graduate students between 25 and 55 years old who are enrolled in one of the ACIM classes mentioned above at LU. Exclusion criteria were students not enrolled in the LU classes selected for this study.

The demographics analyzed in this study included, but were not necessarily limited to the subjects' professional background, age, computer experience and prior CPR experience (see appendix A, form 1).

The sample size for this study was 30 subjects. The control group consisted of 14 ACIM students enrolled in the 1995 Spring Semester Educational Methods class who learned from the CPR video cassette. The experimental group
consisted of 16 ACIM students enrolled in the 1995 Spring Semester Computer Based Training class. They viewed the CPR material utilizing a computer software program developed exclusively for this study.

Materials

Electronic Equipment

The electronic equipment included a color monitor/television and video cassette recorder (VCR). The selected CPR video cassette tape was available for the Instructional Method class from LU, Center for Quality Performance.

The computers' hardware included 17 computers available at LU computer laboratory at Water Tower Campus (WTC). The CPR software was installed in the computer network. These were IBM compatible 486 with 8 megabytes of RAM. The Microsoft Windows software packet presently available at LU WTC was used. Peripheral hardware, such as a color monitor and a mouse, were required for each personal computer.

The CBT software packet required 2.8 megabytes of memory in the executable file and included approximately 400 icons. The executable file and a set of fonts required for the program were tested in stand alone PC’s that had standard monitors to verify its workability and compatibility with other PC systems. The script of the program was analyzed for readability using the Flesch Reading Ease, Gunning’s Fog Index, Flesch Kincaid Grade
Level.

The CBT program consisted of a total of 66 screens. User interaction features included five interactive questions with the respective correct answers. The incorrect answers were followed by an explanation of why the answer was wrong, and would take the learner to the screen that needed review in order to learn the correct answer. This process occupied 20 screens (30% of the total program). The program also featured a CPR mock practice situation or scenario of 21 screens (32% of the total number of screens on the CBT). The practice segment consisted of 13 "correct" scenarios (64%) and six "incorrect" scenarios (36% of total "practice scenario" screens). In summary, interactivity was enhanced by allocating approximately 62% of the screens to questions and answers and practice scenarios. A "time-card" form was developed for the CBT group to determine the amount of time spent running the software program.

Support software packages utilized in the development of the CPR software program included Corel Draw to import graphics and Word Perfect 6.0 for word processing purposes.

Evaluation Tools

The investigator selected 27 multiple choice question from the standardized CPR test from the AHA. These included 19 (70%) qualitative and 8 (30%) quantitative questions. These questions comprised the pre-test to
determine the participant's baseline knowledge (see appendix A, form 2). The same 27 multiple choice questions were used in the post-test. The post-test was designed to analyze cognitive skills, qualitative and quantitative responses. The main criteria for selecting the questions from the standard CPR exam was that they had to be clearly presented in the video cassette excerpt selected for this study.

A twelve question reactionnaire was developed to evaluate the learners' acceptance of content, cosmetic aspects of CBT design, and interest in using CBT in the future. The reactionnaire was compiled from various resources such as Bratt and Vockell (1986).

**Procedure**

**Components of Study**

There was an instructional design process which consisted of five phases: analysis, design, production, implementation and evaluation. After completing the review of the literature, there were four decisions that were done concurrently: subject matter content, audience, video cassette tool and CBT tool.

All these components would become interdependent of one another during the study. These considerations were important in order to make a fair comparison of the two instructional modalities.

The first step was to determine a subject matter
that could be evaluated with standardized tests, would include qualitative and quantitative data, and would have a pre-existing standardized method of instruction. CPR met all of these criteria.

Another reason for selecting a medical topic such as CPR was because it was important to seek out a baseline knowledge of the subject matter common to all study participants. Few people in the ACIM program were likely to know the specifics of CPR as this was not a health science curriculum.

The second step was to confirm the audience. The ACIM students would add value to this study because they would likely be able to distinguish educational strategies and to critique both educational methods.

Also, this audience was in an age group that would benefit from the subject matter (CPR) and from the experimental process. The average age of the graduate student in the ACIM program corresponds to the age group that has an increasing chance of developing heart problems. Most participants fall in the "high risk" age group for heart attacks, which may render this topic to be of interest to this population. Furthermore, the CPR techniques are not sufficiently familiar to most learners to affect the results of the study.

The third decision was to determine which two educational tools would be compared in this study. The
tools selected were computer-based instruction to be compared with video based instruction. The rationale for this was that both technologies appeal to the similar sensory stimuli of movement, self-change or automatic change of screen content; both CBT and video cassette are technology that require common electronic equipment readily available in today’s workplace environment. Both tools promote solitary learning, although video is not as self-paced as CBT.

What is different about these two program that makes them worth comparing? Video cassette historically has been more commonly available and accepted for educational applications in the past two decades than personal computers at home and in the workplace. As technology advances, so does the availability of PC's at homes and in the workplace. CBT programs are becoming more affordable, user friendly and appear to be the next step in the evolution of solitary self-paced learning. Therefore, an evaluation of these two tools appears to be warranted.

A central criticisms of audio visual media (video cassette) is the absence of two important components of learning: interaction and feedback. Comparing video cassette and CBI may help determine whether the interaction and feedback afforded by CBI lead to more effective learning. However, interactivity in the CBT group had to be somewhat curtailed in this study as there was an
agreement that subjects would have a limited amount of time in one class session to complete the software program and evaluation tools.

The video cassette selected would need to have credibility and encompass the material covered in the standardized testing tools. The commercially available video cassette selected for this study, "CPR for Rescuers", was produced by Pyramid Film and Video. This video tape has been updated with the latest CPR guidelines and has AHA approval.

The video cassette selected featured an intermediate level of knowledge so that it would be challenging to most participants in this study. This was an attempt to ensure a similar baseline knowledge among learners; thus, it would be reasonable to assume that the knowledge retention was primarily from the educational tool presented and not prior learner's knowledge on the topic.

The intent of this study was not necessarily to prepare learners for CPR certification; rather, utilize a readily available standardized test that would help with the objective evaluation and measurement of the test score results.

This selection order was deliberate because video cassette is a commonly used educational tool for the CPR instruction of both lay and health professionals. The CBI would become the experimental component of technologically
modern teaching tools readily available at most institutions.

The total video cassette tape was 45 minutes long. Due to time limitations, this study utilized a 15 minute excerpt. The selected video cassette portion was translated into the a CBI program for this comparative study.

The next step was to identify and select an appropriate CBT software packet that would be comparable in content to the video cassette used in this study and affordable for most institutions. In other words a program that would not require CD-ROM, video-laser disk, a sound board, costly PC terminals and other peripheral equipment.

The investigator selected Authorware Star, an authoring system that was acceptable among professional CBT designers, and that had the capacity for branching, sequencing and learner interactivity. The investigator also designed formative and summative computer evaluation strategies and tools for this project.

CBI Software Development

For purposes of this study, the investigator decided to create the CBI program so that, as much as possible, it would replicate the original content of the video tape program. The next step then was to design the software package tailored to this study.

As indicated earlier, Authorware Star was the computer
authoring language selected. The program was comparable to the video cassette in terms of content, literacy level, and completion of time.

To maximize the effectiveness of the learning tools, the following instructional design elements were included in the software development: establishment of instructional goals, analysis of learning requirements (using AHA's CPR standards as a guideline), specification of intended audience, methodology for the measurement of objectives, and a plan for instructional strategy. The CBI technical development elements included: selection of audio visual and computer delivery systems, review of existing titles and other materials, design of the program through flowcharts, design of visuals for graphic and animated sequences, writing the script for the program and formatting of the computer screens, testing of the materials, and finally, implementing and evaluating the data collection sessions.

There was also investigation on software programs from which appropriate graphics could be imported and edited to improve the aesthetic aspects of the program. The CBI evaluation component was conducted utilizing the evaluation tools described earlier in this paper. The above was satisfied by incorporating the information collected through the review of the literature.

Some recommendations cited in the literature by
investigators such as Aspillaga (1991-1992b) incorporated in the CBT design for this study were: "using blank space, being consistent in the presentation, preventing clutter as much as possible and avoiding scroll, capital versus lower case, screen page as a unit and margins". Also, the screens utilized a constant screen format, the text layout was legible by using "white space" and fonts, double spacing, left to right format, creating windows, sectioning functional screen areas and graphics. Unjustified right margins provided visual reference points that guided the eye smoothly down the page. However, these screen design features were misrepresented in the data collection / classroom session due to technical problems with the installation of the program into LU's computer network. Some screens were cluttered with information as the content was to remain similar to that of the video and learners would be tested on this particular material.

In this CBT program cliches and acronyms unfamiliar to the learner were avoided, and a consistent "voice" was used throughout the program following Farabaugh's recommendations (1990c). The screen color varied in this program to see if learners would react by making comments on the reactionnaire, but no one made specific reference to the colors. White and green light have the highest acuity, red and blue have a much lower acuity. Text written in italics does not snap the reading rhythm, thus, italics are
preferred to bright pounding colors such as magenta or pink (MacLahlan, 1986) and (Isaacs, 1987). Highlighting techniques were used with discretion.

To overcome the entry level computer skills of some of the subjects in this study, there was a "user friendly" menu driven sequential format. A side bar menu was provided on the right hand side of the screen so that the learner could select the next sub-topic he or she wanted to proceed. Also, it served as a point of reference to show the learner at what point of the program he or she was. A section on "Instructions" on how to use the program and "Glossary" for technical terms were included.

The software program had multiple choice questions as opposed to narrative questions. This was done to reduce the need of user's keyboard and typing skills and limit the length of the software program.

Data Collection, Logistics and Evaluation

The first step of the data collection was to divide the subjects into two groups: (1) the control group -- 14 students from Instructional Methods class received information via video cassette; (2) the experimental group -- 16 students from CBI class received the same education material via CBI. 30 subjects completed the study. The data collection sessions were held in the respective classrooms during regularly scheduled class time.

Participants' confidentiality was maintained by
assigning a code number to the pre and post-tests, demographic survey and reactionnaire prior to their distribution to learners. The CBT group also filled out a "time-card" form which was checked by the investigator when subjects submitted the completed instruments.

The investigator coordinated with Information Technologies Department to set-up the computer laboratory prior to data collection session. This was arranged in advance and the investigator checked the computer network to ensure that the software program was working properly after the transfer of files. The Information Technologies Department was provided with a copy of the software program on a 3.5-inch diskette to be installed on the university's computer network, as the computer terminals did not have hard drives available. The computers would be available only for the experimental group.

The 2.8 megabytes of CPR material had to be compressed into a 3-inch diskette and decompressed before it was placed into the network. The decompression and software installation into the network process was conducted by Information Technologies. Otherwise, the software would have been installed by the researcher onto the hard drive of each computer utilizing a copy of the CPR software developed.

The investigator made arrangements with the Audio Visual Department to have the video cassette recorder
equipment set-up for the presentation and tested the equipment prior to session. The video tape was loaned from the Center for Organizational Effectiveness at LU Medical Center.

To promote user's interactivity and feedback with the computer, five practice questions with reinforcement of the correct answers or repetition demanded after incorrect answers were incorporated after each questions whenever appropriate. Also, a practice segment of 21 screens walked the learner through a "heart attack scenario" where the learner had to decide on what step to take next. This decision led the learner to the next scenario if he or she made the appropriate decision. If the decision he or she made was not the best choice, then the program would return him or her to the previous scenario.

Time for testing and evaluation were allocated as follows: 15 minutes to view the video cassette excerpt, and 20 minutes to complete the pre-test, post-test and reactionnaire tool manually. The CBI incorporated five practice questions within the program, but the pre and post-tests were done in the same manner (handwritten) as in the control group. The reason for giving a handwritten test instead of incorporating it into the CBT program was to maintain consistency on the test-taking modes and stress factor levels in both study groups. This was to eliminate confounding a variable.
The experimental group (CBT) had the same written test as the control group which was CPR certification exam approved by the American Heart Association. The pre and post-test questions included a total 19 (70%) qualitative and 8 (30%) quantitative questions. Learning was evidenced and measured by gain scores obtained from comparing post-test with pre-test score results.

Upon completion of the lesson, the investigator asked participants to complete a twelve question reactionnaire. This survey utilized a five point Likert-type scale to determine the comparative comfort level of participants using video or CBI instructional methods respectively. The reactionnaire was organized by preference of design of tool, by content matter and if learner wished to use the respective educational method (CBT or video) in the future.

To evaluate the respective instructional method, the following issues were imbedded in the reactionnaire: whether the questions were related to the objectives; whether the material was presented following recognized learning theory and principles. Learners' feedback of the respective tool (CBI or video), appropriate pace and level of difficulty were included. Learners' impressions on cosmetic factors such as screen design, color selection, screen displays were also evaluated. Lastly the accuracy of process was rated for flawlessness, user friendliness and content (see appendix A, form 3).
The investigator gave the participants a short introduction to the general procedures and answered only questions regarding the process. No information regarding content was provided to either study group.

There was an opportunity for the investigator to obtain verbal feedback from participants on a voluntary basis at the end of the session once all data was collected. Also, the investigator informally observed any manifestations of attitudes toward the instructional tools.

Date and Duration of Data Collection

Each control subject underwent one 45 minute video cassette CPR session. This time was broken down into approximately 15 minutes for video cassette viewing time and 25 minutes for test, introduction and closure. The CBI experimental group took a total of one hour per session. This group was allowed approximately 30 minutes to complete the software program, and the remaining time was allocated to manually complete the pre and post-tests, demographic survey and reactionnaire. This would help reduce potential bias on the post-test scores results when compared with the video cassette group.

The additional time given to the CBT group was because CBT typically requires more time than the video cassette format as the learner has to engage in activities that are more time consuming than passively viewing a video cassette. In CBT learners have to get involved in the
program by reading the content, making decisions in the interactive segments of the program, and changing or branching screens.

Originally, both study group sessions were scheduled for the first half of the Spring Semester 1995 when students’ may have been more cooperative and have fewer academic course related responsibilities. However, there was a five week gap between collecting data from each study group due to logistical reasons.

Subjects within each study group completed their self-paced instruction at the same assigned period of time, day and year. This was an attempt to minimize confounding variables.

**Statistical Data analysis**

The data were analyzed using a computer statistical analysis program SPSS-X version 4.0. The statistical tests performed were paired t-test to compare differences in baseline knowledge (pre-test continuous variable) and knowledge retention (post-test continuous variable) between video cassette and CBT. A sign test was conducted to compare the continuous variables of pre with the post-test within each study group. The Pearson’s chi-Square statistics was used included used to identify the relationship in the nominal data such as pre and post test score, demographics, reactionnaire.

The raw data collected included approximately five
nominal variables. Each nominal variable was assigned a letter and a value accordingly (i.e. "A" = age; <35 years old = 0; >= 35 years old = 1). Missing and questionable values were coded 99.

The subjective data were obtained from the reactionnaire scores. The questions regarding the acceptance of the respective tool were based on a five point Likert-type scale. That enabled the derivation of statistical results (see appendix A, form 3).
CHAPTER IV
RESULTS

Data Analysis / Statistics

There were four approaches by which it was attempted to answer the research questions in this study (see chapter 1, page 5). The first approach was to determine if there were differences between the two study groups (CBT and video) of demographic variables such as: age, computer experience, knowledge from previous instruction on the subject matter, being interested in the subject matter, being health professional. The above data was obtained from a demographic questionnaire (see appendix A, form 1).

The second approach used was to determine which of the tools (video cassette or CBI) appeared to be more effective self-instruction method for adults in this population of students. Effectiveness was judged on whether there was a difference in retention of knowledge between learners instructed by CBI and those instructed by video cassettes. This was measured through a pre-test and post-test (see appendix A, form 2).

The third approach was used to determine if there was a significant difference in learner's attitudes toward the
respective tool (video cassette or CBI) used for instruction in this study. This was based on which tool received higher acceptance, and learners attitudes were measured using a reactionnaire evaluation tool (see appendix A, form 3).

The fourth approach used to determine if there were statistically significant differences in the time spent in the respective educational tool between each study group.

The reactionnaire's four subjective, independent variables were: (1) acceptance of method; (2) acceptance of content; (3) desire to get more instruction on a specific technology (obtained from the reactionnaire); and (4) the overall learner's reactions towards the respective tool.

The questionnaire on demographics contained two subjective variables such as perceived importance of subject matter by learner, and two objective, independent variables such as age, computer experience, profession. The objective data also included the dependent variables of pre-test, post-test and gain score results as well as time spent on the respective tool.

Analysis of Demographics

The first approach consisted of the analysis of demographic variables mentioned earlier and comparing them between the two study groups. As a whole, the subjects in both study groups presented with similar backgrounds based on the demographic survey results. A Pearson chi-square
was obtained comparing each demographic category between CBT and the video groups to determine if there were any statistically significant observations. The findings were: age ($r=.39$), computer experience ($r=.29$), former instruction ($r=.59$), subject matter was of interest to the learner ($r=.46$), and subject was a health professional ($r=.22$). Although not statistically significant, the investigator analyzed the demographics directly to attempt to see if there were any trends in the demographic variables. The findings revealed the following:

Most subjects were in the younger age group of $<35$ years old: video group ($n=10, 71\%$), CBT group ($n=8, 50\%$), both groups ($n=18, 60\%$).

Most subjects had at least weekly computer experience in the past: video group ($n=12, 86\%$), CBT group ($n=13, 81\%$), both groups ($n=25, 83\%$).

The majority of subjects did not have former CPR instruction in the past: video group ($n=13, 93\%$), CBT group ($n=13, 81\%$), both groups ($n=26, 87\%$).

Most subjects perceived that the information was applicable to them: video group ($n=13, 93\%$), CBT group ($n=9, 69\%$), both groups ($n=22, 82\%$) -- used "valid percent". Also, most subjects were not health professionals: video group ($n=10, 71\%$), CBT group ($n=12, 75\%$), both groups ($n=22, 73\%$). The specific learners comments will be discussed in chapter V.
In conclusion, although the differences were not statistically significant, the figures suggest a trend that most people in the video group had more computer experience, more subject information and more interest in subject matter (see p values in appendix B, table 6). These noted trends would have to be further investigated in another study with a larger sample population to determine their statistical validity.

The video group was younger (a difference of 21% more people were younger than the CBT group), had more computer experience (a difference of 5% more people more than the CBT group). They also had more former instruction on CPR (a difference of 12% more people had more than those in the CBT group), and they found the information interesting (a difference of 24% more people more than the CBT group). However, the CBT group had a higher number of health professionals which is a difference of 5% more people than the video group (see table 1).

Analysis of the Actual Test Scores

The data analysis to conduct the second approach in this study included the comparison of the pre-test and post-test scores between the two study groups (video and CBT).
### TABLE 1.— Demographics Questionnaire Summary.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Video n=14</th>
<th>CBT n=16</th>
<th>VID/CBT n=30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Age</td>
<td>(71%)*</td>
<td>(29%)</td>
<td>(50%)</td>
</tr>
<tr>
<td>n=10</td>
<td>n=4</td>
<td>n=8</td>
<td>n=8</td>
</tr>
<tr>
<td>Computer</td>
<td>(86%)*</td>
<td>(14%)</td>
<td>(81%)</td>
</tr>
<tr>
<td>Experience</td>
<td>n=12</td>
<td>n=2</td>
<td>n=13</td>
</tr>
<tr>
<td>Former CPR</td>
<td>(7%)</td>
<td>(93%)*</td>
<td>(19%)</td>
</tr>
<tr>
<td>Instruction</td>
<td>n=1</td>
<td>n=13</td>
<td>n=3</td>
</tr>
<tr>
<td>Subject</td>
<td>(93%)*</td>
<td>(7%)</td>
<td>(69%)</td>
</tr>
<tr>
<td>Information</td>
<td>n=13</td>
<td>n=1</td>
<td>n=9</td>
</tr>
<tr>
<td>Health</td>
<td>(29%)</td>
<td>(71%)</td>
<td>(25%)</td>
</tr>
<tr>
<td>Professional</td>
<td>n=4</td>
<td>n=10</td>
<td>n=4</td>
</tr>
</tbody>
</table>

Used "valid percent" from frequency tables. **=highest percent of people between both groups.

**LIST OF VARIABLES:**
- **age:** 1 = >=35 years old, 2 = <35 years old
- **computer experience:** 1 = weekly/daily practice, 2 = 1/2X/month practice
- **former instruction:** 1 = had former instruction, 2 = had no former instruction
- **information interesting:** 1 = it was interesting, 2 = it was not interesting
- **health professional** 1 = is health professional, 2 = is not a health professional
The range, and standard deviation were evaluated, and a t-test was selected to determine the statistical significance of these variables between CBT and video groups, as the scores were continuous variables (see table 2).

Also, a sign test was conducted to compare the difference in knowledge gained within each study group utilizing the pre and post-test scores.

The video group results had a mean pre-test score of 16.43 (S.D. 1.9), and a mean post-test score of 20.86 (S.D. 2.7). This constitutes a gain of 3.87 (S.D. 2.7). Thus, the post-test score was 27% (20.86/16.43) higher than the pre-test score in the video group alone. The time spent in the video cassette tool was 15 minutes.

The CBT pre-test (n=16) results had a mean pre-test score of 16.0 (S.D. 4.6), and a mean post-test score of 19.87. This represents a gain knowledge increase of 4.43 (S.D. 2.5). Thus, the post-test score was 24% (19.87/16.0) higher than the pre-test score in the CBT group. The average time spent in the program was 21 minutes (time ranged 10-30 minutes). However, the accuracy of time spent in CBT is questionable as some learners included the time spent in the reactionnaire and/or post-test.

The learners had a lower pre-test score in both groups (video cassette and CBT 16.2 (S.D. 3.5) and the post-test score was 20.3 (S.D. 3.7); thus, there was a gain knowledge
TABLE 2.— Results of Pre-test, Post-test and Gain Scores and Time (Numerical Data).

<table>
<thead>
<tr>
<th>Educational Tool</th>
<th>Test</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBT (n=16)</td>
<td>Pre-test</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>4.55</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>19.87</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>4.49</td>
</tr>
<tr>
<td></td>
<td>Gain</td>
<td>+3.87</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>2.70</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>20.50 minutes</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>5.317</td>
</tr>
<tr>
<td>Video (n=14)</td>
<td>Pre-test</td>
<td>16.43</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>1.87</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>20.86</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>2.66</td>
</tr>
<tr>
<td></td>
<td>Gain</td>
<td>4.43</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>15 minutes</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>0.00</td>
</tr>
<tr>
<td>Video/CBT (n=29/30)</td>
<td>Pre-test</td>
<td>16.2</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>3.51</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>20.3</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>3.69</td>
</tr>
<tr>
<td></td>
<td>Gain</td>
<td>+4.14</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>2.57</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>18 minutes</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>4.734</td>
</tr>
</tbody>
</table>
TABLE 3.-- Results of Pre-test, Post-test and Gain Scores and Time (Nominal Data).

<table>
<thead>
<tr>
<th>Tool</th>
<th>Test</th>
<th>Percent of Number of People Below or Equal or Greater to the Mean Score (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt; mean</td>
</tr>
<tr>
<td></td>
<td>CBT</td>
<td></td>
</tr>
<tr>
<td>(n=16)</td>
<td>Pre-test</td>
<td>n=8 (50%)</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>n=5 (33%)</td>
</tr>
<tr>
<td></td>
<td>Gain</td>
<td>n=7 (47%)</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>n=6 (37%)</td>
</tr>
<tr>
<td></td>
<td>Video</td>
<td></td>
</tr>
<tr>
<td>(n=14)</td>
<td>Pre-test</td>
<td>n=5 (36%)</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>n=4 (28%)</td>
</tr>
<tr>
<td></td>
<td>Gain</td>
<td>n=6 (43%)</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Video/CBT</td>
<td></td>
</tr>
<tr>
<td>(n=29/30)</td>
<td>Pre-test</td>
<td>n=13 (43%)</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>n=9 (31%)</td>
</tr>
<tr>
<td></td>
<td>Gain</td>
<td>n=13 (45%)</td>
</tr>
<tr>
<td></td>
<td>Time</td>
<td>N/A</td>
</tr>
</tbody>
</table>

(*)Denotes the percent of people who were below or equal/above the mean test score. This was based on both groups combined: pre-test, (mean = 16.2); post-test (mean = 20.3); gain score (mean = 4.14); time spent on the respective educational tool (17.933 minutes).
of 4.1 points. This represents a 25% (20.3/16.2) difference between the pre and post-test scores. The range of knowledge gained in test scores was: video group 9, CBT group 9 points.

Test results were improved between pre-test and post-test between each group was significant based on t-test for paired samples (video group: t-value = -6.62, df=13, p=.000, n=14; CBT group: t-value = -5.56, df=14, p=.000, n=15; both groups combined: t-value = -8.66, df 28, p=.000, n=29). Also the results are reinforced with the gain score and the test scores shown in table 2. The non-parametric sign test compared the differences between pre and post-test score results within each study group and showed a statistically significant difference (video cassette p=.0002, CBT p=.0018). Therefore in this study, based on the sign test, there was a statistical significance in knowledge gained in the video group and in the CBT group (p=.0002 and p=.0018 respectively).

The comparison of the mean test scores results alone between CBT, video and both groups revealed the following:

The pre-test score: video group 16.43 (S.D. 1.87), CBT group 16.0 (S.D. 4.55), (p=.745), both groups 16.2 (S.D. 3.51). The post-test score: video group 20.86 (S.D. 2.66), CBT group 19.87 (S.D. 4.49), (p=.480), both groups 20.3 (S.D. 3.69). The comparison of test scores between the two study groups showed that both the pre-test and
post-test were not statistically significant based on t-test. This shows that the differences on baseline knowledge between CBT and the video groups was by chance.

The analysis of test scores ranges were: the video group had a narrower range of the pre-test score 6 points, post-test score 9 points, and gain score 9 points; the CBT group had a range of pre-test score 15 points, post-test score 15 points, and gain score 9 points. The tests score results were more spread out in the CBT group (based on ranges), almost twice the standard deviation seen in the video group.

The gain test score: video group 4.43 (S.D. 2.5), CBT group 3.87 (S.D. 2.70) (p=.566), both groups 4.14 (S.D. 2.57). Based on gain score results, the video group did slightly better than the CBT group by .65 points (video 4.43-3.87 CBT). This represents a 14% (4.43/3.87) difference between gain scores of the two tools. This difference in knowledge gain is not statistically significant (p=.480).

Analysis of the Number of People who Fall Greater or Equal to the Mean Test Scores

To evaluate the mean pre-test, post-test and gain scores constitutes the second approach used to answer the research questions. The results were divided into two groups: group "A" included pre-test and post-test scores that were ≥ above the mean. Group "B" included those
scores that were below the mean of each group. These adjustments of data were done to compress the raw data into a smaller number of sub-categories; thus, increasing the number of subjects on each cell. This was an attempt to arrive at more statistically significant figures. The relationship between the variables that would answer the pre and post-test, knowledge gain and time spent related research questions mentioned earlier were analyzed accordingly (see table 3).

The comparison of the percent of number of subjects who had an equal or above the mean of the following test score variables revealed the following: (1) The pre-test score: video group (n=9, 64% of the people in the video group only), CBT group (n=8, 50%), (p=.577), both groups (n=17, 57%). (2) The post-test score: video group (n=10, 71%), CBT group (n=10, 67%), (p=.764), both groups (n=20, 69%). (3) The gain test score: video group (n=8, 57%), CBT group (n=8, 53%), (p=.725), both groups (n=16, 55%).

These results indicate that in this study, learners did gain knowledge on CPR. However, the Pearson's chi-square showed that the number of people who were above or equal to the mean in the pre, post-test and gain test scores respectively between video and CBT were similar as the statistical analysis results were not significant (see appendix B, table 7). The data collected analyzing the actual test scores within each group did reveal a
TABLE 4.— Results of Reactionnaire (Likert Scale).

<table>
<thead>
<tr>
<th>Tool</th>
<th>Reaction</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MNAP</td>
<td>20.56</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>4.661</td>
</tr>
<tr>
<td>CBT (n=16)</td>
<td>MNAP</td>
<td>14.69</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>3.81</td>
</tr>
<tr>
<td></td>
<td>MNMI</td>
<td>8.75</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>2.32</td>
</tr>
<tr>
<td></td>
<td>MNREAC</td>
<td>44.00</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>8.48</td>
</tr>
<tr>
<td>Video (n=14)</td>
<td>MNAP</td>
<td>22.14</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>3.61</td>
</tr>
<tr>
<td></td>
<td>MNAC</td>
<td>18.93</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>1.82</td>
</tr>
<tr>
<td></td>
<td>MNMI</td>
<td>8.57</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>1.78</td>
</tr>
<tr>
<td></td>
<td>MNREAC</td>
<td>49.64</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>6.61</td>
</tr>
<tr>
<td>Video &amp; CBT n=29/30</td>
<td>MNAP</td>
<td>21.30</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>4.21</td>
</tr>
<tr>
<td></td>
<td>MNAC</td>
<td>16.68</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>3.47</td>
</tr>
<tr>
<td></td>
<td>MNMI</td>
<td>8.67</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>2.06</td>
</tr>
<tr>
<td></td>
<td>MNREAC</td>
<td>46.63</td>
</tr>
<tr>
<td></td>
<td>S.D.</td>
<td>8.06</td>
</tr>
</tbody>
</table>

Used valid percent values.
MNAP = mean cosmetic acceptance of educational tool.
MNAC = mean content acceptance of educational tool.
MNMI = mean of learner wishing more experience on the respective educational tool.
MNREAC = mean results of total reactionnaire results of the respective educational tool.
TABLE 5.-- Results of Reactionnaire (Nominal Data).

<table>
<thead>
<tr>
<th>Tool</th>
<th>Reaction</th>
<th>Percent of Number of People Below, Equal or Greater to the Mean Score (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt; mean</td>
</tr>
<tr>
<td>CBT (n=16)</td>
<td>MNAP</td>
<td>n=6 (38%)</td>
</tr>
<tr>
<td></td>
<td>MNAC</td>
<td>n=10 (63%)</td>
</tr>
<tr>
<td></td>
<td>MNMI</td>
<td>n=4 (25%)</td>
</tr>
<tr>
<td></td>
<td>MNREAC</td>
<td>n=7 (44%)</td>
</tr>
<tr>
<td>Video (n=14)</td>
<td>MNAP</td>
<td>n=3 (21%)</td>
</tr>
<tr>
<td></td>
<td>MNAC</td>
<td>n=2 (14%)</td>
</tr>
<tr>
<td></td>
<td>MNMI</td>
<td>n=7 (50%)</td>
</tr>
<tr>
<td></td>
<td>MNREAC</td>
<td>n=3 (21%)</td>
</tr>
<tr>
<td>Video/CBT n=29/30</td>
<td>MNAP</td>
<td>n=9 (30%)</td>
</tr>
<tr>
<td></td>
<td>MNAC</td>
<td>n=12 (40%)</td>
</tr>
<tr>
<td></td>
<td>MNMI</td>
<td>n=11 (37%)</td>
</tr>
<tr>
<td></td>
<td>MNREAC</td>
<td>n=10 (33%)</td>
</tr>
</tbody>
</table>

(*) Denotes the percent of people who were below or equal/above the mean reactionnaire score. The numbers in parentheses are based on the adjacent n. The n was based on both groups combined: mean cosmetic acceptance (MNAP = 21.30), mean content acceptance (MNAC = 16.68), mean "more instruction" (MNMI = 8.67), mean total reactionnaire (MNREAC = 46.63). Below the mean indicates the percent of subjects who disagree or strongly disagree (<3 points of 5 point Likert scale); equal or above the mean indicates the percent of subjects who agree, strongly agree (<=3 points of 5 point Likert scale). Used valid percent values.
significant difference as discussed earlier (based on sign test results).

**Analysis of Reactionnaire Scores**

The Analysis of the actual reactionnaire scores (continuous variable) constituted the third approach to answer two research questions. One question was asked to evaluate whether there was a difference in attitudes toward CBI of learners instructed by CBI and those instructed by video cassette (acceptance of the method and tool of instruction). Another question was asked to determine which educational tool was liked the most (the CBT or the video cassette). This analysis was approached in two ways. The first way was based on actual reactionnaire scores (using continuous variables such as the means of both groups combined). The second approach was based on the number of the results from individual reactionnaire ratings converted to nominal variables (sub-group "A" = ≥ mean and sub-group "B" = < mean of the respective test score) obtained from the reactionnaire.

The first data analysis procedure used to answer this reactionnaire related question included comparing the four reactionnaire variables scores between the two study groups (video cassette and CBT). The range, and standard deviation were evaluated and a t-test was selected to determine the statistical significance of these variables as the scores were continuous variables. A relationship
between the reactionnaire variable results are listed in table 4.

The comparison between the mean scores and the following reactionnaire variables between video cassette and CBT were (based on t-test): cosmetic acceptance score was: video 22.14, (S.D. 3.6), CBT 20.56, (S.D. 4.661) ($p=.313$), both groups 21.30, (S.D. 4.21); content acceptance was: video 18.93 (S.D. 1.8), CBT 14.69 (S.D. 3.81) ($p=.000$), both groups 16.68 (S.D. 3.47); "want more instruction": video 8.57 (S.D. 1.87), CBT 8.75 (S.D. 2.2) ($p=.817$), both groups 8.67 (S.D. 2.61); total reactionnaire: video 49.64 (S.D. 6.61), CBT 44.00, (S.D. 8.48) ($p=.054$), both groups 46.63 (S.D. 8.06).

In conclusion, the t-test derived from the reactionnaire variables determined that content acceptance was the only reactionnaire variable that was statistically significant ($p=.000$). Evaluating the raw data directly, the content acceptance was higher in the video group (18.93 points compared with 14.69 points in the CBT group). This represents 128% difference in higher content acceptance in the video group compared to the CBT group.

Both the video and CBT group liked their respective tool in the areas of "cosmetic acceptance", "wanted more instruction" and "total reaction" with reference to the respective educational tool. Also, the standard deviation of the reactionnaire variables scores were more spread out
on the CBT than in the video group, suggesting that as a group, the CBT had a larger difference of opinion in their reaction toward the CBT program experience (table 4).

The above four continuous variables results were converted into nominal variables to determine the number of individuals who favored (or did not favor) the video and CBT tools respectively. The purpose of this step was to focus on each learner's scores that were greater or equal to the mean of means of both groups combined (CBT and video cassette) and not based on the group reactionnaire score averages alone. The results related to the reactionnaire scores were based on a five point Likert scale. They are discussed below and summarized on table 5.

The results indicated that most subjects liked the cosmetic aspects and expressed a desire to receive more instruction utilizing the respective educational tool (CBT or video cassette). The number of people who reacted favorably to the reactionnaire variables were:

1. The "cosmetic acceptance" video group (n=11, 79%), CBT group (n=10, 63%), (p=.707), both groups (n=21, 70%). In this study, the video group had higher preference in cosmetic acceptance than the CBT group. However, according to Pearson's chi-square this comparison (cosmetic acceptance between video and CBT) was not statistical significant (p=.707).

2. Overall, the participants of both study groups
combined reacted favorably to the "acceptance of content" of the respective educational method used. However, the comparison between the two groups showed that the video was better liked than the CBT respectively. The figures were: video group (n=12, 86%), CBT group (n=6, 38%), (p=.040), both groups (n=18, 60%). This comparison of "content acceptance" between video and CBT was statistical significant, based on Pearson's chi-square, which agree with the t-test findings discussed earlier.

3. There was not a significant difference in desire to receive "more instruction" using the respective educational method used. The findings were: video group (n=7, 50%), CBT group (n=12, 75%), both groups (n=19, 63%). This indicated that there was a 25% difference (50% minus 75%) in the number of people who wanted more instruction in the CBT group than in the video group utilizing the respective tool.

4. The difference between the "total reactionnaire" of the respective educational tool were not significant (Pearson's chi square): video group (n=11, 79%), CBT group (n=9, 53%), (p=.515), both groups (n=20, 68%).

In conclusion, the statistically significant findings indicated the following: (1) regarding the "acceptance of content", there were more people in the video group (86%), compared to the number of people in the CBT group (38%) who liked the content of the respective tool; (2) the CBT group
(75%) indicated they wanted more instruction than the video group (50%).

Although the following variables were not statistically significant, the direct analysis of the raw data may suggest a trend which would need to be further studied in a larger population. The comparison of the reactionnaire scores between video and CBT showed that the video group (79%) reacted more positively to the "cosmetic/aesthetic" aspects than the CBT group (63%) did to the respective educational tool. The response on the "total reactionnaire" indicated that more people in the video group (79%) liked the tool, whereas the number of people in the CBT group (56%) favored the CBT tool less than the video group. The reactionnaire response scores are summarized in the table 5.

The fourth approach of this study was to compare the time spent in the respective educational tool. The mean amount of time spent in the respective educational tool was: video cassette 15 minutes, CPR software program 20.50 minutes (S.D. 5.137), (p=.001). This finding would be expected because CBT required reading and interacting with the program (table 2). The number of people who spent an above or equal mean time spent on CBT was n=6, 37%). Video group had 15 minutes to view the video tape (p= n/a).
Methodological Issues

A major limitation of this study involved the use of too few participants were in the study to conduct an ANOVA analysis. The pre-test and post-test categories had to be collapsed into two categories to increase the statistical power of the numbers and attempt to obtain values that would better represent the study groups.

In a larger study, it would be advisable to analyze the demographics of the completed test against the tests that were not completed. Then, compare the two categories with one another in order to make some conclusions. For instance, if there were 10 people over the age of 50 and the rest under 49, then it would be useful to compare these two groups to see if one group got better post-test scores than the other. The group with the worse scores may suggest that they had a difficult time learning the material. This could be the case assuming that both groups had pre-test results showing a similar mean.
CHAPTER V
DISCUSSION

The literature cites a substantial amount of information regarding CBT programs, and comparisons between effectiveness of CBT's and other instructional methods; however, there are few articles which compare CBT and video cassette instruction.

The aim of this thesis was not to compete with the video cassette format as the computer hardware utilized was selected based on the computer equipment commonly available at most corporations and hospitals at the time of this study. No CD-ROM features or video disks were utilized in this thesis as this technology was uncommon at corporate / hospital settings for multi-user purposes such as clinical nursing staff development programs.

Competing with the audio limitations of CBT against the audio effects seen in the video was also a challenge. The focus was to learn to format the CBT so that it would, as much as possible, compensate for those limitations by utilizing an acceptable CBT format which would help maximize the learning experience.

There are three different categories of learners. Those who learn kinetically (by doing), visual (by viewing)
and audio (by listening). Both computer and video can provide something for each sensory preference, although they may function at different degrees. The amount of learner input interactivity between learner and program presentation depends on the format of the information. The CBT format lends itself to better interaction than does the video cassette; however, the time allowed learners on the CBT compromised the level of interactivity.

One of the attractions of CBT is that it has the potential for learners to work on their own, setting their own pace, be able to revisit the material an indefinite number of times. However, for purposes of consistency between the two study groups, it was important to limit the learner's exposure to the subject matter (CPR) to roughly similar time periods in both study groups. This was to avoid biasing the results of material retention on the CBT post-test. The CBT post-test results were to be compared with those of the video group where participants had the opportunity to review the material only once. Therefore, the CBT group utilized the "self-pace" feature to a limited degree, as the learners were only allowed to work on the software program for a pre-determined amount of time (30 minutes).

Video cassette tape tends to work best in large groups because one video tape and one television monitor are all the equipment that is required to present the information.
CBT, however, may work best for instructing a small number of people because one diskette and one computer can be used at one time. This is assuming there is only access to: one software program and a limited number of personal computers, and that the system is not connected to a computer network. In other words, it appears more practical for institutions to in-service 50 employees in one room with one VCR machine and one video cassette tape, than 50 computers and 50 legal copies of a software program. The cost, per capita of viewers, may be in some cases higher for the development of a CBT program than for the development or purchase of a video cassette tape.

People who grew up at a time when computers were not as readily available as they are today tend to be more apprehensive about handling computers than individuals who were raised from 1970 on. This discomfort may deter individuals from focusing on learning the content of the material. There was no opportunity to discern the effect of computer experience in learning the content, as both study groups had similar levels of computer experience.

Both instructional tools (CBI and video cassette) share the advantage of motion capabilities, which is not the case in regular text on paper. This novelty of CBT can serve as a stimulating tool for absorbing and reviewing information. In this study, the CBT software had the additional advantage of easy access to a specific part of
the program for review which was not a feature readily available in the video cassette format.

Some specific comments received from the learners regarding CPR indicated that if an occasion comes up where they found an individual who is having a heart attack, and they were the only person around to help, they would now know at least the basic knowledge of CPR. Other comments from learners indicated that this topic related to their lives: "I work in security"; "the information is useful"; "you never know when you will have to do CPR". This agrees with the adult learning theories which indicate that adults learn better if they find the information relevant or useful to their needs.

A specific educational media (video cassette and CBT) was selected to each study group, and it did not attempt to identify the same individual utilizing both learning tools. In this study the demographics and baseline knowledge were analyzed to identify possible variables, such as different level of baseline knowledge, age, computer experience of subjects in each group, which could potentially confound the interpretation of the results. The results showed that the demographics and baseline knowledge on the subject matter were statistically similar between the subjects in both study groups.

The AHA quiz used to evaluate retention of video cassette represents approximately 25% of a nation-wide
certification exam. It would be inappropriate to attempt to compare the results of this population to the results of the larger population because the test covers only a small percentage of the questions.

The data collected was used to raise questions which may serve as guides to future studies related to these two teaching modalities tested among this population of students. The study also analyzed the design process of developing, implementing, analyzing and evaluating a computer-based program.

Benefits of the Study

This research utilizes the presently implemented curriculum in the graduate ACIM program at LU. The protocol of the study was non-invasive on the subjects studied. The following information explained some of the potential benefits of this study.

First, it demonstrated that subjects can effectively learn the same subject matter with either CBI or video cassette. Second, it exposed ACIM students to a variety of applications in the area of video cassette and CBI, as well as create awareness of the time and resources involved in the development of CBT.

Computer technology and education are here to stay. ACIM students, as corporate management trainers of the future, may well be role models of the computer learning process. Hopefully this project has contributed to their
experiences with computers and has whetted their appetite for further study of the potential and applications of CBT in the future.

Third, this study evaluated an alternate education method that would have the potential to free the trainers or instructors from topics that could be developed into a self-study format and focus on the specific learning needs of students. It attempted to determine a student’s awareness and use of modern methods of education. It promoted a well-rounded approach to a student’s education with reference to CBT program development.

Fourth, it provided a learning environment where students were able to independently self-evaluate their CPR base knowledge in privacy. They were also able to review portions of program as desired (i.e. one man CPR rescue versus Heimlich maneuver), receive standardized instructional delivery and receive appropriate feedback. Furthermore, they had the opportunity to utilize modern instructional technology to ultimately promote a change in their behavior beneficial to improve health. However, identifying the specific behavior changes in this group of learners would be subject for another study.

Qualitative Analysis

The discussion of qualitative analysis (learners comments on reactionnaire and classroom discussion) dealt with the appropriateness of the following considerations
regarding CBT software development: visual issues such as the size, appearance and position of the text and graphics on the screen; navigational and sequencing issues such as menu location, key buttons, exits, information on what material was covered by the learners; interactivity issues such as evaluation of learners' retention of content, subject matter presented at the appropriate technical level.

Both the video and the CBT had the same technical level. The video cassette was selected and the CBT program was developed to be above the audiences' technical educational level and emphasizing on the research aspects of the project. The reading level was measured to be make sure learners would understand the English level.

Professional Credibility on the subject matter was a concern. The video cassette selected for this study was professionally produced to meet the new guidelines published in the Journal of the American Medical Association, October 28, 1992. One challenge in this study was to develop a CBI program that would resemble as much as possible the video cassette material. The subject matter content was standardized by the American Heart Association. The investigator underwent this project to learn the process of design, implementation and evaluation of a learning modality at a basic level. The investigator utilized the techniques learned through graduate school and
implemented them into the creation of this CBT software program in order to conduct a comparison study between these two tools. The intent of the CBT project was not to necessarily compete with a professionally manufactured product.

Learners were able to learn from the CBT tool despite the challenges they faced in this experimental process.

No written comments were provided by the video group in reference to the CPR video cassette. One verbal comment was that the video cassette was overloaded with information.

In some prior CBI studies, computer literacy and the disparity of computer handling experience was a concern. In this study, statistical analysis revealed that all subjects had similar computer experience levels.

**Study Findings**

The summary of the following study findings include:

The demographics analyzed (age, computer experience, having previous instruction on subject matter, being interested in the subject matter, and health related career) between CBI and video group were similar. The differences were not statistically significant (table 6).

Overall both educational tools appeared to be effective self-instruction method for adults in this study. Learners in both groups were able to learn utilizing the respective educational tool.
To further explain this conclusion, there was not a difference in baseline knowledge and retention of knowledge between CBT and video group. Both groups had similar baseline knowledge on the subject matter. Learners in both groups were able to effectively gain knowledge on the subject matter based on post-test score results. Although not statistically significant, the post-test and gain score results were higher in the video group than CBI. This may suggest a trend which would need to be further evaluated in another study with a larger subject population.

There was a significant difference in pre versus post-test scores within each study group. Learners in the video and CBT groups respectively increased their test scores. This reinforces that both educational tools were effective methods of education in this student population.

There was a statistically significant difference in time spent in the respective educational tool between both groups. As expected, the CBT group took longer time to go through the material than the video group.

There was no statistical difference noted in overall learners' attitude (reactionnaire) between CBI and video cassette in "cosmetic acceptance", desire to obtain "more instruction" utilizing the respective tool, and "total reaction". The only variable where there was a statistically significant differences was on the "acceptance of content" variable to the respective
educational tool. Video cassette received a higher "acceptance of content" mean score. Overall, both tools were accepted by the learners in this study.

**Conclusions**

The demographics analyzed (age, computer experience, having previous instruction on subject matter, being interested in the subject matter, and health related career) between CBI and video group were similar.

Overall both educational tools appeared to be effective self-instruction method for adults in this study. Learners in both groups were able to learn utilizing the respective educational tool. Furthermore, there was not a difference in baseline knowledge and retention of knowledge between CBI and video group. Learners in both groups were able to effectively gain knowledge on the subject matter based on post-test score results.

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APPENDIX A

FORM 1

Participant No. ____

DEMOGRAPHIC QUESTIONNAIRE

Please answer the following questions as applicable.

<table>
<thead>
<tr>
<th>CODE</th>
<th>QUESTION</th>
</tr>
</thead>
</table>
| "Age" | HOW OLD ARE YOU?  
1. 20-34 YEARS OLD  
2. 35-50 YEARS OLD  
3. OTHER__YRS OLD |
| "CE" | YOU WORK ON COMPUTERS  
1. NEVER / Seldom  
2. ONCE OR TWICE A MONTH  
3. WEEKLY / DAILY |
| "CL" | YOU ARE ENROLLED IN:  
1. CBT CLASS  
2. INSTRUCTIONAL METHOD  
3. HUMAN RESOURCE DEVELOPMENT CLASS |
| "FI" | HAVE YOU HAD FORMAL CPR INSTRUCTION IN THE PAST 5 YEARS?  
1. YES  
2. NO |
| "SI" | THIS INFORMATION IS APPLICABLE TO ME.  
1. YES  
2. NO  
EXPLAIN WHY ________________________ |
| "HP" | ARE YOU IN A HEALTH RELATED FIELD?  
1. YES  
2. NO |
These questions are excerpts of the American Heart Association of Metropolitan Chicago written examination Basic Life Support Course C, Health Care Provider Course.

1. When the rescuer is alone with an adult cardiac arrest victim, the rescuer should:
   a. activate the EMS system before opening the victim’s airway
   b. do nothing and wait for help arrive
   c. open the victim’s airway, then activate the EMS system
   d. perform CPR for one minute, then activate the EMS system

2. During the switch in two-rescuer CPR:
   a. any method of switching is acceptable
   b. the new compressor checks the patient’s pulse
   c. no pulse check is necessary
   d. both rescuers check the pulse

3. The most common cause of airway obstruction in the unconscious victim is:
   a. food
   b. tongue
   c. mucous
   d. dentures

4. Even when performing proper CPR, the following complications may occur:
   a. rib fractures
   b. rib-cartilage separations
   c. contusions (bruises) of the heart
   d. any of the above

5. When may a non-physician discontinue CPR?
   a. when the rescuer thinks the victim will not survive
   b. when the rescuer suspects the victim will suffer permanent brain damage
   c. when a physician or paramedic assumes responsibility
   d. when there is no reaction in the pupils, or other sign of life.
6. To perform the Heimlich maneuver the rescuer should:
   a. sit on the victim's ankles
   b. kneel beside the victim's chest
   c. kneel beside the victim's thighs
   d. kneel astride (straddle) the victim's thighs

7. A victim's most common reaction to a heart attack is to:
   a. panic and refuse help
   b. call for a doctor
   c. deny the possibility of a heart attack
   d. drive to a hospital

8. The greatest chance of survival in a cardiac arrest victim when CPR is begun:
   a. within six minutes of the arrest
   b. between six to eight minutes of the arrest
   c. between eight to ten minutes of the arrest
   d. after ten minutes of the arrest

9. The symptoms of a heart attack may:
   a. be mild and ignored, or attributed to some other cause
   b. occur suddenly without warning
   c. radiate to the jaw
   d. include all of the above

10. The most serious danger of a heart attack is:
    a. stroke
    b. brain damage
    c. severe pain in the chest
    d. cardiac arrest

11. If someone complains of chest pain that lasts more than two minutes you should:
    a. drive the person to a doctor's office
    b. call the person's doctor
    c. call Emergency Medical Services
    d. begin CPR
12. The preferred method used for opening the airway is:
   a. tilting the head and lifting the chin
   b. turning the head and opening the mouth
   c. striking the victim on the back
   d. wiping out the mouth and throat

13. The reason for taking 5 to 10 seconds to check unresponsiveness in a collapsed victim is:
   a. that the victim may have only fainted
   b. that it helps prevent unnecessary resuscitation
   c. that it may prevent possible harm to a sleeping person
   d. all of the above

14. Before beginning chest compressions, the rescuer should check for:
   a. brain damage
   b. dilated pupils
   c. absence of pulse
   d. shallow respirations

15. The rescuer who sees chest movements in an unconscious victim after opening the victim's airway should:
   a. not initiate any CPR procedure
   b. assume the victim is breathing
   c. listen and feel for air exchange
   d. perform only chest compressions

16. After ventilations by the rescuer, the victim will exhale by:
   a. normal relaxation of the chest
   b. gentle pressure of the rescuer's hand on the upper chest
   c. compressions on the chest
   d. turning the victim's head to the side

17. During the initial assessment of an unconscious victim, the pulse should be checked:
   a. immediately after opening the airway
   b. after the first two ventilations
   c. immediately after calling for help
   d. before ventilations are given
18. If breathing is not present after opening the airway:
   a. begin chest compressions
   b. give manual thrusts
   c. check pupils
   d. attempt mouth-to-mouth ventilations

19. To perform chest compressions on an adult, one hand is placed on the top of the other with the heel of the lower hand pressing on the:
   a. lower half of the sternum
   b. upper third of the sternum
   c. middle of the sternum
   d. xiphoid process

20. The ratio of compressions to ventilations in adult one-rescuer CPR is:
   a. 15 to 2
   b. 12 to 4
   c. 5 to 1
   d. 3 to 1

21. Complications may result from external chest compressions even when properly performed. Which of these complications may occur?
   a. punctured lungs
   b. lacerated liver
   c. fractured ribs and sternum
   d. all of the above

22. During one-rescuer CPR, after activating the EMS, the rescuer should check the carotid pulse:
   a. after the first minute of CPR, and every few minutes thereafter
   b. after the first 5 minutes of CPR and every 5 minutes thereafter
   c. every 10 minutes
   d. every 15 minutes

23. When performing chest compressions on an adult, the sternum should be depressed:
   a. 1/2 to 3/4 inch
   b. 3/4 to 1 inch
   c. 1 1/2 to 2 inches
   d. 2 1/2 to 3 inches
24. The rate of compressions for one-rescuer adult CPR is:
   a. 120-140 times a minute  
   b. 80-100 times a minute  
   c. 60-70 times a minute  
   d. 50-60 times a minute

25. If a carotid pulse cannot be felt in an unconscious adult victim, the rescuer should:
   a. begin chest compressions  
   b. deliver six to ten abdominal thrusts  
   c. check the femoral pulse  
   d. relocate the pulse and feel again

26. Rescue breathing in an adult with a pulse is given once every:
   a. 2 seconds (30 times per minute)  
   b. 3 seconds (20 times per minute)  
   c. 4 seconds (15 times per minute)  
   d. 5 seconds (12 times per minute)

27. The ratio of compressions to ventilations in two-rescuer CPR is:
   a. 5 compressions to 1 ventilation  
   b. 5 compressions to 2 ventilation  
   c. 15 compressions to 1 ventilation  
   d. 15 compressions to 2 ventilation
Mark your honest opinion of this computer based training session in the corresponding box.

<table>
<thead>
<tr>
<th>I found this program to be:</th>
<th>Strongly agree</th>
<th></th>
<th></th>
<th></th>
<th>Strongly Disagree</th>
</tr>
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<tbody>
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<td>3</td>
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<td>C. interactive</td>
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<td>E. easy to use</td>
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<td>F. focused on topic</td>
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<td>I found the content to be:</td>
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</tr>
<tr>
<td>1. organized</td>
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<td>3. clear</td>
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<td>4. a good review of topic</td>
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<td>3</td>
<td>2</td>
<td>Strongly Disagree</td>
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<td>----------------</td>
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<td>-------------------</td>
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<tr>
<td>1. as a trainer</td>
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<td>2. as a learner</td>
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</table>

Comments:

__________________________________________________________________

__________________________________________________________________
APPENDIX B

TABLES
### APPENDIX B

**TABLE 6.** Chi-square Summary for Demographics  
(Independent Samples—Between Video and CBT Group)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Chi square</th>
<th>p value</th>
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<td>Computer Experience</td>
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<td>Health Professional</td>
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<td>.22</td>
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</table>

The df=1 in all demographic variables.
TABLE 7.-- T-test and Chi-Square Summary for Test and Reactionnaire Score Results (Compares CBT Versus Video Cassette Variables as Independent Samples -- all Subjects Combined)

<table>
<thead>
<tr>
<th>Variable</th>
<th>t-value</th>
<th>df</th>
<th>p value</th>
<th>Chi square</th>
<th>p value</th>
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</thead>
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</tr>
<tr>
<td>Post-test</td>
<td>-0.72</td>
<td>27.00</td>
<td>.480</td>
<td>0.090</td>
<td>.764</td>
</tr>
<tr>
<td>Gain score</td>
<td>-0.58</td>
<td>27.00</td>
<td>.566</td>
<td>0.124</td>
<td>.725</td>
</tr>
<tr>
<td>Time spent on tool</td>
<td>3.86</td>
<td>28.00</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cosmetic Acceptance</td>
<td>-1.03</td>
<td>28.00</td>
<td>.313</td>
<td>0.141</td>
<td>.707</td>
</tr>
<tr>
<td>Content Acceptance</td>
<td>-4.19</td>
<td>28.00</td>
<td>.000*</td>
<td>4.20</td>
<td>.040*</td>
</tr>
<tr>
<td>More instruction</td>
<td>0.23</td>
<td>28.00</td>
<td>.817</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Reaction</td>
<td>-2.01</td>
<td>28.00</td>
<td>.054</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The above t-test results are based on equal variances between both groups:
- n=15 CBT group; n=14 video group in the test score (first three variables above).
- n=16 CBT group; n=14 video group in the time spent on the respective educational tool.
- n=16 CBT group; n=14 video group in the reactionnaire scores (last four variables above).
REFERENCES


VITA

Janine Ricketts-Byrne was raised in Arequipa, Peru, South America to Roberto and Margaret Ricketts. She graduated from Our Lady of Pilar (high school) and in 1978 graduated from Margarita Cabrera Secretarial School, Lima, Peru. She arrived in the United States in 1979 and worked for Bank of America while attending college.

On receiving a Bachelor of Science in Nutrition and Medical Dietetics from the University of Illinois, Chicago in 1985, Ms. Ricketts-Byrne worked as a Community Dietitian for the WIC Program and Public Health Department for two years. Then she moved on to clinical dietetics in 1988, and obtained a Nutrition Support Certificate while she worked at Mount Sinai Hospital, Chicago, and as a Nutrition Support Consultant for Mavin Enterprises. Since October of 1990, she has been working as a Clinical Dietitian at Loyola University Medical Center in Maywood, IL.

Between 1992 and 1994, Ms. Ricketts-Byrne completed the coursework requirements toward a Master of Arts in Adult Corporate Instructional Management at Loyola University. Since 1994, she has been working as a Nutrition Consultant and Trainer for the Nutrition Education and Training Program (NET), Illinois.
APPROVAL SHEET

The thesis submitted by Janine Ricketts-Byrne has been read and approved by the following committee:

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The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of MASTER OF ARTS in Adult Corporate Instructional Management.

10-12-95
Date

Todd Hoover, PhD
Thesis Director