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Is Nutrition CAI [Computer Assisted Instruction] an Effective Substitute for an Instructor

Deborah Falls Lockhart

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A Digest Presented to the Faculty of the
Graduate School of the Lindenwood Colleges in
Partial Fulfillment of the Requirements for the
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Digest

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This study tests the hypothesis that using Computer Assisted Instruction for teaching basic nutrition concepts to foodservice personnel is as effective as presenting the material in a lecture style presentation with a qualified instructor. The effectiveness of both methods of presentation is tested by using a pre/posttest.

The result was as anticipated, proving CAI to be an effective substitute for an instructor. Both groups, regardless of method of presentation attended, showed significant improvement in overall nutrition knowledge. Differences between the two groups, however, were not significant.

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To my husband, Greg--thank you for your unwaivering encouragement and enthusiasm. It was your faith in me that changed "I think I can" to "I know I can."

Table of Contents

List of Tables

List of Figures

Chapter One: Introduction

The microcomputer has found its way into nearly every aspect of life. It is utilized in industry, business, healthcare, and extensively in the military. It is utilized for communications, for entertainment, and for personal use. A rapid area of growth has been in education as the computer gains acceptance and educational software becomes available. A recent example was the purchase of 1800 MacIntosh computers, Apple's newest microcomputer, by Stanford University on the first day the MacIntosh became available on the market (Rydell, 1984).

The entire history of computers in education spans a period of less than 40 years. The first electronic computer was installed at this time at the University of Pennsylvania (Gold & Duncan, 1980). It was large, very expensive, and unreliable by today's standards. The IBM company developed an early form of a computer assisted introduction (CAI) program in the late 1950's to test memory and learning. The IBM program improved on an old idea, namely programmed learning and the mechanical teaching machine. The teaching machine was a short-lived but significant addition to the world of education (Crawford, 1983).

A team, Suppes and Atkinson, following the programmed learning concept, began work in 1963 developing software to be used to teach reading and arithmetic to elementary students. Until this time, there was no education software; therefore, much time needed to be spent on learning theories and the "how-tos" before actual programming could begin (Suppes, 1966; Atkinson, 1967).

Educational programming was made less complicated when IBM developed Coursewriter, the first computer assisted instruction author language (Suppes & Macken, 1978). This program would enable programming to be done by persons with minimal computer skills.

The computer itself, or hardware, has changed many times in the past 40 years. It has been reduced from a cumbersome size to what is recognized today as the microcomputer, a machine hardly larger than a portable television set. It once operated slowly with vacuum tubes, while today's computers have integrated circuit systems and can process information in seconds (McMurray & Hoover, 1984).

The evolution of computers in education began slowly. It has only been in the past five years that computers have been seen in the classroom. Now, they are being used extensively for classroom instruction as well as in the home for educational purposes. Gleason (1981) has investigated this "computer boom," citing that the dramatic cost reduction over the past 2-3 years undoubtedly is a major reason for the large influx of microcomputers. Another reason is the software which is rapidly becoming available. The National Science Foundation (NSF) found that in 1981, there were as many as 200,000 computer units in elementary and secondary schools and projects that one million units will be in use by 1985. A survey conducted by Chambers and Bork (1980) showed that during the years 1980 to 1985, the use of computers in the nation's public schools is projected to increase from 54% to 74%.

Current computer uses in education and training can be classified into three basic categories (McMarr, 1983):

1. Computer-assisted assessment (CAA)

   Using the computer to make assessments of a performance made at the terminal. CAA isn't used frequently because many computer programs record an ongoing assessment of a student's performance for later review.

2. <u>Computer-managed instruction</u> (CMI)

   Using the computer to manage or organize academic materials, arrange timetables, schedule appointments, and make check lists. CMI can coordinate the administrative and record keeping information.

3. <u>Computer-assisted instruction</u> (CAI)

   A mode of instruction in which students can learn by interacting with the computer program or be instructed in tutorial style presentation with feedback given to questions answered. CAI basically builds in CAA so that assessments can be known by the student as well as the instructor.

The above gives examples of how differently computers can be used in education: CAA to perform objective appraising of a student's performance, CMI to do the "secretarial" and time consuming tasks of organizing coursework and student activity, and CAI to do the actual teaching. The idea of using the computer in education is not new. With the increased availability of microcomputers and expansion of software in nearly all areas of instruction, it would appear that the computer has found its place. Perhaps Ellis and Raines sum up the motive behind this Culminating Project when they state, "While a computer can present educational material acceptably, it remains to be shown that it should" (1981, p. 77).

Chapter Two: Literature Review

A computer literature search was done to identify articles specifically pertaining to uses of computers in education. The articles found can basically be categorized as how-to use a computer, how-to write courseware, the results of using a computer in education, and speculations about where computers are taking us in the field of education.

The designers of software need a solid background in educational theory in order for computer courseware to gain a firm foothold in the field of education. There is much in the way of learning theories available in the literature, but little has spilled over into computer applications. Gagné and Briggs (1979) point out that the instruction designer must first have knowledge of how human beings learn if the instruction is to be effective. Theories of learning are numerous and have been in existence for many decades, although the entire process of learning is not fully understood. Silverman (1971) defines learning as "a process in which past experience or practice results in relatively permanent changes in an individual's repertory of responses" (p. 198).

Learning Theories

There are two major schools of thought as to just how an individual changes in response to learning. The first, the Stimulus-Response Association, proposes the act of learning is observable and the change in response is external. As expressed in the Cognitive Theory, the second major theory of learning, a response occurring in learning can be internalized as in thinking or considering and may not be observable (Crawford, 1983). The Stimulus-Response Theory of learning can be broken down into two major classes: Classical Conditioning and Instrumental Conditioning.

Classical Conditioning. Learning is a result of an involuntary response or reflex action to a given stimulus. The classical example is the Pavlovian dog experiment in which a salivation response was eventually elicited to the conditioned stimulus of a tuning fork (Eysenck, 1963). This model of learning is not applicable to this project's CAI program because the response desired is above the reflexive level. Clement (1981) has studied computer video games in which the player becomes conditioned (measured as increased stress, increased heartbeat, and increased attention) to associate the difficulty of the game by the rapidity or intensity of the sound and movement of the screen figures. Clement claims that it may well be Classical Conditioning techniques which control the user's attentiveness and interest. The user may be developing (learning) strategy which is otherwise difficult to teach by traditional computer methods. One such computer courseware which appears to have incorporated the Classical Conditioning theory is MasterType, a computer program which conditions the learner to press the correct typewriter keys to prevent the letters to be mastered from bombing a ship in the center of the screen. In the process, the user learns to type. The "game" educational tool came on the market approximately two years after Clement suggested that the Classical Conditioning theory needed more study for computer application. (MasterType is currently the number one selling education program on the market ["The Top Thirty," 1984]).

Instrumental Conditioning. Instrumental Conditioning or Operant Conditioning differs from Classical Conditioning in that the individual is able to control the response rather than a reflexive response. In edcation, Instrumental Conditioning occurs when a learner responds with a correct answer and receives a reinforcement (praise, merits, or a smile from a teacher, etc.). The reinforcement increases the likelihood of the student answering correctly again in order to be rewarded.

It is important when writing a computer program to play down the response given to an incorrect answer. Many times the Instrumental Conditioning Theory can be overridden and actual learning decreased if incorrect answers evoke as entertaining a response as a correct one. Students may actually sabotage a program and defeat its purpose by repeatedly responding incorrectly to the computer (Crawford, 1983). Reinforcement does not need to follow every correct response but can be given discontinuously or by a predetermined response pattern as described below:

> Fixed Ratio: Reinforcement occurs after a fixed number of correct responses. An example is some sort of reinforcement given after 10 correct responses. This form of reinforcement would encourage the learner to make many responses but the program would have to interact continuously with the learner.
>
> Variable Ratio: This method operates from

an average reinforcement ratio but the actual ratio varies from question to question. This method keeps the learner's attention for long periods of time because the reward system is unpredictable.

Variable Interval: This method uses an average time interval for reinforcement with the time intervals varying throughout the lesson. This technique finds students tend to work at a high level of speed, moreso than other methods of reinforcement (Crawford, 1983).

Silverman (1971) states that the most effective reinforcement schedule is continuous at first and then gradually shifting to intermittent reinforcement.

It is appropriate here to mention a lesser cited theory of learning called the Contiguity Theory (associated with E. R. Guthrie) (Gagné & Briggs, 1979). This theory downplays the importance of reinforcement in learning. It suggests the idea that once an association has been made between the stimulus and a response, the stimulus will naturally evoke the response without an outside reinforcement needed. Gagné and Briggs (1979) explain this theory as "the stimulus situation to which one wants the learner to respond must be presented contiguously in time with the desired response" (p. 32). It is generally believed, too, that repetition of contiguous ideas increases learning.

The Cognitive Theory of learning is quite different from the previously discussed Stimulus-Response Theory. It can best be understood by the following models of stimulus and resulting perception.

Purposive Behaviourism. This model suggests that the student learns because of a stimulus from within to learn or reach toward a goal. In order for learning to take place, the goal or outcome of learning must be compatible with the student's goals. In other words, if a student is not interested or motivated to learn, then learning will not take place.

Gestalt Model. This model of learning states that a student learns by means of insight, often based on information previously learned (Gagné, 1977). Learning is viewed as a change in perception. An understanding of sensory input such as verbal or pictorial images is necessary for the learner to successfully problem solve or, in essence, learn.

The previous section has been a brief review of the learning theories thought to be relevant to designing computer courseware. Although learning theories differ, they should be looked on as a continuum. In summary, one end of the continum puts weight on external factors for learning to take place, while the more modern models, or the other end of the continum, emphasizes the combination of the internal factors influenced by the external factors on instruction. The following figure attempts to clarify the learning process (Gagné, 1977, p. 10).

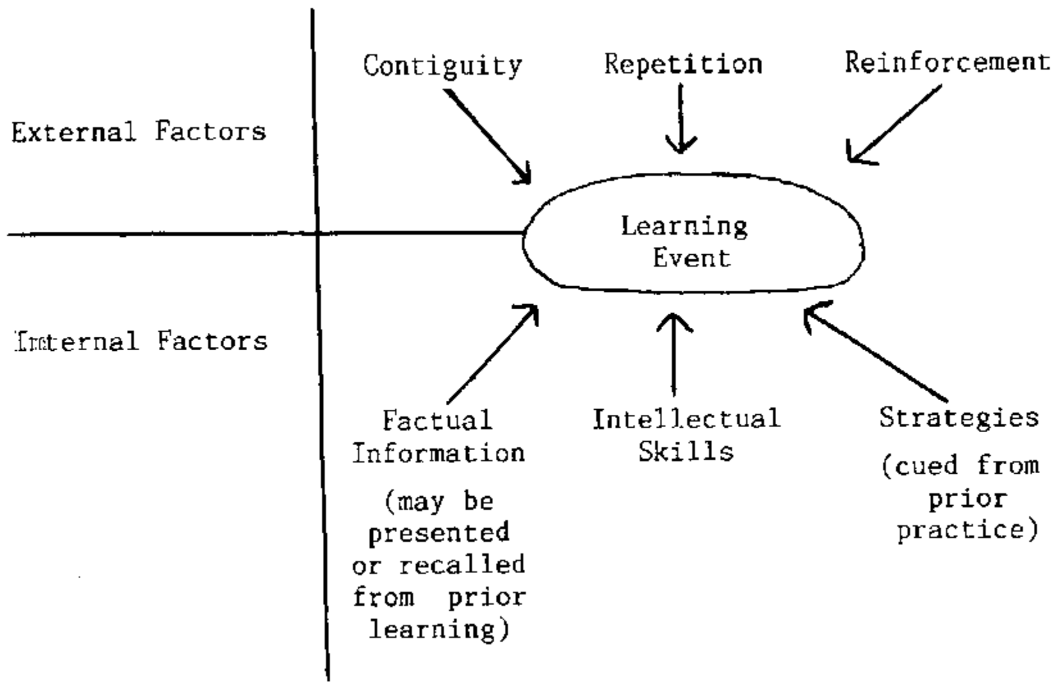


Figure 1. The Learning Process

Effects of Feedback on Retention

Research shows that the efficiency of the learning process can be affected (increased or decreased) with feedback. Studies show that students learn more when receiving feedback than when receiving no feedback (Gagné & Briggs, 1979; Tait, Hartley & Anderson, 1974). However, there are several camps of thought in determining when to give feedback and what effect this has on retention. It has been shown that learning is often increased if feedback can be given immediately, as in a test score given directly after completion of the test (Anderson, Kulhavy & Andre, 1971). Although in a traditional classroom setting this task might be difficult to complete, computer assisted testing can easily provide an instant feedback (Fry, 1963; Kulhavy, Yekovich & Dyer, 1976). In the same article, Kulhavy contends that immediate feedback is one of the powerful tools in instructional design.

In contrast to this, Rankin and Trepper (1978) conducted a study using programmed instruction to examine the effects of delayed informational feedback. The results showed improved retention occured when feedback was delayed. Other similar studies have been conducted using double presentations of material with delayed feedback (Sassenrath, 1968; Sturges, 1968, 1972), versus single presentation with immediate feedback (Brackbill & Knapp, 1962; Kulhavy & Anderson, 1972; Markowitz & Renner, 1966). All concluded that retention improves following delayed informational feedback. An interesting conclusion by Rankin and Trepper (1978) was that despite the numerous studies supporting the superiority of retention in delayed feedback, the cause or reason why was not understood. No studies were found with a substantial explanation.

Bardwell (1978) looked at all of the immediate versus delayed feedback studies cited earlier and set up an experiment to determine how feedback functions. Her findings were that immediate feedback increases acquisition of information, but delayed feedback also facilitates acquisition (although not as quickly) and retention of the information learned. The results, in addition, showed feedback to be informational rather than reinforcing. In other words, it is more helpful for the student to know the correctness of his response than it is to receive a reinforcement or reward.

Along with studying the effects of feedback on learning and retention, Kulhavy et al. (1976) set up a study to test the relationship between feedback, confidence, and post-response behavior. This study was based on proving that feedback is not just corrective in nature. The study assumes that a student's confidence in an answer is of equal importance to the answer's correctiveness and this confidence level will determine how the feedback will be used by the learner. The results showed the effects of feedback are determined by the student's own perception of his response. When the response is correct, feedback increases the likelihood of repeating the right answer on a posttest. When the confidence is high but the response is incorrect, feedback served as a strong corrective means. In other words, when a student is sure he is right but his response is wrong, he tends to spend additional time figuring out what made his response incorrect. An interesting outcome of this study showed that feedback had no effect either positively or negatively if the student was not familiar with or did not understand the material presented.

Electronic Data Processing in Education

Computer Software: Misconceptions. As mentioned earlier, computer software for use in education is a growing marketplace ("Software Presents the Bestsellers," 1984). Despite the availability of computers, many educators are still hesitant to use the computer, in part because of the image of the computer as an "electronic page-turner." Instructional materials have for years been developed by technicians with little experience in instructional design (Clement, 1981).

Caldwell (1980) concurs, saying that the problems with software continue because much of what passes for courseware neither helps to develop higher cognitive skills nor challenges the learner to use higher learning strategies. Many educators agree that much of the available educational programs are "junk" and have slowed down the overall acceptance of using CAI for educational purposes (Gleason, 1981; Hirschbuhl, 1980). Gleason is critical of the poor quality found in much of the courseware, blaming this trend on misleading salespitches which promise to make a CAI programmer out of anyone who can read.

Courseware manufacturers advertise the ease with which their courseware can be used and programs developed. The Intellect, an IBM software package, claims it is so easy to use because it enables the computer to use English instead of "computerese." Up to the writing of this paper, this claim has not been substantiated by any available software.

The literature is full of "how-to" articles on writing CAI programs. Of greatest importance is the choosing of a language for programming. Each language has its use and its limitations. In other words, it would be difficult if not impossible to program the teaching of a foreign language using Fortran, a computer language used primarily for number calculations.

Unfortunately, many have the misconception that to program merely means learning a computer language (Edwards & Tillman, 1982; Gleason, 1981). Much of the promotional advertising can lead the prospective buyer astray with promises of being able to write programs after learning a few simple commands.

A basic rule of thumb is that the more complex the language, the more detailed and comprehensive but versatile the finished program will be (Edwards & Tillman, 1982). Do-it-yourself CAI is not yet available, despite efforts to convince the buyer otherwise.

The development of computer courseware is costly (both in materials and in human time), difficult, and time consuming. What appears to be lacking in most programs, both commercially prepared and "homemade," are educational and instructional objectives. In other words, the desired outcome needs to be clearly defined.

The results of using the computer in education have shown surprising similarities, despite the discipline or subject taught and the age group of the students. Fowler (1983) used a computer assisted instruction to teach an introductory science course to college students. The findings showed that those students using the computer developed increased confidence and improved attitudes about working with quantitative data. The students also had an increased appreciation for using the computer. Despite these favorable findings, the students did not show a significant effect on their science exam or problem solving abilities.

Other studies concur that the use of the computer in teaching does not significantly increase the amount of information learned versus the conventional lecture method of instructing (Canter & Beach, 1981; Gadzella, 1982; Hills, 1983; McMarr, 1983; Schroeder, 1981, 1983). An overwhelming concensus of the literature shows an agreement that the computer was well accepted once the students began working with it and they lost the anxiety associated with computers. Most articles mentioned that the students felt learning was more fun and effective with the computer's ability to give immediate feedback. The computer saved instructor time and was easily accessible at any time by the students.

CAI: Use in Nutrition Education

In the field of nutrition, computers have been used in limited fashion for teaching since the early 1970's. Computer assisted instruction was the only type of computer programming found aside from the traditional use of the computer for data storage and calculations. Few articles on teaching nutrition with a computer were found, leaving the question of how many institutions actually use computers for nutrition education. If these computer users have been in existence, have they merely failed to report findings in the literature? Most articles found did not conduct research on the use of the computer. The uses varied from teaching dietetic students management and skills (Argo, Watson & Lee, 1981; Canter & Beach, 1981; Schroeder & Driscoll, 1983; Sifferman & Hoover, 1981) to introducing nutrition to elementary through undergraduate level students (Asp & Gordon, 1981; Hills, 1983; O'Hayan, Altosaar, Nantell & Armstrong, 1980).

This year has shown a significant increase in using computers in the field of nutrition. For the first time, the American Dietetic Association has included the microcomputer in its call for papers for the 1984 Annual Convention. Also, the literature is showing more sophisticated uses for the computer in the area of nutrition (McMurray & Hoover, 1984; Ries, Grannell & Zemel, 1984). One of the computer projects in particular showing promise for the future will offer a bank of nutrition programs nationally to undergraduate, graduate, and medical students through a central data center (Boker, Weinsier & Brooke, 1984).

Other educators are producing programs to teach nutrition to non-nutrition majors (Carew, Elvin, Yon & Alster, 1984; Cooks, 1984) and in the community (Njus, Gilmore, Fanslow, Njus & Motoyama, 1984; Ries, et al., 1984). Hopefully, this is a sign that computer assisted instruction is beginning to show promise in effective nutrition education.

Computer-Assisted Instruction (CAI)

Gleason (1981) proposed the following generalized findings for using CAI based on his studies of major universities across the country:

1. CAI can be used successfully to assist learners in attaining specified instructional objectives.
2. CAI appears to be a substantial savings in time (20%-40%) required for learning as compared to "conventional" instruction.
3. Retention following CAI is at least as good if not superior to retention following conventional instruction.
4. Students react very positively to good CAI programs.

CAI can be defined by three levels based on the complexity and sophistication of the student-system interaction. The first level of complexity is called the Drill and Practice Method. This system presents both a fixed sequence and variation of problems. Very little branching or individualization is programmed into the system.

At the other end of the spectrum is the system called "Dialogue." This system allows the student to respond with natural language responses and ask questions freely of the computer. Needless to say, the programming of a Dialogue system is extremely complex and is not being used yet to any extent.

The system which lies between Drill and Practice and Dialogue is called Tutorial. The student controls the computer's course of instruction based on his responses. For instance, if a student has difficulty answering a series of questions based on the material just presented, the computer will branch into a remedial program or a review of the material. On the other hand, if the student's performance shows accelerated tendencies (i.e., answering a significantly high percentage of questions accurately), the computer will take a different course into more difficult material. This type of programming allows students following different paths, appropriate to their level and pace of learning, to be exposed to the same instruction (Atkinson, 1967).

McMarr (1983) found that in the medical field CAI is the mode most used for educational purposes in most hospital and medical school settings. CAI is used as a means of quality control to assure standard levels of entry level knowledge, as remedial instruction or tutorial assistance, to provide review and practice tests, to offer updates about new findings in the field, and to allow clinical experiences to be gained before actual patient contact. These uses can be applicable to numerous fields from pharmacology to dietetics.

To aide in summarizing the value of CAI, Tables 1 and 2 (on the following pages) were taken from McMarr's (1981) findings.

Gleason (1981) notes that few researchers are now making comparative studies--studies which compare the results of CAI with results of conventional methods. This is because of the vast amount of uncontrollable variables. Gleason feels that CAI should be researched to be sure it is as good a method rather than a potential "turn-off" to the learner.

Edwards and Tillman (1982) work as consultants to help higher education facilities develop CAI. They find that, a majority of the time, CAI is not the appropriate mode for delivering the proposed educational

Table 1: Computer Applications in Education and Training: Educational Return-On-Investment

	Learners	Instructors	Program
Time	Comparison of speed, quality and retention of learning reveals equivalent or superior grasp of CAI presented material in 1/2 to 1/3 the time as compared with conventional modes of teaching. Individuals can learn individually as suits their schedule.	When computer programming is used, instructors can conserve as much as 20% of their instructional lecture time. In addition, since routine and clerical tasks and statistical analyses are or can be automatically performed within a program, computer use frees the instructor to give more time and effort to clinical and laboratory teaching and makes possible more one-on-one contact with students or staff.	Less time and personnel are needed to achieve generally guaranteeable levels of student-paced learning performance as compared to conventional instructional methods. Accessibility is greater. Computers can efficiently handle large amounts of data.
Climate	CAI solves the problem of anxiety, embarrassment and not knowing where to start with a test or task.	The teacher can provide feedback in a quiet, non-threatening, non-competitive atmosphere.	

(Continued on following page)

Table 1 Continued

	Learners	Instructors	Program
Impact on Learning			
Recall	• Better retention. • Affect of use on scores in exams appears higher.		Significant learning occurs when use is integrated into an overall course.
Problem-solving	• Transfer and application of learning is higher with CAI. • After CAI, decision-making skills were improved in undergraduate medical students on clinical rotations. • Learning with computers has been found to be more effective than standard educational procedures in learning situations that call for judgment, interpretation of complex problems and student assessment of whether their solutions to problems are appropriate.	Use of CAI patient simulations allows symbolic, rather than real consequences to make up the learning experience. Risk to real patients is reduced.	CAI with simulations is perceived as the ultimate alternative in instructional methodologies since it most clearly approximates clinical experience and yet provides the learner with a controlled environment for learning.

(Continued on following page)

Table 1 Continued

	Learners	Instructors	Program
Problem-solving	After CAT, learners experienced an increase in confidence, comfort and skills in managerial decision-making ability.		
Evaluation	Evaluation becomes an integral part of the learning process with the prompt individualized feedback that is part of CAI.	Analysis of results via computer gives feedback to the instructors about the students and about the areas in which instructors should intensify teaching efforts.	Objective evaluation of cognitive skills in medicine is possible using computer patients.
		Capability for instructional materials analysis is possible based on their effectiveness with learners.	Data collected provides a statistical basis to expand or update any given module of instruction.
Staff	Learners can manage their own learning, proceeding at a pace commensurate with their capabilities, motivation, and time, covering material more than once, learning from mistakes, etc.	Use of a computer to support educational and training enables lowering of the student-teacher ratio.	Computer use provides a way to individualize and self-pace with large numbers of students.
		Instructor is freed for more one-on-one contact with students.	

Table 2: Computer Applications in Education and Training: Planning Considerations for Implementation

	Learners	Instructors	Program
Costs			Present methods of education are cheaper by a factor of 10. (This is comparing main frame or large computer costs to traditional methods of teaching. The use of a microcomputer would decrease costs significantly.) High usage is required to obtain a reasonable cost with main frame systems. Large computer based instruction systems incur high maintenance and operating costs.
System Acceptance	Unfamiliarity with the technology may inhibit use.		Because CAI is generally monosensory, it may not be accepted when learning situations require visualizations.

(Continued on following page)

Table 2 Continued

	Learners	Instructors	Program
System Acceptance	Procedures for accessing and running the program, including language and syntax, may be difficult for users. Students who perceived the learning as less dull learned more than students who perceived the learning as dull. Active-experimentation learners may learn more than other types. Successful utilization of computers requires self-direction on the part of the learner. Motivation (to learn) was linked to students' general enjoyment interacting with the computer.		Accompanying visual media is recommended. Research indicates that use after proper introduction to the CAI system appears to result in increased and even enthusiastic acceptance by learners. Acceptance of CAI is increased if its use is integrated into an overall course.

objectives. The point here is not whether CAI should or should not be used, but making certain that the objectives or the description of what performance the learner is to exhibit once learning has taken place is met using CAI (Mager, 1975). Rockart and Morton (1975) suggest that CAI technology will simply be added onto what already exists, not replace the older approaches. An example is how writing added to oral instruction and printed text added to handwritten pieces--not replaced them totally, just extended their potential as teaching tools.

It should be said here that computers supplement and not take the place of texts; both have their place. Tillman (1978) summarizes this concept, saying, (a) the textbook, along with the instructor, carries the major teaching responsibilities, and (b) the computer is used as a supportive role with its ability to test, tutor, and store summary information.

In conclusion, an attempt has been made to present differences of opinion in the literature concerning the use of computers and CAI in education. A review was also done on learning theories and techniques to increase learning. This was done because this author, in writing a nutrition lesson to be programmed into a microcomputer as part of the culminating project, needed background in educational theories. Much time needed to be spent "learning" about learning and attempting to incorporate this information into the actual computer program.

The following summarizes five major advantages for using CAI:

1. As opposed to traditional modes of instruction, the learner is rarely able to be a totally passive receiver of information. When using a CAI program, the student is generally an active participant in the learning process (Chambers & Sprecher, 1980).
2. CAI has the potential to be a highly individualized method of instruction. Students can proceed at their own pace and can respond to questions without fear or embarrassing failure. In addition, students can receive important individualized feedback regarding progress being made.
3. Students can simulate experiments or explore situations which would be too dangerous, expensive, difficult, or time consuming to undertake in the real world (Gaede & Singletary, 1979).
4. When computers are used as an aid to in-

struction, classroom teachers can become "facilitators" of instruction rather than lecturers. In addition, teachers generally have more free time to devote to dealing with students in a more personal and meaningful manner (Chambers & Sprecher, 1980).

5. The computer evaluates a student's performance in a completely objective manner, and the possibility of unconscious teacher bias is eliminated (Clement, 1981).

Chapter Three: Problem Statement

The purpose of this Culminating Project is to test the hypothesis that using Computer Assisted Instruction (CAI) for teaching basic nutrition concepts to food-service personnel is as effective as presenting the material lecture-style with a qualified human instructor.

The nutrition lesson is comprised of information considered to be basic ideas in building a foundation in nutrition education. Terms and concepts such as the names and roles of the essential nutrients are well defined separately, reviewed, and, finally, put together as the lesson progresses.

In testing the hypothesis, instruction or teaching conducted by a Registered Dietitian will be tested against a machine tutored lesson or the Computer Assisted Instruction. The Dietitian or instructor is qualified to teach elementary nutrition material based on having completed a 5-year nutrition program, internship, and being recognized by the American Dietetic Association as a Registered Dietitian. The Apple II-e is the vehicle for the machine taught lesson which has been programmed to present "You Are What You Eat."

The participants (foodservice personnel) are employees from the patients' food serving areas of St. Louis State Hospital and St. Louis Developmental Disabilities Treatment Center. Their status as foodservice helper I, II, or Dining Room Supervisor indicates supervisory ability and foodservice experience but does not relate necessarily to fundamental knowledge on nutrition; therefore, the personnel are tested only according to presentation attended, not employee ranking.

The result anticipated is that Computer Assisted Instruction will prove to be an effective substitute for an instructor as determined by individual testings.

Chapter Four: Research Methods

The study was set up to prevent as many unexpected variables and human errors as possible. The group studied was 41 foodservice employees, 6 foodservice supervisors, and 5 dietitians. The foodservice employees and supervisors were divided arbitrarily, but as evenly as possible and according to the work schedule so as not to leave an area unstaffed. This provided a cross section of the employees distributed by number of years employed, level of education completed, age, etc. This distribution can be seen in Table 3 on page 35.

The five dietitians agreed to participate as controls. Their scores on the pretest and posttest should be almost perfect regardless of whether or not a presentation was attended simply because the material covered is considered fundamental in a dietitian's education.

The schedule for testing the hypothesis is presented below:

Schedule for Testing Hypothesis

"You Are What You Eat":	Taught by an Instructor
Attended by:	18 Foodservice Employees 3 Foodservice Supervisors
Time for Pretest:	approx. 20 minutes
Time for Presentation:	approx. 30 minutes
Total Time:	50 minutes

"You Are What You Eat":	Computer Assisted Program
Attended by:	23 Foodservice Employees 3 Foodservice Supervisors
Time for Pretest:	approx. 20 minutes
Time for Presentation:	approx. 20-30 minutes
Total Time:	40-50 minutes

The pretest was composed of 20 True/False or Multiple Choice questions. The posttest was exactly the same test. (See Appendix A for the Pretest/Posttest.) The test covered basic nutrition information that was also thoroughly covered in both the oral and computer assisted presentations.

The posttest was given to each employee within 24 hours of the nutrition presentation. This method was in keeping with the numerous studies found in the literature which show that delayed feedback improves learning (Kulhavy & Anderson, 1972; Sassenrath & Yonge, 1968; Sturges, 1972). This study did not test retention beyond the posttest because time did not allow.

Table 3: Demographics of Subjects Tested, Grouped by Method of Material Presentation

	LECTURE			COMPUTER		
	Last Year of Education Completed	Age (yrs)	Years of Employment	Last Year of Education Completed	Age (yrs)	Years of Employment
	12	42	6	8	53	5
	8	42	15	12	39	14
	8	55	15	6	38	14
	9	53	27	8	32	5
	12	50	16	10	52	16
	8	58	17	16	46	14
	--	23	3	12	22	2
	--	37	15	--	44	6
	12	58	6	9	52	16
	12	56	12	14	31	3
	12	53	10	8	63	13
	10	38	13	12	41	8
	11	47	14	10	35	6
	7	64	16	8	45	6
	12	43	13	12	43	1
	12	43	4	7	65	12
	11	37	13	11	65	10
	8	47	6	14	37	7
	12	48	16	--	--	(3 mos)
	14	44	4	12	23	3
	12	53	8	9	26	(9 mos)
				12	32	2
Mean	9.62	49.19	11.86	9.55	40.18	7.45

Chapter Five: Writing the Computer Assisted Program: "You Are What You Eat"

This section summarizes the steps taken to write this Culminating Project's computer program. To illustrate the organization of this project, a PERT chart is shown in Figure 2 on pages 37 and 38.

The inception of this project, that of writing a nutrition lesson to be translated and programmed into a microcomputer, proved to be a complex process. Before reading about learning theories and the like, time was spent determining what language would afford the most versatility while being appropriate for a tutorial computer assisted program on basic nutrition. Computer stores were contacted and articles studied. A limitation was that the language had to be suitable for an Apple II-e microcomputer.

SuperPilot was the language selected. It appeared to be fairly simple to understand and had enough commands or versatility to include graphics and sound editors. SuperPilot is not considered a

Figure 2: PERT Chart

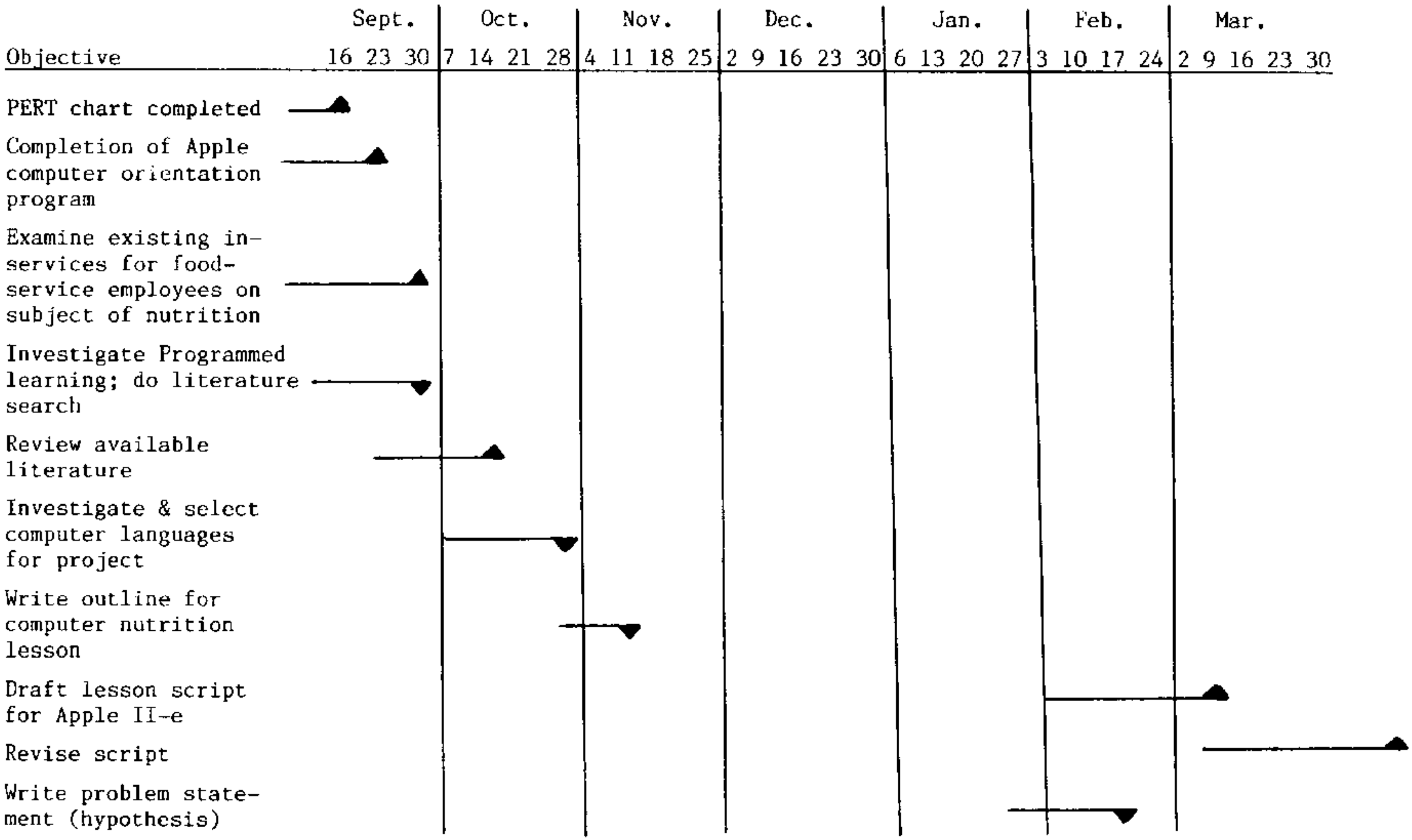
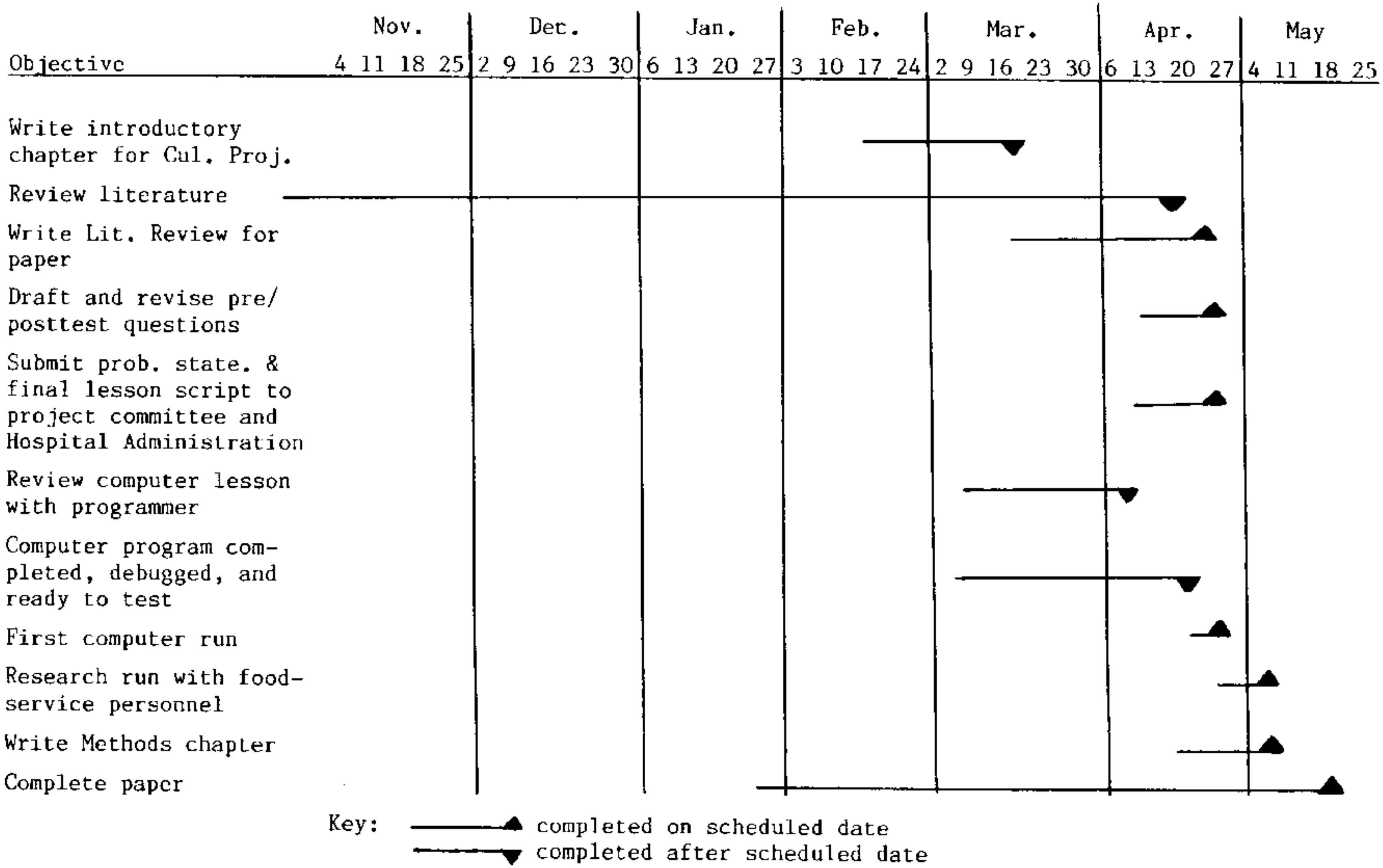


Figure 2 Continued



powerful language by experts in the computer field (Merrill, 1978). While it does compare to the more powerful languages, PASCAL and Basic, for principal commands such as "ask question," and "check for correct answer," it cannot go beyond this minimal subset. The advantage of the language SuperPilot is that it is a straightforward language, easily learned with a manual that presents the language in a self-teach fashion. Of major consideration was cost. SuperPilot was reasonably priced and was approved for use at this institution.

Following the selection of the language, a topic was agreed upon. Objectives for the use of the computer and the expected outcome for the actual program were written and presented to the administration of St. Louis State Hospital.

<u>Project Objectives</u>:

1. Demonstrate a need for computer utilization for inservice teaching purposes at St. Louis State Hospital.
2. Introduce the use of the microcomputer to employees, thereby reducing anxiety and/or reluctance associated with using a computer.
3. Provide a method of nutrition inservice teaching which is consistent, decreases

departmental costs with repeated sessions and inflexibility of employee time away from their work area.

<u>Program Objectives or Expected Outcomes</u>

1. Teach basic nutrition concepts to foodservice employees.
2. Provide a method of teaching which is as effective as the conventional lecture-style inservice.

A search was done for nutrition software programs already existing on the market. Crawford (1983) finds this step essential for two reasons. First, it enables the instructional designers to familiarize themselves with the capabilities of the computer. Secondly, effective CAI materials may already be available. Gerhold (1980) suggests that there is little point in "reinventing the wheel" unless the reinvention suits the purpose more exactly. Often, if copyright permits, existing software may be modified and improved without the expense of starting from scratch. Several programs on nutrition education were found. These programs, however, were primarily for elementary school children and were not available for adaptation (<u>Index to Computer Assisted Instruction</u>, 1970).

Another consideration was whether or not the subject matter was suitable to be programmed or whether traditional methods would be more effective (Kehrberg, 1979). Again, the literature confirmed that topics in the sciences, mathematics, and foreign languages did well when programmed as CAI material (Koch, 1973).

At this stage in the planning, a design team was selected. Higgins (1976) claims that the best design team consists of a programmer, at least one subject area specialist, and a team leader. All members should have a general idea of computer programming and of the computer's and software's capabilities. Culminating Project Committee members Wesley Wilber and Rosemary Erman functioned as the programmer and team leader respectively. The author wrote the lesson to be programmed. The team concept worked well and the varied perspectives proved invaluable. The educational material to be programmed was written as a script or storyboard. It was done on computer paper with sketched-in graphics and suggested sound effects. It was laid out so that it represented what would appear on each screen of the program. Each team member suggested changes, with the programmer weighing the degree of difficulty of the final format against the language limitations and time needed to program.

Feedback was limited to correct/incorrect messages. Although informational feedback enhances overall learning, the program itself ran approximately 20-30 minutes, the maximum time found beneficial at the terminal (Higgins, 1976); therefore, informational feedback was minimal. In other words, considering the basic nature of the material presented, it was felt that informational feedback would dilute rather than enhance the overall lesson. The program does, however, give the user the opportunity for reviewing (or repeating) the information.

The lesson was programmed so that the speed of the material is determined by the user through the single push of a button. The material was purposely presented in a clear concise manner so that the entire screen was not filled with text. Also, each screen shown contained a complete thought or message rather than having the material "scroll" off the screen. This allows the user to spend as much time on each screen as necessary.

A major concern in writing the lesson was the vast difference in reading levels of the potential users. The lesson was programmed with short, simply worded statements. Even after the program is run, it will be difficult to determine if reading posed a problem in completing the lesson.

Interaction with the program has been limited to Multiple Choice and True/False questions. A printout of the computer program is contained in Appendix B.

Chapter Six: Research Conclusions

The pretest and posttest scores for both groups receiving the lecture or computer assisted instruction are presented in Table 4.

Table 4: Pretest and Posttest Scores, by Method of Presentation

Lecture Session		Computer Session	
Pretest	Posttest	Pretest	Posttest
10	15	12	16
8	16	13	17
9	13	7	7
13	14	5	16
14	17	10	16
17	20	14	15
7	11	13	18
4	no posttest	13	14
8	14	10	15
14	14	8	19
15	20	6	14
9	19	10	17
8	17	15	18
6	16	7	17
10	16	9	17
10	16	1	5
6	8	13	15
10	15	13	17
11	14	10	16
14	17	13	15
7	10	3	11
		11	12

Means and standard deviations for both groups were calculated and appear in Table 5.

Table 5: Means and Standard Deviations of Test Scores

	Computer		Lecture	
	Pretest	Posttest	Pretest	Posttest
Mean	$\bar{x}=9.6154$	$\bar{x}=14.8636$	$\bar{y}=10.0$	$\bar{y}=15.10$
Standard Deviation	$\sigma_x=3.585$	$\sigma_x=3.36$	$\sigma_y=3.32$	$\sigma_y=2.9983$
No. of Subjects	22		21	

The control group of dietitians were given the test once; these scores can be seen in Table 6.

Table 6: Dietitian Test Scores

19
19
20
19
20

An analysis of Table 4 shows that all participants, regardless of the group, improved on posttest scores with the exception of one person whose scores remained the same and one person who did not return the posttest completed. Table 5 demonstrates this point with the means of both groups' pretest and posttest scores. The degree by which each group improved was the same. Although the posttest scores are significantly increased above the pretest scores, the standard deviation between the lecture and computer assisted group is not significant.

The control group originally scheduled to take a posttest met instead as a group to discuss the pretest questions. It was decided as a group that the questions were clearly worded and easily understood. The question missed on the pretest by three dietitians was the same question. The incorrect answer selected was a result of reading "too deeply" into the question and considering exceptions in disease states which were not intended in the question nor covered in either presentation. In other words, the group of dietitians agreed that the questions and expected responses were appropriate for the level of nutrition being taught.

The statistical results clearly show the hypothesis to be true. Both groups improved in overall nutrition knowledge regardless of which presentation was attended. Computer assisted instruction has been demonstrated by this study to be a viable substitute for an instructor in effectively teaching basic nutrition.

Chapter Seven: Conclusions and Recommendations

Computer assisted instruction is an effective alternative to teaching the same material with an instructor. This finding concurs with those studies testing instructor taught courses versus computer assisted instruction (Canter & Beach, 1981; Gadzella, 1982; Hills, 1983). The possible applications of using a computer to inservice foodservice employees at St. Louis State Hospital are many. New employee orientation, periodic review on subjects such as sanitation, foodhandling techniques, and portion control are all applicable to being programmed into a computer for use at the employee's own pace and availability.

For those personnel participating in the CAI group, no one had ever used a computer prior to the presentation. The computer was readily accepted by all those participating once the lesson began. The acceptance of the computer fulfilled one of the project's objectives. (See pages 39-40 for Project Objectives.) A second objective was met in demonstrating a need for computer utilization. This study demonstrated that a computer taught program could be as effective as an instructor taught program. The third project objective, that of providing a teaching material which is consistent, decreases instructor's time, and decreases departmental costs, was also met. Running the program, however, a single time for 23 employees did not make the project cost effective. Cost comparisons can be seen in Table 7 on page 49.

The cost discrepancies initially are great; however, each time the introductory nutrition segment of employee inservicing is repeated (estimate two times per year), the costs of using a professional's time are reincurred. The computerized lesson is a single expense item requiring no additional costs each time it is repeated. The expense of future educational programs will probably decrease as the programmer gains the experience to complete each program faster and with fewer revisions. The cost of hardware was not included because the computers were not purchased solely for educational purposes but also for management tasks.

The expected outcomes or Project Objectives for conducting this project were met. Basic nutrition

Table 7: Cost Comparison of Lecture versus Computer Assisted Instruction

Presentation	Preparation of Lesson (Hours)	Write Script (Graphics & sound effects)	Time Spent Lecturing (Hours)	Programming Computer (Hours)	Total Hours	x	Hourly Wage	=	Cost
Lecture	4	--	4	--	8	x	$8.76	=	$ 70.08
Computer	--	14	--	40	54	x	$8.76	=	$472.04

was taught to foodservice personnel and a method of teaching as effectively as a lecture-style inservice was provided.

For future computerized educational programs, the use of more graphics and sound effects would improve the overall quality of the program. This allows the user's attention to be momentarily diverted and gives the user an opportunity to relax or rest. The graphics need to be part of the lesson presented so as not to be a distraction but a "breather" from text.

To improve the program "You Are What You Eat," recommendations are to increase user/computer interaction with nutrition games or more variety in review questioning. Graphics should be increased and, if possible, should be made more animated. For instance, the basic nutrients could be presented as caricatures depicting the role played in one's health. Other recommendations include adding a Part II on meal planning and a section for new employees to include simulations of work areas and responsibilities.

The use of microcomputers in St. Louis State Hospital is a relatively new trend. Adapting the micros for educational inservice purposes was done for the first time in conducting this Culminating Project. Further use in educating our employees will be dependent upon the availability of appropriate software and enthusiasm for computer utilization by our department heads.

In conclusion, this project has met all objectives and expected outcomes and has proved the hypothesis to be true. It has hopefully provided a stimulus for furthering the use of microcomputers in employee education either at St. Louis State Hospital or in other Missouri State facilities.

> If goals can be met with more efficient management of time and resources or if learning can be enhanced through the use of CAI, then the decision to proceed with the design of a specific CAI program is valid. (Hartmand, 1981, p. 44)

Appendix A

Pretest/Posttest

You Are What You Eat!!!!

1. From the following list pick out the 6 basic nutrients:

carbohydrate	water
salt	cholecalciferol
iron	protein
fat	calcium
tryptophan	minerals
essential nitrites	vitamins

2. A Calorie is:
   a) found mostly in "fattening foods"
   b) a unit of energy
   c) an essential nutrient

3. T or F: Vitamin C holds body cells together like glue.

4. We need Vitamin A to:
   a) prevent cancer
   b) prevent hangovers
   c) prevent blindness
   d) prevent deafness

5. The body requires ________________ to help regulate body temperature.
   a) carbohydrate
   b) air
   c) sunshine
   d) water

6. T or F: Carbohydrate gives the body the necessary energy so that protein can be used for repairing and building new body parts.

7. The repair of tissues such as muscles, skin, hair, intestinal lining, etc. requires __________ in the diet.

   a) fat
   b) vitamins
   c) protein

8. If you could choose only one nutrient to survive, which one would you select?

   a) carbohydrate
   b) protein
   c) water
   d) fat
   e) vitamins
   f) minerals

9. The mineral that must be present so that blood can carry oxygen is ____________.

   a) water
   b) calcium
   c) iron
   d) zinc

10. Circle the correct answer(s). Why are nutrients important?

    a) they can be eaten raw
    b) they regulate all the body's activities
    c) they are inexpensive to buy
    d) they provide you with energy
    e) they build or repair body parts
    f) they taste good

11. Which nutrients have calories? (May pick more than one)

    a) fat
    b) water
    c) vitamins
    d) protein
    e) carbohydrate
    f) minerals

12. Which nutrients <u>do not</u> have calories? (May pick more than one)

    a) fat
    b) water
    c) vitamins
    d) protein
    e) carbohydrate
    f) minerals

13. You need how many servings from each group? Fill in with the correct number.

    ____ Milk
    ____ Meat
    ____ Fruit/Vegetable
    ____ Grain

14. Which mineral is important for making strong bones and teeth?

    a) magnesium
    b) zinc
    c) calcium

15. T or F: Eating a balanced diet means you get all the vitamins and minerals you need.

16. Protein is made up of building blocks called:

    a) aminophylline
    b) nucleic acids
    c) amino acids
    d) lincoln logs

17. Which nutrient is a storage of energy and helps to keep the body insulated?

    a) carbohydrate
    b) fat
    c) protein
    d) Vitamin C

18. Which nutrient transports other nutrients into the body and waste products out of the body?

    a) water
    b) fats
    c) milk
    d) glyceride

19. This nutrient can be found in fruits, breads, vegetables, and cereals.

    a) water
    b) carbohydrate
    c) fat
    d) protein

20. T or F: Each vitamin has a very specific job to do and no other vitamin can be substituted.

Appendix B

Printout of Lesson NUT

```
r:************************************

r:nutrition program
r:produced by Wesley Wilber
r:written by Deborah Lockhart
r:rev 1.0
r:date 4/25/84

r:************************************

r:Init program
pr:lw
d:n$(20)

g:v;es;c1;m0,0;d0,511;d559,511;d559,0
:;d0,0;v1,38,5,22
r:(color border)

s:50,10;50,10;50,10
r:(sound effect)

ts:s2;t2
t:You are
t: What you eat
ts:s1;t1

tx:maxwell
r:(special character set)
t:DAW
t:EB
t:FC
t:
r:(picture of charlie)
tx:
r:(back to standard character set)
g:v5,38,11,22
```

```
t:Hi.  I'm Charlie.
t:
th:What's your name?
s:50,10
a:$n$
m:#!$!/! !1!2!3!4!5!6!7!8!9!0
r:(test for illegal characters)
jn(n$<>""):start
j3:human

t1:
t1:Sorry, I didn't quite catch that.
s:10,50
r:(low note)
w:1
t:
t:Please type just your first name.
t:
th:What's your name?
j:@a
r:(try it again)

*cont
th:Press the  space bar to continue...
ps:

*bird
gx:lafbird!
g:v22,39,0,23
sx:lafbird
tx:
ts:es
e:

*human
c:n$="human food person"
r:(default name)

*start
c:/n$ /"/ /'/ /,/ /./ /?/ c
r:(edit student's name)
g:es
t:Hi, $n$ !
s:32,10;44,10;56,10
t:
t:Do you know what  Nutrition is?
t:
a:
m:%ye!%y**
jn:no
t:
```

```
t:Ok, $n$ . Do you want to go on?
t:
a:
m:%ye*!y**
jn:end
j:nut


*no
mj:%no!n!nt%
t:
t:Well, let's find out, shall we?
t:
u:cont
j:nut


*nut
g:v;es
t:
t:
t:
t:
t:NUTRITION                    NUTRITION
t:
d:r1$(15);r2$(15);r3$(15)
c:r1$=" a / bc/ de";r2$=" fg/ hi/
:jk";r3$=" lm/ nop/ qr"
tx:maxwell
ts:g10,1;*10(ar1$;d15;ar2$;d15;ar3$;d1
:5;wr)
tx:
t:
t:
t:
t:
t:
t:
t:                          What!
t:
t:
t:          Are nutrients important
t:
t:
t:                          To ME ????????
t:
u:bird
t:
t:SURE They Are!
t:
t:
```

```
t:NUTRIENTS are
t:
t:1. Carbohydrates
t:
t:2. Fats
t:
t:3. Protein
t:
t:4. Vitamins
t:
t:5. Minerals
t:
t:6. Water
t:
t:
t:
u:cont
w:2
ts:es
t: $n$ , the process is simple!
t:
t:First you eat food---
t:
t:Next your body digests the food
t:and breaks it into nutrients.
t:
t:Remember the six major nutrients...
s:32,20;44,20
t:
t:Fat
t:Water
t:Carbohydrates
t:Protein
t:Vitamins
t:Minerals
t:
t:
u:cont
g:v;es
g:v22,39,0,23
t:Nutrients come from foods like
:hamburgers.....
gx:floobies
sx:flubs
t:
t:Then nutrients are used to...
t:
t:FIRST  build or repair body parts.
t:
t:SECOND  regulate all the
:body's activities.
t:
```

```
u:cont
g:v;es
g:x4
t:Can you answer this question?
g:v1,38,07,22
t:Nutrients are important because they-
t:
t:
t:    1. Regulate all body activities
t:    2. Taste good
t:    3. Provide you with energy
t:    4. Are inexpensive when bought
t:    5. Can be eaten raw
t:    6. Build or repair body parts
t:    7. All of the above
t:    8. None of the above
t:
t:What is your answer?
a:
m:1!3!6
jn:error
j:next
*error
t(%a<5):Try again!
j:@a

*next
r:this starts the section on nutrients
u:bird
t:
t:That's Correct!
t:
t:Well,  $n$  are you ready now to meet
:the six nutrients?
t:
t:
t:They
t:     have
t:          been
t:       waiting
t:outside
t:        .
t:        .
t:        .
t:        .
t:        .
t:        .
sx:loneranger
u:cont
u:pro
u:fat
```

```
u:vit
u:h2o
l:PART2
end
*pro
g:v;es
g:x4
t:  P R O T E I N
g:v1,38,05,22
t:Do you know that protein makes up
:most of your body?
t:
t:It's true! [illegible]
t:Skin, hair, fingernails and muscles
:are all made of protein. On the inside
:of your body, protein is the main part
:of the heart, lungs and blood.
t:
t:Protein makes special body parts too,
:like hormones and enzymes which
:regulate things like how hot or cold
:you are and how well you digest foods.
t:
t:
t:
u:cont
w:2
ts:es
t:I have an important job to do as you
:can see.
t:
t:When you eat a food containing
:protein, your body breaks me down into
:building blocks called AMINO ACIDS.
t:
gx:blocks
t:
t:
t:
t:
t:
t:
t:
t:
t:
u:cont
w:3
ts:es
t:There are twenty-two amino acids.
t:
t:They can go together in any
:combination.
t:
```

```
t:Once your body breaks down the
:protein food into amino acids, it
:reassembles them into many different
:kinds of protein, each with a special
:appearance and function.
t:
t:
t:
t:
u:cont
w:4
ts:es
t:Just think of me as a bunch of amino
:acids.
t:
t:Remember, the only place you'll find
:the raw me is in ...
t:
t:meat
t:cheese
t:eggs
t:milk
t:some vegetables
t:
t:
t:
u:cont
e:
*fat
g:v;es
g:x4
t:     F  A  T
g:v1,38,05,22
s:10,20;10,40
t: $n$  I get a lot of bad publicity,
t:but the truth is I'm important too.
t:
t:I provide you with concentrated
:energy when you haven't eaten all day,
:it is the F A T that gives you energy
:to keep going.
t:
t:I help carry some of the vitamins
:your body needs.
t:
t:I also act as insulation so your
:body's organs like the heart, stomach
:and lungs have a cushion and don't
:bump into one another.
t:
u:cont
w:2
ts:es
```

```
t:You will find me in ...
t:
t:
t:Oils
t:Butter
t:Margarine
t:Meat
t:Dairy Products
t:Shortening
t:
t:My job is a thankless one. I'm not
:really a bad guy. Think how uncomforta
:ble it would be to sit down without
:me!
t:
u:cont
e:
*car
g:v;es
g:x4
t:carbohydrates
g:v1,38,05,22
t:Hiiii!  $n$  , I'm Ms Energy!
t:
t:I am made up of starches and sugars,
:supplying energy so protein can be
:used for growth and repair of body
:parts.
t:
t:Without me, Protein would be used for
:energy and you would gradually fall
:apart because no repairs would be
:made.
t:
t:When I am around everyone does the
:job they are assigned to do and your
[illegible]
t:
u:cont
w:2
ts:es
t:You will find me in ...
t:
t:fruit
t:vegetables
t:breads
t:cereals
t:rice
t:pasta
t:
t:I'll be dashing off  $n$  --- got a
:big job to do keeping you going!
```

```
s:35,100;35,100
u:cont
e:
*vit
g:v;es
g:x4
t:VITAMIN & MINERAL
g:v1,38,05,22
s:10,50;10,50
t:Hello Hello ...We're the "min"  twins.
t:Vita'min  and  min'eral
t:
t:We're seen together often in most
:foods but we don't provide energy or
:serve as building blocks. Eating a
:balanced diet every day gives you all
:the vitamins and minerals you need.
t:
t:As a vitamin, my job is to control
:what your body does. Think of me like
:a refree, controlling the amount of
:energy released to build new body
:parts and repair old ones. Each of the
:13 vitamins does one or more special
:jobs and no other vitamin or nutrient
:can be substituted.
t:
u:cont
w:2
ts:es
t:
tx:maxwell
t:DAW
t:EB
t:FC
t:
tx:
t:
t:MINERALS are present when you
:build new body parts and to help
:regulate some of your body's
:functions.
t:
t:When you grow bones and teeth you ne
:ed me.  When your heart
:beats it needs minerals each time to
:keep it ticking.
t:There are 15 minerals but there are
:only six of major importance.....
t:
t:Calcium                          Iodine
t:        Iron               Zinc
```

```
t:
u:cont
w:3
ts:es
t:
t: $n$  let's look closely at a few
:important vitamins and minerals.
t:
t:Vitamin C         What does it do?
t:It acts like glue to hold your cells
:together. Vitamin C keeps your act
:together!
t:
t:Vitamin A         Prevents blindness.
t:It helps your eyes adjust to changes
:in light - so if you don't get this
:vitamin your eyesight could suffer.
t:
u:cont
w:4
ts:es
t:Calcium is a mineral which helps make
:strong bones and teeth, even after you
:are grown up!
t:
t:Iron, the mineral, carries oxygen in
:your blood cells so all your tissues
:can breath. When your diet is low in
:IRON you feel tired and rundown.
t:
t:Each vitamin and mineral is a
:specialist with one job to do.
t:
u:cont
e:
*h2o
g:v;es
g:x4
t: W A T E R
t:
g:v1,38,07,22
t: $n$  Do you know that I make up over
:70% of your body!
t:
t:It's a good thing you have skin or
:else you'd just be a big puddle!
gx:puddle
tx:
t:
t:
u:cont
w:2
[illegible]
```

```
ts:es
t:
t:
t:My job is very important because I
:carry other nutrients around to where
:needed and I wash away unneeded waste
t:
t:I'm around all the time to keep your
:body temperature under control. You
:will find me in most foods and of
:course in beverages.
t:
t:Without me you cannot live! If you
:could select only one nutrient to
:live...choose me!
t:
u:cont
e:
```

Print of lesson PART2

```
r:*************************************

r:nutrition program
r:produced by Wesley Wilber
r:written by Deborah Lockhart
r:rev 1.0
r:date 4/25/84
r:This is part two of NUT

r:*************************************


*review
g:v;es
u:bird
g:v20,39,0,23
t: R E V I E W
t:
s:50,10;50,10;50,10
t:The following review is designed to
:help you use the nutrient information
:you have learned.
t:
t:You will be given a true or false
:statement based on the information
:presented. Enter a T for True or a F
:for False.
```

```
u:cont
g:v;es
g:x4
t:FAT
t:
t:H2O
t:
t:MIN
t:
t:VIT
t:
t:PRO
t:
t:CARB
g:v15,39,0,23
pr:u
c:s=0
c:q=0
m:%k
u:score
j:questa

*score
cy:s=s+1
t:Correct:#s      Incorrect:#(q-s)
s:8,100
t:
e(q=10):text
c:q=q+1
t:Question ##q : T or F
t:
[illegible]
:blocks called amino acids.
a:
m:%T
u:score
t:Fat helps to cushion major body
:organs.
a:
m:%T
u:score
t:Water spares protein so it can be
:used for building tissue.
a:
m:%F
u:score
t:Carbohydrates are found in grain
:foods like pasta.
a:
m:%T
u:score
t:Minerals act like a glue to help hold
```

```
a:
m:%F
u:score
t:Water transports nutrients around and
:waste out.
a:
m:%T
u:score
t:Protein prevents blindness.
a:
m:%F
u:score
t:Protein makes up all your major
:organs and skin, hair.
a:
m:%T
u:score
t:Vitamins are concentrated forms of
:energy.
a:
m:%F
u:score
t:Mineral are important for bones and
:teeth.
a:
m:%T
u:score
u:cont
*text
u:cont
g:v;es
g:v1,38,0,22
ts:es
ts:s2;t2
t:You are
t:    What you eat
ts:s1;t1
sx:beethoven
t: $n$  your body's most basic need is
:for ENERGY. Energy is necessary so
:you can breath, walk or run, and keeps
:your heart pumping. Your energy needs
:change depending on how active you
:are.
t:Foods energy value is measured in
:units called CALORIES. Almost all food
:supplies energy - calories - but some
:foods have more calories than others.
t:
t:When you eat more calories than you
:need, your body stores this extra
:energy as fat. Sound familiar? FAT is
```

```
u:cont
ts:es
g:v1,38,5,22
t:Protein, fat and carbohydrate contain
:calories or energy---
t:
t:       1 Gram of Protein = 4 Calories
t:       1 Gram of Carbohy = 4 Calories
t:       1 Gram of Fat     = 9 Calories
t:
t:Vitamins, minerals and water do N O T
:contain calories. The job they do is
:primarily helping to regulate body
:processes but do not provide you with
:energy themselves.
t:
u:cont
u:bird
g:v20,39,0,23
t:I think I'm beginning to understand
:this stuff.
t:
t:Vitamins, minerals and
:water (H2O) do not give me energy but
:they must be present for the calorie
:containing nutrients (Protein-Fat-
:Carbohydate) to release their energy
:and do their jobs.
t:
t: $n$  let's put this information to
:use.
t:
*groups
u:cont
ts:es
t:The food we eat has been classified
:into groups with other foods
:containing similiar nutrients. For
:example milk would be in the same
:group as ice cream or yogurt.
t:
t:There are 4 food groups....
s:1,5;5,5;10,5;15,5;20,5;25,5
t:
t:        MILK
t:        MEAT
t: FRUIT/VEGETABLE
t:        GRAIN
t:
u:cont
ts:es
t:
```

```
t: If you don't drink milk, consider
:getting your 2 servings as cheese, ice
:cream, cottage cheese or yogurt. Also,
:cooking in milk is a good idea.
t:
u:cont
ts:es
t:Meat Group
t:
t:Adults need 2-3 servings per day or
:about 6 ounces.
t:
t:Cheese is in both the Meat and Milk
:Groups. Meat includes fish, chicken,
:pork, beef and even peanut butter.
t:
u:cont
ts:es
t:Fruit/Vegetable Group
t:
t:Adults need 4 servings per day.
t:
t:Citrus fruits are recommended daily
:to provide Vitamin C. Dark green leafy
:or orange vegetables and provide
:Vitamin A.
t:
u:cont
ts:es
t:Grain Group
t:
t:Adults need 4 servings per day.
t:
t:Bread, cereals, pasta and pancakes
:are good examples of this group.
t:
u:cont
ts:es
t:
t: *n*  you have completed Part I.
t:
t:Charlie and I hope we have helped you
:understand nutrients.
t:
t:Anytime you would like to review this
:program we'll be right here to help.
t:
u:cont
ts:es
ts:s2;t2
t:Good-bye!
t:
t:Remember  You are
```

```
ts:s1;t1
u:cont
j:end
*bird
gx:lafbird!
g:v22,39,0,23
sx:lafbird
tx:
ts:es
e:
th:Press the space bar to continue...
as:
e:

*end
g:v;es
t:
t:This lesson, was created by staff of
t:
t:
t:   St Louis State Hospital!
t:
w:2
t:
t:   We hope you enjoyed it
t:
t:
t:                          as much as we did.
t:
w:4

tx:bigletter
r:(custom picture character set)
t:
t:         23  23  23  23  23  23
t:         45  45  45  45  45  45
t:
t:         23  ABEFIJMNQRUVYZ  23
t:         45  CDGHKLOPSTWX01  45
t:
t:         23  23  23  23  23  23
t:         45  45  45  45  45  45
t:
tx:
s:44,20;0,30;39,10;38,10;39,10;40,30
s:0,10;39,30
t:         That's all, food people!
s:0,20;43,20;0,30;44,20
w:5
```

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