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A COMPARISON OF COMPUTER-AIDED INSTRUCTION VERSUS TRADITIONAL INSTRUCTION IN APPAREL DESIGN PROGRAMS

By

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ABSTRACT

A COMPARISON OF COMPUTER AIDED INSTRUCION VERSUS TRADITIONAL INSTRUCTION IN APPAREL DESIGN PROGRAMS

By

Carol A. Beard

This study was designed to examine the effectiveness of using computer-aided instruction (CAI) to teach sewing skills in apparel design programs and compare its efficacy to traditional classroom instruction. Data collection procedures involved using both methods of instruction, CAI and tradition classroom instruction, to teach the sewing skill of inserting a lapped zipper. Both groups were assessed for age, sewing experience, past sewing instruction, and computer skill background.

The dependent variable, quality of zipper insertion, was evaluated in light of the predictor variables of type of instruction, age, sewing experience, and computer skill background. Assessment of quality of insertion was done, with almost no variation in the outcome noted. The quality of product was high regardless of type of instruction.

The results of this study show that CAI can be successful in teaching a sewing skill. Computer-Aided instruction, in the form of a sell-designed instruction module, accomplishes effective learning of sewing skills. The small sample size should be addressed in future studies, as well as development of additional CAI modules for sewing instruction in apparel and textile programs.

THIS PAPER IS DEDICATED TO MY FAMILY WHO HELPED AND STOOD BY ME WHILE I PURSUED MY DEGREE AND TO DR MARC SILVERSTEIN WHO CONVINCED ME THAT IT IS NEVER TOO LATE TO REACH FOR A DREAM

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STATEMENT OF THE PROBLEM

Introduction

For centuries the classrooms of college campuses were confined to the lecture, the printed word, and the blackboard. As computers have found their way into the university instructional environment, they have evolved as an important teaching tool. It is truism that change comes slowly to the university, with a great deal of reluctance from some faculty and administrators. But change will come, albeit deliberate and hesitant. The information technology revolution of the last twenty years is transforming universities across the globe, with the computer and its related technologies becoming an integral part of the university in general and college classroom instruction in particular. "The magnitude and importance of these changes can be appreciated in light of the fact that by some estimates, the world market for technology-based learning was $6 billion by 1997 and is predicted to rise to at least $26 billion by the year 2005" (Maddux, Cummings, Torres-Rivera 1999, 43).

The computer offers something that is qualitatively different which is a way to replicate intelligent interactions with the learner. This changes not only the kind of delivery but also the meaning and roles of the education system. The technologies of computer-aided instruction (CAI) are evolving at a rapid rate, enabling us to do more work and more kinds of work at the same or lower cost. The key index of CAI merit is the performance/cost ratio, which has grown exponentially over the last decades and is projected to continue to do so (Gagne and Bunerson 1987, 283-289).

Rationale

Higher education is changing in response to the many challenges that technology brings. Most institutions are now offering an incredible diversity of information utilities for students, faculty members, and staff. Each of the elements of the technology infrastructure can be used for many educational goals. Computer-Aided-Instruction (CAI) could be used for the acquisition of basic and advanced apparel structuring in the Apparel Design Program at colleges and universities. If CAI could be shown to be successful in teaching these skills, then students would be allowed the opportunity to review skills covered by the instructor in the sewing laboratories or to independently add advanced skills needed for individualized design projects. Since time in the sewing laboratory is limited, and particular sewing skills are critical to construction, the most relevant and expeditious teaching methods available are needed, in order that student learning may occur in the shortest time possible with maximum quality. There are also a plethora of skills that instructors cannot address given the heterogeneous level of sewing skills among the students. Individualized instruction, which could be made available with CAI, would allow the students to tailor their instruction needs and allow faculty to use their limited time to guide students through a unique path of learning by choosing appropriate modules for particularized needs. By using CAI, the graduating student could acquire more skills, preparing them for enhanced creative design opportunities.

Unfortunately, Apparel program instructors have limited options with respect to Computer-Aided Instruction. Software Programs exist for apparel design, but not for clothing construction. There is a need for better avenues of providing essential skills for enhanced employment and moreover address individualized learning needs, but there have not been software options available to meet this need.

Purpose

This study was designed with a twofold purpose. The first purpose is to develop a carefully designed computer module, using software programs, that can be used for sewing instruction in university apparel and textile programs or in less formal settings for basic sewing construction education. This CAI module will be used to teach a required sewing skill, in this case, the insertion of a zipper. The second purpose of this study is to implement a field test comparing the effectiveness of two instructional techniques, the CAI module and a traditional lecture/demonstration.

Research Questions and Hypotheses

1) Does instruction techniques influence sewing performance (quality)?

2) Does sewing construction experience, age, or computer skill influence performance?

In addition to answering these questions, the researcher will address the underlying questions of: Could CAI potentially meet the wide range of individualized sewing instruction needs of apparel students at Michigan State University? Would CAI increase sewing skills without having to add increased instructor time, and yet give an acceptable level of performance?

The following are the hypothesis to be tested in this study:

1. Ho: There will be no difference in sewing performance as a result of instruction technique.
2. Ho: There is no interaction between age and method of instruction.
3. Ho: There is no interaction between computer skills and method of instruction

4. Ho: There is no interaction between sewing experience and method of instruction.

Definition of terms

Zipper Insertion refers to a procedure for inserting a visible zipper in a seam allowance, using a lapped insertion technique.

Lapped Insertion Technique is a versatile application, that is one of the four standard methods. It hides the zipper completely and can be used at numerous locations (front, side and back). While more complicated to construct, most persons can do a better job of topstitching using this method (Bane, 260-264).

Computer Skill score is based on the number of software and Internet applications that the participant in the study uses on a regular basis

Sewing Experience score was calculated by assigning points for the number of years of sewing, type of instruction, and number of zipper insertions.

Sewing Instruction is defined by formal and informal classes and guidance received by the participant.

CAI Module is a module of instructions prepared in sequence to give the entire instruction for a sewing skill. This video/audio instruction is stored on CD-ROM and then is accessible by computer to the user as desired.

Traditional Instruction is a classroom demonstration and explanation given by an instructor.

CHAPTER II

REVIEW OF THE LITERATURE

EducationalTechnology-What Is It

Educational technology is evolution in progress; in and of itself it is not new and is not limited to the use of equipment. Modern tools and techniques are merely the prevailing developments in a field that is as old as education itself. In education, it is the combination of process and product merging instructional procedures with instructional tools. It is a combination of media, instructional systems, and computer-based support systems. Guidance in the application of tools comes from learning theories that are based on the sciences of human behavior (Robyler 1997, 4-7).

B.F. Skinner, the leading behaviorist explained certain fundamental laws of learning. Skinner considered operant conditioning the most important form of learning. His central premise was that behavior is shaped by its consequences and is thus 'shaped' by patterns of reinforcements in the environment. Thus desired behavior can be achieved by a series of steps that lead to a target behavior. This was the impetus for the first designed teaching machines-if you optimized the presentation of learning materials you could optimize the process of learning. Early machines had very rigid paths that were followed by the learner in a carefully defined order, these were then replaced with systems where different paths could be followed depending on what responses the learner used.

When Gagne published his 1970 book on *The Conditions of Learning*, this formal systematization of learning theory was influential in shaping approaches to Computer-Aided Learning design. It was a very disciplined approach to educational design. The targeted behavior was systematically broken-down into component skills with a sequence of content. Simpler skills were practiced and mastered before more complex ones. This systematic structuring of curriculum placed an emphasis on systematic drill and practice. It provided systematic guidance for Computer-aided learning designers and multimedia learning environments (Boyle 1997, 9-10).

The occurrence of learning can come from, with, around, through or supported by technology through assessment and management. When learning occurs from technology it can be facilitated by having content explicitly taught by a software package. Material that is to be learned is based in the software package and skills can be acquired through activities that the software milieu expressly induces through practice or inherently requires through development of competence in skills like simulations. The desire would be for the learner to have the greatest opportunity to develop the sought after skill. -with technology doing the teaching (Goldsworthy 1999, 59-62). Technology amplifies the power and flexibility that resources can deploy to support the numerous components of learning (McLellan 1994, 7-8).

<u>What Constitutes Learning</u>

What is learning? "Learning is a change in human disposition or capability, which persists over a period of time, and which is not simply ascribable to processes of growth. The kind of change called learning exhibits itself as a change in behavior, and the inference of learning is made by comparing what behavior was possible before the individual was placed in a 'learning situation' and what behavior can be exhibited after such treatment. The change may be, and often is, an increased capability for some type of performance" (Gagne 1977, 3).

Varieties of learning and the conditions that produce them have definite implications for educational practices. Five varieties of learning capabilities are noted by Gagne and include intellectual skill, verbal information, cognitive strategies, motor skills, and attitudes (Gagne 1977, 26-28). For purposes of this study, motor skill acquisition will be detailed. An individual will be considered to have acquired a motor skill when he/she can perform prescribed movements in a smooth regular and precisely timed fashion, thus indicating that the performance has a high degree of internal organization. The separate parts of a motor skill can be learned and practiced separately (Gagne 1977, 42-43).

Basic motor skills are learned early in life and become an automated part of the individual's repertoire. The pursuit of play, sports, and organized athletics require many motor skills that are essential to maintain physical and mental health. Beyond this there are specialized motor skills that are intimately involved with the pursuit of learning and of great significance are motor skills that underlie performances of vocationally useful activities. Motor skills usually occur as components of procedures involving choices or sequences of movements. Various kinds of external stimulation can be employed to guide this learning of a motor skill. Verbal instructions can be given to the learner; pictures or actual demonstrations can be used. By using this guidance two functions are accomplished. First the executive routine can be learned and internalized as either an image or verbal sequence. Second, pictures or demonstrations highlight external cues, which control the desired motor response (Gagne 1977, 227-228).

A learning analysis seeks to identify what the prerequisites are for learning of the total task and any of the subtasks necessary to the skill. Some prerequisites are supportive and some are essential. This gives a learning hierarchy that indicates the essential prerequisites for learning new rules and concepts and is useful in planning the sequences of instruction. This learning analysis needs to identify prerequisites and critical external conditions for the learning of different human capabilities. By classifying the type of capability to be learned, it is possible to specify the external events which are differentially effective for each kind of learning outcome (Gagne 1977,279-280; Jonassen 199, 35-37).

If we know the learning process and have an analysis of the tasks needed for learning we have direct applications to the design of instruction. A very practical decision that is involved in the design of instruction is the choice of media. When delivering instruction, language in oral or printed form is combined and supplemented by objects or representations of these objects. Assuming that the learners are able to respond to directions conveyed by language, the instructional designer can choose a kind of language medium that can to perform all of the functions required to establish the necessary instructional events. One can then use oral communication, printed language, and verbal and non-verbal medium (Gagne 1977, 283-312).

Instructional Design

Gagne, Briggs, and Wager define instruction as 'a human undertaking whose purpose is to help people learn.' They speak of instruction rather than teaching because they feel it is important to describe all events that have a direct effect on the learning of a human being, not just events that are set in motion by an individual who is a teacher. Instruction viewed this way includes events such as those that are generated by a page of print, by a picture, a television program, or a combination of physical objects. The teacher has the essential role of arranging these events or learners may manage instructional events themselves. The purpose of designed instruction is to activate and support the learning of individual students. Learning aids should bring individuals closer to the goal of optimal use of their talents (Gagne, Briggs, Wager 1992, 3-4; Winn 1991, 38).

According to Gagne, the events of instruction constitute the external conditions of learning and involve an ordered sequence of activities that relate to the learning processes as well as the basic assumptions of learning that dictate instructional design, see Table 1. Based on the learning process, assumptions about learning that dictate instructional design are identified, see Table 2. Thus instruction is a deliberately arranged set of external events that are designed to support internal learning processes (Gagne 1977, 10-11; Ference and Vockell 1994, 25-31; Merrill 1996, 30-36).

TABLE 1. GAGNE'S EVENTS OF INSTRUCTION
1. Eliciting performance stimulation to gain attention to ensure the reception of stimuli
2. Informing learners of the learning objective, to establish appropriate expectancies
3. Reminding learners of previously learned content for retrieval from LTM
4. Clear and distinctive presentation of material to ensure selective perception
5. Guidance of learning by suitable semantic encoding
6. Eliciting performance, involving response generation
7. Providing feedback about performance
8. Assessing the performance, involving additional response feedback occasions
9. Arranging variety of practice to aid future retrieval and transfer

(Gagne 1977, 11-12).

TABLE 2. GAGNE, BRIGGS AND WAGER'S ASSUMPTIONS ABOUT INSTRUCTIONAL DESIGN	
1.	It is aimed at aiding the learning of the individual
2.	The design has phases that are both immediate and long-range
3.	Systematically designed instruction can greatly affect individual human development
4.	Instructional design should be conducted by means of a systems approach
5.	Designed instruction must be based on knowledge of how human beings learn

(Gagne & Driscoll 1988, 10-13).

Data points to the importance of an infrastructure to act as a critical catalyst for innovation and for the integration of technology in instruction. These catalysts would include such items as multimedia-capable computers, commercial interest in the campus market, technical assistance, and user support. Data also suggests that instructional use will continue to rise. This will be accompanied by growing demand for expanded and enhanced infrastructure resources and services, which will include more and more powerful computers in campus labs and faculty offices; more support personnel to assist and train faculty and students; richer and more sophisticated instructional software and multimedia products from commercial developers and publishers (Green 1996, 24-31). "These data also indicate that the use of information technology has reached what diffusion theorist Everett Rogers calls critical mass: 'the point at which enough individuals have adopted an innovation so that the innovation's further rate of adoption becomes self-sustaining" (Green 1996, 24-31). Rogers' widely acclaimed work suggests that critical mass typically occurs when about 15 or 20 percent of a target population (in this case college faculty) adopt a new innovation. Data from the Campus Computing survey suggests that most colleges and universities have finally passed the point of critical mass affecting the instructional use of information technology (Green 1996, 24-31).

Academe is still in early stages of adapting and incorporating the various kinds of information technology into its instructional functions. There is no indication that we will see a sudden and dramatic departure from past practice. Information technology, as a function and as a resource, has in fact entered the academic mainstream. There has been no radical transformation of classrooms or instructional activities of most faculties. The transformation, if it occurs, will take time (Green 1996, 24-31). "Curriculum enhancement and innovation, however, will be a continuing and incremental process, remaining largely dependent on the interaction between individual initiative (the way individual faculty design the syllabus and structure their classes) and institutional infrastructure (the hardware, software, and support services available to students and faculty)" (Green 1996, 24-31).

Historical Perspective of Technology in Education

The past 15 years shows a steady migration of information technology into instruction and other aspects of the learning experience. The arrival of desktop computing on college campuses fostered great aspirations for the eventual integration of computing and information technology into the curriculum. "Technology in this context is not a goal or an outcome; rather it is an enabling resource intended to supplement, enhance, and extend the learning experience. The potential of technology to provide new tools and information resources has long been the great expectation that fueled institutional investments and individual experimentation; the potential and the possibilities remain as appropriate and attainable goals" (Green 1996, 24-31).

Early instruction typically involved assignments that were away from the classroom in general-access computer facilities. Students would then verify that they had completed the assignment on the computer with printouts. Computers have moved into the classroom as an active teaching tool during class-time instruction. Four distinct ways computers are used in the classroom are as an intricate presentation system, structured laboratories, computerized lecture halls and lastly as a self-paced classroom (Kettinger 1991, 36). Educators have searched over the years for ways to assist in self-study learning. Hypermedia, available with the contemporary technologies allows for searching, linking and assembling of information under the control of the student. In a traditional classroom, lectures and discussions recapitulate information that is present in printed form with the student using note taking in a sequential form. It would then be accessed linearly. Hypermedia, however can change the way that students interact with the primary source of material. Students take an active role in navigating the links by specific points of interest. The computer has the ability to add pedagogical value when the appropriate classroom situation exists. In Table.3, a list of the benefits as compiled by Kettinger (1991,36-39) is presented.

TABLE 3. BENEFICIAL CIRCUMSTANCES FOR COMPUTERS IN THE CLASSROOMS
1. "Simulations of the real world" or simulation of situations that could not be created in a traditional laboratory environment
2. Visualization of numerous and complex images in a self-selected or programmable order
3. Individualization of instruction to accommodate personal learning styles and interests
4. Access to multimedia learning environments where video, sound, and image are needed
5. When attempts need to be made to make the subject matter more interesting and challenging
6. When intensive computer-based quantitative analysis during class-time allows more time for interpretation and discussion
7. When network access facilitates sharing and consulting on subject matter

(Kettinger 1991, 38-39).

Students thus have the opportunity of easier design and problem solving, flexible erasable workspace and the feasibility to try numerous versions of their designs, which increase their quality of conceptual breakthroughs.

Computer-aided instruction is designed to permit students to proceed at their own pace and to be tested for comprehension of this material as the student proceeds through the material. Students continue as they demonstrate mastery of the course material at some specified level of comprehension. Course software is typically designed to function as either a reference tool (in which trainees can select the topics they wish to cover) or as a set-content course in which students must take all topics and pass tests on the material. Other than these basic elements, the types and forms of Computer Aided Instruction (CAI) vary widely. A few of the many advantages of CAI include that it is available on demand for each student any time and anywhere with subject selectivity to each student. Students can review material later and yet receive the same level of instruction as they originally received, with the advantage of all that they have learned since the last instruction session. The quality and consistency of content and the ability to easily update course material, once the module has been developed, quickly adds to the advantages of CAI. See Table 4 for more advantages of CAI.

TABLE 4. ADVANTAGES OF COMPUTER-AIDED INSTRUCTION
1. Available on demand (any time, anywhere, with subject selectivity) 2. Ability to review the materials later at the same level of instruction as original training sessions, but reflecting what the student has learned since the last time 3. Responsive to different learning styles (audio, visual, kinesthetic, etc.) 4. Consistency of training presentation quality and content 5. Ability to update course materials more quickly (particularly with Internet-based courses). 6. Takes less time to teach the same material. 7. More motivational (pace not reduced to slowest learner in class). 8. No cost-effectiveness constraint on small numbers of learners (no minimum class size). 9. Easier, more accurate, and immediate assessment of student performance/comprehension

(Lewis 1999, 53-56).

Two principle issues that are central to CAI working so well are retention and comprehension. Comprehension is an outcome of several factors that other forms of instruction don't have: increased interactivity, choice of learning styles, and choice of venue (time, location). Interactivity forces the student to pay attention and also allows the student to control the rate and level at which the course material is delivered at each session. Students often sit in the classroom and wish they could fast-forward the teacher past a topic they already know or slow him down when they're having trouble. By also being able to select varying forms of media (video audio, text, animations, graphs, equations, etc), students can receive the material in the most meaningful form for their individual learning styles. With the ability to individualize the learning process it greatly facilitates students' comprehension and, as a result, can also reduce the time it takes to move through the course material (Lewis 1999, 53-56).

Improved retention is also a direct outgrowth of many of these same factors. When students are active participants in formulating their learning, there is more motivation and they are likely to retain the course materials covered. If the students are active participants in formulating the learning approach, they are more likely to retain the course materials covered. As the student goes through the course work, there is frequent testing for mastery of the materials, which helps to identify areas that they need to work on while also informing the software tool so that it can reinforce the topic areas needing it (Lewis 1999, 53-56).

Skill acquisition, which places great importance on the learner forming a visual image of the skill to be performed, has traditionally been achieved in a number of ways, including verbal explanations, diagrams, audiovisual material, and demonstrations. However, the ability of the learner to obtain a comprehensive picture of the skill is somewhat limited. These teaching methods are not able to provide a view of the skill from any specified angle and, as such, the clear mental images, which may be necessary for successful skill development, are diminished. Thus CAI can also work better, even though the value of traditional media should not be abandoned. The advantages of utilizing modern software for skill education, such as sports, needs to be recognized and applied. Computer technology now permits more diverse representation of information and concepts, yet allows for interactive capabilities that were beyond the scope of traditional media. Computer software now has the capability to illustrate the spatial characteristics associated with skill execution. This last point represents a significant advance from previous forms of skill based instruction (Dickson 1998, 371-4).

Given the previous principles of learning and technology in relation to learning, what would be the characteristics of good computer-aided instruction? All CAI is not generically equivalent because all software does not incorporate the best features and avoid the worst shortcomings. Table.5 indicates the desired characteristics of good CAI.

TABLE 5.	CHARACTERISTICS OF GOOD CAI
1.	Interactive-requiring students to take actions that depend upon comprehension.
2.	Adaptive, adjusting the rate and/ or level of training presentation to the student's comprehension
3.	Simulates real-world situations and demands problem solving, applying the learned principles.
4.	Uses an instructional design that allows the student to drill down into a topic more deeply, if interested.
5.	Utilizes a broad range of stimuli (animation, video, audio, text, graphs, how spots) to enrich the presentation and appeal to varying interests of students.
6.	Provides reliable/credible information from a trusted source (Lewis, 1999)
7.	Avoids using 'talking head' videos of instructors speaking the material (as opposed to showing and demonstrating the material itself).
8.	Avoids using simplistic graphics that don't enable the student to correlate the concepts with real-world applications or examples.

(Lewis 1999, 53-56).

Students are changing, and the way they want to learn is changing, and the tools to accommodate these demands are changing. As knowledge in many fields increases dramatically, students cannot learn all that is needed in any profession in a four year program, even if one were to stay in that profession for a life-time. As the global economy changes, new jobs are replacing old ones to the extent that forecasters predict most people will change jobs six or seven times during their working years. Thus students and faculty need to be skillful, motivated life-long learners to survive in the world of work. People are seeking educational opportunities to meet these demands. Consequently, the mission of higher education must expand in order to include the goal of life-long learning and CAI is the easiest avenue for life-long education and distance learning (West 1999, 16-18).

If you talk with faculty about the uses of technology in teaching, two major issues often surface. One has to do with the eagerness of many faculty to embrace the new technologies. Indeed, faculty are using desktop and laptop computers more frequently and in more different ways every year. The other issue is the reluctance of many faculty to become too deeply involved in creating technology applications with other demands on their time and minimal administrative support to have time allocated for its development (Cartwright 1994, 26-8). There is a gradual trend toward a supportive environment in colleges for faculty to develop instructional technology application. "Preliminary work by the National Project on Institutional Priorities and Faculty Rewards suggests that the development of instructional software can be considered scholarly or professional work if it- a) requires a high level of discipline-related experience, b) breaks new ground or is innovative, c) can be replicated or elaborated, d) can be documented and peer-reviewed with impact on...the discipline itself" (Cartwright 1994, 26-8). If technology-based development is central to these missions, has a strong disciplinary base and is judged by peers to be quality for the discipline, it should be recognized as legitimate and appropriate (Cartwright 1994, 26-8).

Another obstacle to teachers integrating computers and related technology into practice, is lack of prior experience in using it as a productivity tool for teaching and they have not been prepared to do so. Other obstacles include: "(a) school leaders neglect to identify the problem(s) to be addressed by introducing technology in schools, (b) failure of school leaders to provide a vision of how technology can transform teaching, (c) teachers vested interest in other pedagogy to accomplish teaching and learning objectives, (d) teachers lack of access to the technology they are expected to integrate in to practice, and (e) failure of change agents to articulate the advantages technology has over what teachers presently do to accomplish their work. That technology must have a demonstrated advantage over what teachers currently use to accomplish their work cannot be underestimated. Teachers will not abandon traditional pedagogy if there is not sufficient documented benefit to the student and the educator. For teachers to integrate technology into their practice, they need to believe that using technology is more efficient and effective than their usual methodologies" (Hope 1998, 137-40).

Researchers have identified some of the reasons for this lack of teacher education: (1) limited availability of equipment (2) lack of faculty training (3) no clear expectation that faculty will incorporate technology into academic activities (4) lack of funds (5) lack of time to develop facility in using equipment and software (6) doubt about academic validity of using some of the newer technologies (7) lack of technical support (8) lack of appropriate materials and (9) absence of clear programmatic goals for the teacher education program as a whole (West,1999; Khan 1995,43-46). By providing technology based instruction the following objectives could be achieved:

- faster development of new techniques for the student.
- shorten the length of training without diminishing the quality of training.
- provide learning that is relevant and useful.
- provide training that learners collectively can leverage into expanded knowledge.
- cover a broader array of topics.
- make training easily accessible. (Keegan 1995, 38-40)

<u>Relevant Studies Computer-Aided Instruction</u>

What are the students concerns in preparing CAI coursework? Are there differences in student learning styles that need to be considered in this preparation? In 1999, Diaz conducted a study comparing the student learning styles of online and equivalent on-campus health education classes. Diaz used a learning style instrument, the

Grasha-Reichmann Student Learning Style Scales (GRSLSS), which seemed ideal for assessing student learning preferences. "The styles described by the GRSLSS refer to a blend of characteristics that apply to all students. Each person possesses some of each of the learning styles. Ideally, one would have a balance of all the learning styles; however, most people gravitate toward one or two styles. Learning preferences are likely to change as one matures and encounters new educational experiences.

Dowdall and Grasha also have suggested that particular teaching styles might encourage students to adopt certain learning styles . . .The GRSLSS promotes understanding of learning styles in a broad context, spanning six categories. Students possess all six learning styles, to a greater or lesser extent. This type of understanding prevents simplistic views of learning styles and provides a rationale for teachers to encourage students to pursue personal growth and development in their underused learning styles" (Diaz 1999, 130-5).

Learning styles included: (a) independent students who preferred independent study and self-paced instruction; (b) dependent learners who look to teachers and peers for structure and guidance and want an authority figure to tell them what to do; (c) competitive students learn to perform better than peers and receive recognition; (d) collaborative learners acquire information by sharing with teacher and peers liking group discussion and projects; (e) avoidance learners who are not enthusiastic about attending class and are typically uninterested; (f) participant learners are interested in class activities and discussion and want as much class work as possible (Diaz 1999, 130-5).

"The online distance students were taught according to the same course outline, used the same textbook, covered the same lecture material, and took the same tests as the on-campus students" (Diaz 1999, 130-5). After analyzing all data, Diaz concluded that the online class students are likely to have different learning styles than equivalent on-campus students. Online students tended to be more independent in styles as learners. On-campus students matched the profile of the traditional student willing to work in class and obtaining rewards for working with others and meeting teacher expectations. Online students seemed to be more driven by intrinsic motives and not by class reward structure. The study was limited by convenience sampling techniques and non-probability sampling as opposed to random sampling techniques. Faculty thus need to use social learning style inventories and its results to help in class preparation, delivery methods, choosing educational technologies and considering differing student learning preferences (Diaz 1999, 130-5).

"The implication of the work on learning styles and technology is that students who prefer, and benefit from, learning in technologically based courses are different from those who prefer more traditional courses" (Grasha 2000, 2-10). "Thus, teachers employing technology need to understand the learning styles of their students when designing course activities. And those promoting technology in courses must recognize that not every student will easily benefit from its use" (Grasha 2000, 2-10).

In exploring students' reaction to technology presentations of course material, a survey study of her own students, done by Linda Reinhardt revealed the following:
the vast majority of students (over 80 percent) reported that the PowerPoint presentations support the course content, are easy to read, make the lectures more organized, help them take notes, do not distract from the content of the lectures, and help to clarify the information. A smaller majority of the students (60 to 79 percent) found that the

presentations help them remember the material, make the lecture more interesting, and help them pay attention. Almost all the students appreciated being able to obtain the lecture outlines by purchasing them from the bookstore or by downloading them from the course Web page. In a quantitative assessment made of the effects of the computer-enhanced presentations on student performance, the students' midterm grades showed a higher percentage of As, Bs, and Cs and a lower percentage of Ds and Fs in the semester she introduced the computer-enhanced presentations compared with one year earlier. On the negative side, students' written comments have led her to be concerned that some students may use the lecture outlines as a substitute for taking notes or even for attending class. Darkening the room to see projected images can induce sleep, and bulleted slides may be attractive and legible and may help the students know where they are in the presentation, but they aren't very stimulating. Moreover, some students become spectators rather than participants in a classroom where the professor "orchestrates" a multimedia presentation (Reinhardt 1999, 48-50). The following table gives what Reinhardt feels to be the essentials of success.

TABLE 6. LESSONS FOR SUCCESS
1. Identify a handful of target lessons
2. Explore design strategies
3. Select software. Consider what feature you want in your presentation.
4. Develop a prototype lesson.
5. Deliver presentation and get some student response.
6. Assess the value of your presentation and what lessons you learned

(Reinhardt 1999, 48-50; Kemp & McBeath 1994, 15-17).

Given the possibilities of CAI and its ability to address individualized instructional needs and learning styles, study of its specific potential for skill areas of specialized instruction needs to be evaluated. The results can heighten learning levels, thereby increasing efficacy of instruction; can reduce the time of instruction thereby increasing the efficiency of learning; can control costs of instruction yet provide mentioned benefits; can influence the motivation and approach of students and instructors positively (Kemp and McBeath 199, 15-16).

Relevant Studies of CAI in Apparel Instruction

The pressure on all faculties across the country to cover a overabundant amount of material, has created the impetus for using CAI in the Apparel Curriculums. A pilot study and evaluation was done by Hethorn (1993) at the University of California in using draping videos (for VCR use) for students. A pilot of the videos was done with three students who were able to complete laboratory exercises in a similar manner to students who had instructor help. These were then slated for use as a supplemental resource in teaching. No follow-up studies were noted.

Ambose (1994) from Syracuse University created digitized knit videos, that were interactive, while students were referenced as having tried the videos, no formal evaluation of the results was reported. Monk and Loker (1996) worked with multimedia presentation on teaching seam stitches and finishes, and O'Rourke-Kaplan from University of North Texas created a CD-ROM that was interactive to teach principles of grainline, interfacing, labeling, allowances, and closures. Both studies had pre and post test scores for students to assess if there was increased learning from before instruction. Students were enthusiastic and instructors felt that multimedia increased educational strategies. Studies were not taken past the pilot stage, nor compared with other methods of instruction or with a control group. Nineteen ninety-nine brought two more studies, one from Sandra Tullio-Pow from Ryerson Polytechnic University using three instructional videos (for VCR use) on construction skills; the second study was done by Kallal, Tavia, Sharp, and Orazla at University of Delaware on learning to develop 3D designs from 2D designs. Tullio-Pow used three instructional videos over a two-year period of time. Faculty and students were then interviewed. The results of these interviews were used for the creation of a handbook for the implementation of instructional videos for subjects that other instructors might wish to develop. These were seen as a viable solution to constraints of teaching large classes and for courses taught through distance education.

Therefore, previous studies have shown technology as a useful adjunct to traditional classroom instruction. However, there has been a lack of published results of a formal study comparing the two types of instruction. With the diverse population of apparel students, this style of teaching needs to be pursued to expand opportunities for traditional and non-traditional students to add expertise in skills pertaining to apparel design.

CHAPTER III

METHODS

Inasmuch as the purpose of this study was to compare traditional instruction techniques with that of Computer-Aided Instruction, it was first necessary to select a fundamental skill and develop a computer module that could be used in teaching apparel design. Since the insertion of a zipper is an essential skill for clothing construction, and is a higher level skill with multiple steps, the problem of zipper insertion was chosen. If this skill could be taught using CAI, then it would be reasonable to infer that less step-intensive skills also could be taught with Computer-Aided Instruction.

Computer Module Development

After careful scripting of steps for insertion of a lapped zipper, pictures were taken with a digital camera for each step necessary to visualize the technique in accordance with the script. Using Director™ 7.0, digitized pictures were arranged to accommodate this script. Then, using Sound Forge XP™ 4.5, the audio portion was completed using the script developed. This audio portion was imported into Director and was programmed to drive the slide presentation. After editing the presentation, the file was saved as a Shockwave movie on a CD-ROM with an approximate length of six minutes. Using the Director software gave the option of Shockwave presenting the module. Shockwave is a plug-in that is installed on your computer as a free download from Macromedia. The movies can then be made available via the Internet from the CD-ROM or the file can be accessed from a course website. Access to the module is then readily available to students from any computer laboratory on campus or from home.

A second purpose was to evaluate the CAI in relation to traditional instruction. To do this, a field experiment was planned in which participants would be inserting a zipper after they received either CAI or traditional instruction.

Background Questionnaire

In order to assess the computer and sewing skills of participants in the study, a one-page background survey (See Appendix A) was developed by the researcher for participants to fill out prior to being assigned to a method of instruction. Four questions on the survey were to assess sewing experience and included questions on years of sewing, informal instruction (such as by family member or friend), as well as formal instruction (high school, 4-H, or post high school classes taken) that the participant had received. Three questions were specific to experience in zipper insertion. The last question was designed to assess computer experience, and asked about the type of computer applications software that the participants were able to use.

Subjects

Participants for the study were obtained by asking for volunteers from a local chapter of the American Sewing Guild, from an on-campus group, the Student Apparel Design Association (SADA), and a computer design class. An oral explanation of the research study was given at group meetings and volunteers were obtained. Participants signed informed consent statements (See Appendix B) and completed a background questionnaire. Questionnaires were numbered with an attached index card that had a matching number. No names were included on the surveys, but name and phone number were written on the numbered index cards. When participants turned in their surveys, index cards and surveys were separated.

Participants were randomly assigned to either the traditional or CAI instruction group, based on sewing experience. To give an ordinal value to sewing experience, a numerical score was assigned to questions that related to sewing experience and a total score was obtained for each survey. On the basis of the sewing experience score, participants were assigned to either the traditional, or the CAI group. At the same time, an attempt was made to balance age and computer experience in the two groups. After assignment to a treatment group, names were obtained from the matching index cards so those participants could be notified of the date and location where the instruction would take place.

Study Design

Participants of the study were divided into two groups and given a choice of dates to receive their instruction at one of two locations. Eighteen participants completed the experiment in the MSU sewing laboratory and the remainder at the researcher's Sewing School. Half of the participants received traditional classroom style instruction in groups of two to six people. With traditional classroom instruction, the instructor demonstrated the techniques to participants, following the same script as the computer module. The researcher, who had developed the computer module, gave the demonstration. Following the demonstration, each participant received an instruction sheet detailing the same steps for the insertion of a lapped zipper. Participants were given the materials to insert a zipper: 6"x12" pieces of cotton twill fabric to represent the back of a skirt, a 12" zipper, fabric marker pen, fabric glue stick, tape and thread to insert a zipper. All sewing machines were threaded prior to the demonstration. If participants had any questions, they needed to refer to the instruction sheets, or look at a tabletop display of various steps needed for insertion, that had been displayed in the room. The instructor provided no additional information.

CAI participants viewed the computer module detailing the same steps of zipper insertion as shown by the instructor in the traditional instruction group. Participants viewed the module in a room near the sewing laboratory or instruction space in the Sewing School. Participants viewed the module in groups of one to seven people, and they were allowed to see the module a second time, if desired, before inserting their zipper. After viewing the module, participants proceeded to the sewing laboratory. Each participant then received the same instruction sheet as was distributed to the traditional instruction participants. Participants were also given all the materials to insert a zipper using the described method. If participants had questions, they needed to refer to the instruction sheet, or look at the tabletop display of the various steps in the process needed for insertion. The researcher was present throughout the process, but did not provide additional explanation.

Evaluation Instrument

In addition to the background questionnaire, an evaluation questionnaire was developed for the Computer-Aided Instruction module. (See Appendix C). This one page survey included six questions that were used as an assessment of the module itself, one covered adequacy of computer background prior to seeing the module and three questions were related to outcome as viewed by the participant. Responses were on a five point Likert scale that ranged from strongly disagree to strongly agree. Responses were weighted with strongly disagree receiving a score of one and strongly agree a score of five.

A second instrument was for the purpose of evaluating the quality of the zipper insertion (See Appendix D). This one page instrument contained seven criteria and is used by the apparel faculty at Michigan State University in evaluating class work. Two people evaluated the samples made by the participants. Judges were experienced sewers, who had teaching experience. Judges marked when the zipper sample met the criteria. The score was obtained by counting the number of criteria that were met. Each judge had their own evaluation sheet with numbers that matched the insertion sample. Thus, two people, who were not aware of which type of instruction that the participant received, evaluated all zipper insertions.

Analysis and Creation of Variables

Background surveys for all participants were reviewed and variables were created for sewing and computer experience. Scores for sewing experience were obtained by assigning a value for each participant based on the number of years the participant had been sewing, classes taken, formal education, and number and type of zipper insertions. Computer scores were obtained from the background surveys by assigning a value for each participant based on the number of programs the participant regularly used.

SPSS for Windows was used for data analysis. Variables inputted were: participant ID number, age, sewing experience score, computer experience score, insertion score by rater number one, insertion score by rater number two, and lastly an indication of any difference in raters' scoring. Anticipated plans for analysis included Regression, ANOVA, and possibly a General Linear Model. A significance level was selected at .05.

CHAPTER IV

RESULTS AND DISCUSSION

Two purposes were established for this study. The first was to develop a computer instruction module to teach a sewing skill. This was accomplished using the equipment described in the methods section. Using a digital camera, thirty-nine color digital slides were produced. Slides were prepared that included a display of necessary equipment and then numerous visualizations of each step of the carefully scripted module. The script, and later the handout, contained eighteen steps which included several steps that marked the fabric in preparation for sewing. After the module was complete, it took approximately six minutes for presentation. Modules were burned onto CDs for participants to use in the study.

The second purpose was to evaluate the effectiveness of the CAI module in relation to traditional classroom instruction. The following section will describe the sample and report results of the comparative evaluation. Evaluation of the CAI module by the participants who used it is also reported.

Description of sample

There were thirty-two people who participated in the study, thirty-one females and one male. Thirty of the participants were Caucasians. Participants ranged in age from 18 to 67 years, with a mean age of 42.03 years. Young people between the age of 18 to 30 constituted the largest proportion of the sample, 38%. Those aged 40-50 comprised 25% of the sample, and a similar number, 22% were aged 61-70. Persons aged 51-60 constituted the smallest proportion of the sample, 15%. Figure 1 shows the age distribution of participants.

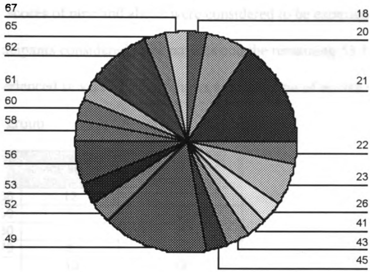

FIGURE.1 AGE DISTRIBUTION OF PARTICIPANTS

Sewing Experience

Sewing experience for participants ranged from a score of one to a high score of sixteen; the mean score was 8.32. Table.7 shows the frequency and percentage of scores.

SCORE	FREQUENCY	PERCENT
1	3	9.4
2	5	15.6
3	1	3.1
4	1	3.1
6	1	3.1
7	2	6.3
8	2	6.3
10	3	9.4
11	5	15.6
12	1	3.1
13	1	3.1
14	5	15.6
15	1	3.1
16	1	3.1

TABLE.7 DISTRIBUTION FOR SEWING EXPERIENCE SCORES

Participants whose score ranged from zero to eight were classed as novice sewers, and scores of nine and above were considered to be experienced sewers, with 46.9% of participants considered to be novices and the remaining 53.1% considered to be experienced sewers. Table.8 shows a distribution of novice vs. experienced sewers by age group.

AGE	NOVICE SEWERS	EXPERENCED SEWERS
18-30	12	
41-50		8
51-60		5
61-70	1	6
TOTAL	13	19

TABLE.8 **SEWING EXPERIENCE LEVEL BY AGE CATEGORY**

Since sewing experience scores were reflective of previous opportunities the participant had to acquire sewing skills, participants who were 40 years old and above, 62% of the sample, had higher experience scores. See Table 9 for frequency and type of instruction according to their experience classification.

PRIOR SEWING EXPERIENCES	NOVICES SEWERS	EXPERIENCED SEWERS
0-5 CLASSES	13	5
6-10 CLASSES	0	5
10+ CLASSES	0	9
PARTICIPATED IN 4-H	2	3
SEWING IN HIGH SCHOOL	3	10
FRIENDS/FAMILY GAVE INSTRUCTION	5	12
PRIOR ZIPPER INSERTIONS	4	19

TABLE.9 **FREQUENCY OF PAST SEWING INSTRUCTION BY EXPERIENCE CLASSIFICATION**

Older persons had opportunities to learn in the formal education system and more learning opportunities from 4-H and family members. Because the number of years of sewing was a factor in the score received, the older participants had the opportunity of receiving a higher score in this area. With younger participants having no sewing classes in the formal education system, most of these participants did not have the opportunity to achieve a level of sewing that included a higher skill such as inserting a zipper. Three of the experience scores were based on experience inserting zippers.

Computer experience scores for participants were based on the number of programs used. Scores ranged from zero, for no experience, to a high score of 8. Mean score was 4.69. Table 10 shows the frequency of the distribution of each experience score.

SCORE	FREQUENCY	PERCENT
0	3	9.4
1	1	3.1
2	1	3.1
3	3	9.4
4	4	12.5
5	9	28.1
6	5	15.6
7	1	3.1
8	5	15.6

TABLE 10 DISTRIBUTION FOR COMPUTER EXPERIENCE SCORES

Most participants had done word processing and used electronic mail, but if they had moved beyond to such programs as spreadsheets, Power Point, or doing Internet searches, then it was considered to be a more experienced level. Participants with a score between 0-2 were considered novices and scores of three and above were considered experienced. Novices comprised 15.6% and the remaining 84.4% were considered to be experienced with computers. This is consistent with the fact that 38% of the participants were18-26 years of age and currently students at MSU with ready access to computers and consistent exposure at a high school level. Age is thus related to computer experience but the relationship is the reverse of what was seen with sewing experience. See Table 11.

AGE	NOVICE WITH COMPUTERS	EXPERENCED WITH COMPUTERS
18-30		12
41-50	1	7
51-60	1	5
61-70	3	3
TOTAL	5	27

TABLE. 11 COMPUTER EXPERIENCE LEVEL BY AGE

Participants were randomly assigned to treatment groups first on sewing experience and then considering age and computer experience, with an attempt to assign an equal number of participants from each category to Computer-Aided Instruction and to traditional instruction. Table 12 depicts the distribution of participants by these variables.

AGE	CAI	TRADITIONAL
18-30	6	6
40-50	3	4
51-60	2	3
61-70	5	3
SEWING EXPERIENCE		
NOVICE	6	7
EXPERIENCED	11	8
COMPUTER EXPERIENCE		
NOVICE	2	3
EXPERIENCED	14	13

TABLE. 12 TREATMENT ASSIGNMENT BY AGE AND EXPERIENCE

Research Questions and Hypotheses

Addressing the research questions of whether instruction technique and sewing construction experience influence sewing performance (quality), the following results compared the two types of instruction. The first hypothesis to be addressed was that there would be no difference in sewing performance as a result of instruction technique. The data supports retention for this hypothesis. The dependent variable in the study, ratings for the quality of zipper insertion had a possible total score of 7. Twenty-nine of the participants in the study scored 7 and 3 participants scored 6. See Figure 2 shows a histogram of the results. The mean score was 6.91.

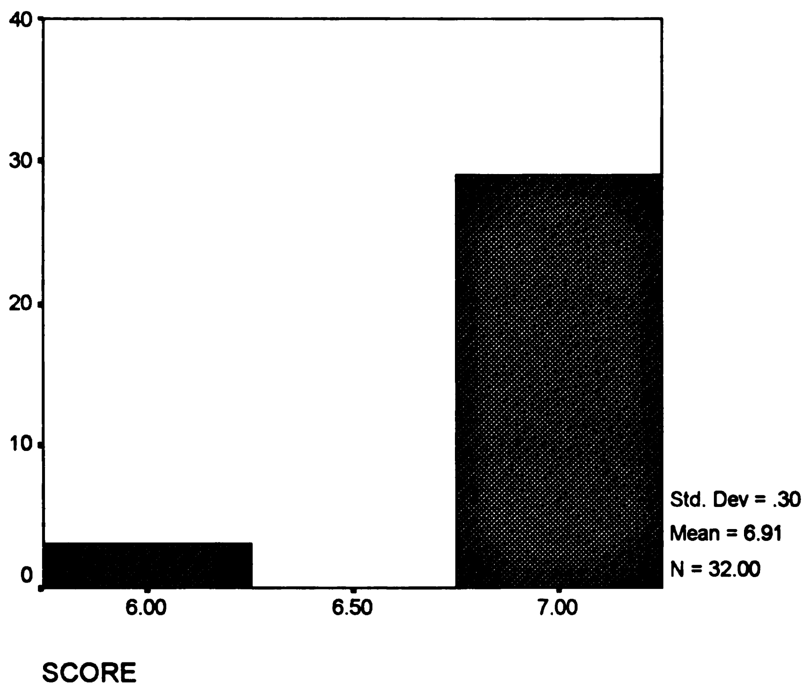

FIGURE.2 DISTRIBUTION FOR ZIPPER INSERTION SCORES

Both evaluators, who worked independently, were in agreement on the scores for each participant 100% of the time showing a high reliability for the results. See Figure 3 and Figure.4 for digital pictures of samples of zipper insertions from scores of six and scores of seven.

Through the lack of variation in results in this study, the researcher was able to retain the null hypotheses. Both instructional methods were effective, so effective, in fact, that variability in the outcome, i.e. the scores for zipper insertion was reduced to near zero. Of thirty-two participants, all but three scored a perfect score of seven and the three who did not scored a six. Twelve of the fifteen novice sewers (80%) produced a product that received a perfect score. This is remarkable given the fact that seventy-five per cent of these novice sewers had never before inserted a zipper.

The three other hypotheses examined the interaction between the predictor variable and the dependent variable, score for zipper insertion, and were also retained.

1. H_o: There is no interaction between age and quality of insertion.
2. H_o: There is no interaction between computer skills and quality of insertion.
3. H_o: There is no interaction between sewing experience and quality of insertion.

Table 13 depicts these interactions:

AGE	SCORE OF 6	SCORE OF 7
18-30	3	9
40-50		8
50-60		5
60-70		7
COMPUTER EXPERIENCE		
0-2		5
3-8	3	24
SEWING EXPERIENCE		
0-8	3	12
9-16		17
METHOD INSTRUCTION		
Traditional	3	13
CAI		16

TABLE.13 FREQUENCY OF PERFORMANCE SCORES BY PREDICTOR VARIABLES

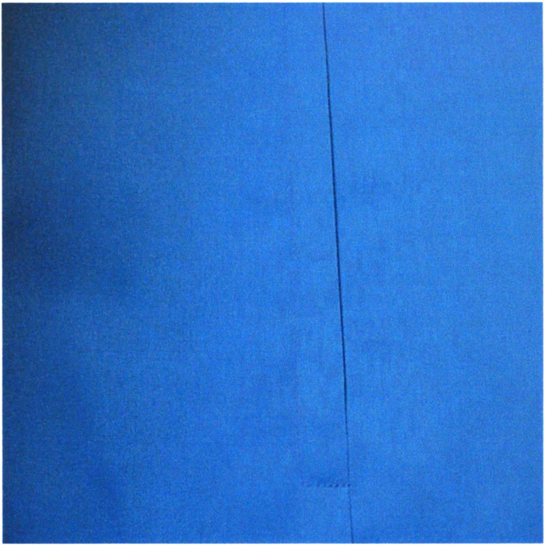

FIGURE 3. ZIPPER INSERTION WITH A PERFECT SCORE OF 7

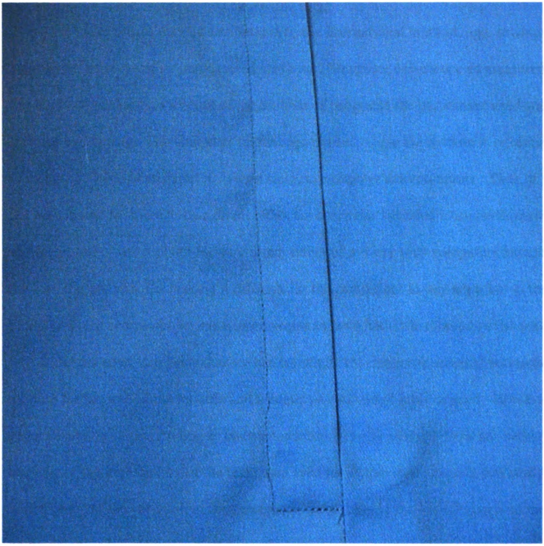

FIGURE 4. ZIPPER INSERTION WITH A SCORE OF 6

Attempts to do analysis of data using Regression, ANOVA, and Linear modeling failed due to lack of variation in the dependent variable. This lack of variation in the dependent variable makes it impossible to model variation in the outcome statistically, because as noted in Table.13, all three students who scored less than perfect were in the traditional group. These participants were also younger and less experienced in sewing. Thus, the lower scores may be attributable to the instructional method, age, sewing experience, or some other unmeasured attribute. Computer experience as measured in this study, was based on a count of the number of programs the participant used and Internet experience. The computer knowledge needed to use the module is minimal, how to insert a CD-ROM and start it. There were no computer manipulations. Thus, it was not anticipated for there to be a direct effect for computer knowledge on performance. However, there was concern for an indirect effect of anxiety with computers hampering the learning process, i.e. making it difficult for the participant to pay attention to the module. From scores above, experience seems to have had little relation to the outcome.

In this case, it appears that we can substitute the computer-assisted instructional module for the traditional module and achieve an equivalent performance. However, the generalizability of this finding to instructional modules for other skills is not defensible because of the high quality of the technique used for zipper instruction in this study, which reduced the variation in the outcome to the point that the variation can no longer be modeled.

Evaluation of CAI

All participants in the CAI group were given an evaluation survey to fill out. Thirteen of the sixteen participants who received instruction from CAI filled out an evaluation form. On the following page, Table 14 shows the frequency of scores noted on the evaluation survey with mean scores for each question.

SCORE	1	2	3	4	5	MEAN
I had no problem understanding what I was to do for the zipper insertion technique	0	0	3	8	2	4
The computer-aided design activity was appropriate to this course	0	0	0	6	7	4.54
It was easy for me to visualize what I needed to do from the visuals presented on the computer screen	0	0	0	8	5	4.38
The computer project took a reasonable amount of time to complete	0	0	1	7	5	4.31
I felt adequately prepared to use the computer to complete the computer-aided design project	0	0	1	6	6	4.38
The visuals in the computer program were clear	0	0	0	2	11	4.85
I like the idea of using the computer to learn construction techniques	0	0	1	4	8	4.54
I will use the skills I gained from the module for sewing in the future	0	0	0	2	11	4.85
The computer-aided design activity made me more aware of the importance of accuracy in zipper insertions	0	0	1	6	6	4.38
I enhanced my knowledge of sewing construction by using the computer-aided design module	0	1	0	6	6	4.31

TABLE.14 FREQUENCY OF SCORES ON CAI EVALUATION SURVEY

The first six questions on the evaluation were used as an assessment of the module itself. Responses were on a five point Likert scale, with a score of one for strongly disagree and a score of five for strongly agreeing. As noted in the table, the highest mean was for the quality of the visuals in the module and for participants feeling that they would use the skills gained from the module for sewing in the future. From these results, participants were shown to have felt that the module allowed for easy understanding and good visualization of the process, permitting them to complete the procedure with skills gained for future use. Participants gained knowledge and learning did indeed take place.

Discussion

The results of this study show that CAI can indeed be successful in teaching a sewing skill. Twelve of the novice sewers (80%) produced a product that received a perfect score. Seventy-five per cent of them had never before inserted a zipper. Zipper insertion, a skill with a higher level of difficulty, was chosen for this project, with the need to clearly define and order the steps. If complex, multi-step instructions can be given with CAI, then one can assume that less complex sewing skills could be successfully addressed using Computer-Aided Instruction. Part of the success of both instructional treatments, was the careful sequencing of steps. The procedure produced a proficient treatment, and visuals allowed for thorough processing which led to a good quality product.

If additional CAI modules were developed, then the goal of creating a more homogeneous background of sewing skills could be addressed. CAI could be used to give students, in a limited laboratory-time situation, the opportunity to obtain skills on their own that would expedite instruction in the classroom. Students could be guided through a unique path of learning by choosing CAI modules that were appropriate to their particularized needs.

Previous studies for using Computer-Aided Instruction in apparel construction had found it useful to use instructional videos and multimedia presentations and these methods were tested on a limited basis. There appears to be a lack of published formal studies comparing the sewing instruction-technology versus traditional instruction. The advantage of using Shockwave movies that are produced using Director™ and Sound Forge™ Software, is the ability to address specific teaching needs at low production cost that can be edited by the instructor on an as needed basis. While there is an expected learning curve with any new software, after the initial learning curve, it is very quick to edit modules.

Because results have to be limited to this zipper module, further study would be beneficial for other apparel structuring skills with students at different levels in the apparel curriculum, as well as pursuing instruction on the draping and flat pattern methods of apparel design.

CHAPTER V

SUMMARY AND CONCLUSIONS

The information technology revolution of the last twenty years is transforming universities as the computer and its related technologies become an integral part of the college classroom. The world market for technology-based learning was $6 billion by 1997 and is predicted to rise to at least $26 billion by the year 2005. The technologies of computer-aided instruction (CAI) are evolving at a rapid rate, enabling us to do more work and more kinds of work at the same or lower cost. Many of the elements of technology can be used for multiple educational goals. The basic question addressed by this study is can CAI be used for the acquisition of basic and advanced sewing skills in the Apparel Design Program at MSU?

This study involved the development and evaluation of a CAI module for teaching a sewing skill that is critical for apparel construction. Instruction in Apparel Design presents unique challenges. Time in the sewing laboratory is limited, yet particular sewing skills are critical to garment construction, so it is necessary for student learning to occur in the shortest time possible with maximum quality. Instructors have limited time to meet heterogeneous needs. Individualized instruction, which could be made available with CAI, would allow the students to tailor their instruction needs, and also allow faculty to use their limited time to guide students through a unique path of learning by choosing appropriate modules for particular needs. Some students enter the Apparel Design Major with no sewing skills and other students come with a diverse range of sewing skills. Apparel program instructors need an avenue of providing essential skills, in this extremely heterogeneous environment.

This study was designed with a twofold purpose. The first purpose was to develop a carefully designed computer module that could be used for sewing instruction in an Apparel and Textile Program, as well as for home use. The insertion of a zipper was chosen for the module since it was a higher level skill that was very step-intensive. This would allow for inference to less step-intensive skills. Careful scripting of steps for the insertion of a lapped zipper were drafted. Digital pictures were then taken to visualize the technique in accordance with this script. Using Director™ 7.0, these digitized pictures were arranged to accommodate this script. The audio portion of the module was completed for the developed script, using Sound Forge™ XP 4.5, and was imported into Director™ and programmed to drive the slide presentation. Using Director software gave the option of Shockwave presenting the module, with access to the module readily available to students from computer laboratories on campus or from the student's home.

The second purpose of this study was to implement a field test comparing the effectiveness of two instructional techniques, the CAI module and a traditional lecture/demonstration. Participants for the study were obtained by recruiting volunteers from a local chapter of the American Sewing Guild and from the Student Apparel Design Association at Michigan State University. Participants were randomly assigned to receive either the traditional or CAI instruction based on their age, sewing experience and computer experience. Sixteen of the participants that were randomly assigned received traditional instruction and the remaining sixteen of the participants viewed the computer module. All participants then proceeded to insert a zipper. Blind evaluation of the insertions was done independently by two judges.

The dependent variable in the study, which was the ratings for the quality of each zipper insertion, had a possible total score of seven. Twenty-nine of the participants in the study scored seven and the remaining three participants scored six. Both evaluators in the study worked independently and were in agreement on the score for each participant 100% of the time. Thus, there was a high reliability for the results.

Through the lack of variation in dependent variable, quality of performance, the null hypotheses were retained. The first hypothesis was that there would be no difference in the sewing performance as a result of instruction technique was retained. Both of the instructional methods were so effective that the variability of outcome was almost zero, allowing for the retaining of the other three null hypotheses, which were 1) that there would be no interaction between age and quality of insertion, 2) that there would be no interaction between computer skills and quality of insertion, and 3) that there would be no interaction between sewing experience and quality of insertion. The three people with lower scores were younger, less experienced and in the traditional group.

Attempts were made to do analysis of data using Regression, ANOVA, and Linear modeling, but failed due to lack of variation in the dependent variable. This made it impossible to model variation in the outcome statistically.

Conclusions

In this case, it appears that CAI and traditional teaching yielded similar results with respect to performance. CAI was indeed successful in teaching a sewing skill. The skill used in the module, insertion of a lapped zipper, is one that required complex multi-step instructions and we can assume that less complex apparel structuring skills could be addressed successfully using Computer-Aided Instruction. Based on previous observation that was not part of this study, the success of the instructional technique was thought to be the careful sequencing of steps and an appropriate number of steps, which produced such a proficient treatment. The method used for this study relied on careful preparation of the fabric, including marking, taping and careful pinning. By having steps and visuals that allowed for thorough processing, we were able to lead to improved performance, whether the sequence of steps was presented by the computer or in person.

While this study was able to show a proficient outcome with CAI, this researcher feels that the most advantageous use of CAI for the Apparel Program, would be for instruction of repetitive tasks that are basic unchanging methods, which need to be taught on an ongoing basis to students. For future modules, it would be helpful to have handouts keyed to the visuals and use a software program that could be paused as the students accomplish various steps of the procedure. With appropriate steps superimposed on the screen, and the ability to pause the steps, it would be easier for the student to independently perform the given skills.

Faculty also must never lose sight of the mentoring process that occurs with traditional method of teaching. CAI can be a key component in the education process that allows the student to create a unique path to meet their individual needs. The instructor then has the opportunity to create an environment that gives these mentoring opportunities, not one consumed with task oriented learning.

<u>Limitations</u>

The generalizability of these findings to instructional modules for other skills is not defensible because the high quality of the instruction technique reduced that variation in the outcome to the point that the variation could not be modeled.

Additional CAI modules that teach sewing skills would need to be developed and tested, or a replication of this study with another class, with the goal of creating the homogeneous environment in the sewing lab.

The small sample size should be addressed in future studies and include a larger number of student participants. By using a diverse age group, the independent variable of age was addressed; however, it did not give a large sample size of students.

Recommendations For Further Study

With the baseline module that was created for this study, it is recommended that future studies broaden the sample size and develop more CAI modules to see if the goal of creating a more homogeneous background of apparel structuring skills could be addressed and indeed meet the goal of homogeneity. Follow-up would be needed to see if students gained skills on their own that would expedite instruction in the classroom. Students' unique paths of learning could be surveyed to see if their particular needs were met. As needs become defined, more modules could be developed.

Summary

This study has identified the fact that CAI, in the form of a well-designed instruction module, accomplishes effective learning of sewing skills. The utilization of instructional techniques that are carefully sequenced and produced a proficient treatment are a key to success. Steps and visuals need to allow for thorough processing of information, which lead to improved instruction. With increasing numbers of students entering the Apparel and Textile Major with a large diversity of apparel structuring skills, the ability to use CAI is becoming increasingly important.

To benefit from CAI, it is imperative for research to continue to identify and address potential skills that can be taught through CAI and utilize it effectively. Thus instructor time could be used in an efficient manner to meet the needs of the largest number of students. Apparel structuring skills are desirable, yet almost mandatory in providing the student with the ability to design at the highest level and advance in the profession with an arsenal of skills to position themselves in a highly competitive job market.

APPENDICES

APPENDIX A

SEWING AND COMPUTER EXPERIENCE

NUMBER____

1. How many years have you been sewing?________

2. Do you own a sewing machine?
   ____Yes
   ____No

3. How many classes have you taken that included basic sewing construction?
   ____0 Classes _____1-5 Classes
   ____5-10 Classes _____10+ Classes

4. Does any other member of your family sew?
   ____Yes
   ____No Who __________

5. Have you received any sewing instruction from the following sources and if so, for how many years?
   __________Family Member ______________# of sewing projects (approx.)
   __________Friend _______________________# of sewing projects (approx.)
   __________High School/Middle school _______# of semesters
   __________4H _________________# of sewing projects (approx.)
   __________Other

6. How many zippers have you inserted?
   ____0 Zippers _____1-5 Zippers
   ____5-10 Zippers _____10+Zippers

7. The last time I inserted a zipper was_______years ago (approximately)

8. If you have inserted a zipper, which zipper application have you used:
   _____Lapped Application
   _____Center Application
   _____Handpicked Application
   _____Invisible Zipper
   _____Don't know

9. I have used the computer to do the following (check all that apply)
   _____email ____word processing ____internet searches
   _____Photo Shop ____Spread Sheet
   _____Power Point Presentation _____Send or make greeting cards
   ____Other (Specify_________________________)

10. Age_____

APPENDIX B

CONSENT TO SERVE AS A SUBJECT IN RESEARCH

You are invited to participate in a research investigation entitled Effectiveness of Traditional vs. Computer Aided Instruction methods for Teaching Apparel Construction.

The investigator, Carol Beard, has explained the nature and general purpose of the research. Your involvement consists of watching a demonstration of a sewing technique and then completing the technique yourself. This will take approximately one to two hours and you will not be paid for participating.

Your confidentiality will be protected and your name will not be reported with the results. Any information that you provide will be used solely for this project.

The investigator is authorized to proceed on the understanding that you may terminate your service as a participant at any time you so desire.

I have read the information above and voluntarily agree to participate.

Signed___________________________ ___________________

Participant Researcher

Date___________________________

If you have questions regarding the project contact Dr. Ann Slocum, Michigan State University, phone: (517) 355-3779, fax: (517)- 432-1058 or e-mail aslocum@msu.edu. If you have questions about participating in research in general, contact Dr. David Wright at Michigan State University, phone: (517) 355-2180, fax: (517) 353-2976, e-mail UCRIHS@msu.edu.

APPENDIX C

EVALUATION OF TUTORIAL

INSTRUCTIONS TO PARTICIPANT

Respond to the following statements with a rating from SD to SA, where SD is the strongest level of ***DISAGREEMENT*** and SA is the strongest level of ***AGREEMENT***. Please circle your answer where SD=strongly disagree D=disagree N=neutral A=agree SA=strongly agree.

1. I had no problem understanding what I was to do for the zipper insertion technique. . . . . .SD D N A SA

2. The computer-aided design activity was appropriate to this course . . SD D N A SA

3. It was easy for me to visualized what I needed to do from the visuals presented on the computer screen. SD D N A SA

4. The computer project took a reasonable amount of time to complete. . .SD D N A SA

5. I felt adequately prepared to use the computer to complete the computer-aided design project. . . . . . . .SD D N A SA

6. The visuals in the computer program were clear. . . . . .SD D N A SA

7. I like the idea of using the computer to learn construction techniques. . . . . SD D N A SA

8. I will use the skills I gained from the module for sewing in the future. . . . . SD D N A SA

9. The computer-aided design activity made me more aware of the importance of accuracy in zipper insertions. . . . . SD D N A SA

10. I enhanced my knowledge of sewing construction by using the Computer-Aided Design Module. . . . . .SD D N A SA

APPENDIX D

ZIPPER EVALUATION FORM
LAPPED ZIPPER APPLICATION

1. **Zipper is positioned correctly in placket opening . . . . Y N**

2. **Topstitching is parallel to placket opening. . . . . Y N**

3. **Topstitching is appropriate distance from folded edges of placket Opening . . . . Y N**

4. **Zipper tape and seam allowance are caught firmly in the stitching on both sides of zipper opening . . . . Y N**

5. **Zipper teeth and tab are well-concealed . . . . Y N**

6. **Top of zipper is located the appropriate distance down from top edge . . . . Y N**

7. **Appropriate stitch length, thread ends secured . . . . Y N**

Score Total (1 points for each Y). . . . . _______

BIBLIOGRAPHY

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Ambron, S., & Hooper. (1990). Learning With Interactive Multimedia. Redmond, Washington: Microsoft Press.

Bane, A. (1966). Creative Clothing Construction. New York: McGraw-Hill.

Boyle, T. (1997). Design for Multimedia Learning. New York: Prentice Hall.

Burbules, N., & Callister. (2000). Watch It. Boulder, Colorado: Westview Press.

Cartwright, G. (1994, Sept/Oct). Information technology: Considerations for tenure and promotion. Change, 26, 26-8.

Chiou, G.-F. (1995, May/June). Beliefs and Computer-Based Learning. Educational Technology, 35(3), 48-52.

Diaz, D., & Cartnal. (1999, Fall). Students' learning styles in two classes: Online distance learning and equivalent on-campus. College Teaching, 47(4), 130-5.

Dickson, S., & Parsons. (1998). The odd couple-skill learning and computer software. British Journal of Educational Technology, 29(4), 371-4.

Elfin, M. (1996, September). The high cost of higher education. U.S. News & World Report, 121, 90-3.

Ference, P. R., & Vockell. (1994, July/August). Adult Learning Characteristics and Effective Software Instruction. Educational Technology, 34(6), 25-31.

Gagne, R. M. (1977). The Conditions Of Learning. New York: Holt, Rinehart And Winston.

Gagne, R. M. (1987). Instructional Technology: Foundations. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Gagne, R. M., & Briggs. (1992). Principles Of Instructional Design. Fort Worth: Harcourt Brace Jovanovich College Publishers.

Gayeski, D. M. (1997, Nov/Dec.). Predicting the Success of New Media for Organizational Learning: How Can We Avoid Costly Mistakes. Educational Technology, 37(6), 5-13.

Goldsworthy, R. (1999, July/August). Lenses on Learning and Technology: Roles and Opportunities for Design and Development. Educational Technology, 39(4), 59-62.

Grasha, A., & Yangarber-Hicks. (2000, Winter). Integrating teaching styles and learning styles with instructional technology. College Teaching, 48(1), 2-10.

Green, K. (1996, Mar./Apr.). The coming ubiquity of information technology. Change, 28, 24-31.

Hannafin, M. J., & Hall. (1994, October). Learning in Open-Ended Environments: Assumptions, Methods, and Implications. Educational Technology, 34(8), 48-55.

Hope, W. (1998, Spring). The next step: Integrating computers and related technologies into practice. Contemporary Education, 69(3), 137-40.

Jamieson, J. (1994, 13 July). TI: A History of Commitment. Presented at the Computers in Applied Linguistics. Ames, Iowa.

Jonassen, D. H. (1993, January). Thinking Technology. Educational Technology, 33(1), 35-7.

Jonassen, D. H. (1995, July/August). Supporting Communities of Learners with Technology: A Vision for Integrating Technology with Learning in Schools. Educational Technology, 35(4), 60-63.

Keegan, L., & Jacobson. (1995, July). Training goes mod(ular) at Apple. Training and Development Alexandria, 49, 38-40.

Keller, A. (1987). When Machines Teach. New York: Harper Row.

Kemp, J. E., & McBeath. (1994, May/June). Higher Education: The Time for Systemic and Systematic Changes. Educational Technology, 34(5), 14-19.

Kettinger, W. J. (1991, August). Computer Classrooms in Higher Education: An Innovation in Teaching. Educational Technology, 31(8), 36-43.

Khan, B. H. (1995, Mar/Apr). Obstacles Encountered During Stages of the Educational Change Process. Educational Technology, 35(2), 43-46.

Kommers, P. A. M., & Grabinger. (1996). Hypermedia Learning Environments. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Laszlo, A., & Castro. (1995, Mar/Apr). Technology and Values: Interactive Learning Environments for Future Generations. Educational technology, 35(2), 7-13.

Lewis, M. (1999). Computer-based training: New technologies for improved effectiveness. Heating/Piping/Air Conditioning Engineering, 71(12), 53-6.

Li, R. (1993, May). Creating Interactive CBT Lessons Without Video. Educational Technology, 33(5), 20-26.

Maddux, C. D., & Cummings. (1999, May/June). Facilitating the Integration of Information Technology into Higher-Education Instruction. Educational Technology, 39(3), 43-47.

McLellan, H. (1994, October). Situated Learning: Continuing the Conversation. Educational Technology, 34(8), 7-8.

Merrill, D. M., & ID2 Research Group. (1996, May/June). Instructional Transactional Design Based on Knowledge Objects. Educational Technology, 36(3), 30-37.

Newby, T. J., & Stepich. (1996). Instructional Technology for Teaching and Learning. Englewood Cliffs, New Jersey: Merrill.

Reinhardt, L. (1999, Spring). Confessions of a "techno-teacher*." College Teaching, 47(2), 48-50.

Roblyer, M., & Edwards. (1997). Integrating Educational Technology Into Teaching. Columbus, Ohio: Merrill.

Squires, D. (1999, May/June). Educational Software for Constructivist Learning Environments: Subversive Use and Volatile Design. Educational Technology, 39(3), 48-54.

Watson, D. M., & Downes. (1999). Communications And Networking In Education. Boston: Kluwer Academic Publishers.

West, G. (1999, Summer). Teaching and technology in higher education: Changes and challenges. Adult Learning, 10(4), 16-18.

Winn, W. (1993, March). Instructional Design and Situated Learning: Paradox or Partnership. Educational Technology, 33(3), 16-21.

Winn, W. D. (1991, September). The Assumptions of Constructivism and Instructional Design. Educational Technology, 31(9), 38-40.