A comparison of video and illustrated audio as an instructional tool

Christopher E Zakrzewski
University of Nevada, Las Vegas

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A COMPARISON OF VIDEO AND ILLUSTRATED AUDIO
AS AN INSTRUCTIONAL TOOL

by

Christopher E. Zakrzewski

Bachelor of Science
Purdue University, West Lafayette, Indiana
1994

A thesis submitted in partial fulfillment
of the requirements for the

Masters of Science Degree in Hotel Administration
William F. Harrah College of Hotel Administration

Graduate College
University of Nevada, Las Vegas
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The Graduate College
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Examination Committee Chair

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Examination Committee Member

Examination Committee Member

Graduate College Faculty Representative

1017-53

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ABSTRACT

A Comparison of Digitized Video and Illustrated Audio as an Instructional Tool

by

Christopher Edward Zakrzewski

Dr. Andrew Hale Feinstein, Examination Committee Chair
Assistant Professor of Hospitality Administration
University of Nevada, Las Vegas

This study examines the differences in the acquisition of procedural knowledge between the utilization of video versus illustrated audio as an instructional tool. One hundred and forty-five students from two major southwestern universities participated in the study. Results indicate that there are no differences in the acquisition of procedural knowledge between using these instructional tools. It was also determined that several participant demographic characteristics and a participant's learning style – determined by the Gregorc Style Delineator – did not significantly moderate their acquisition of procedural knowledge.
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I would like to thank the students of the two southwest universities who participated in the study. Without their participation the data for this study would have never been collected.
CHAPTER 1

INTRODUCTION

New advances in Internet-based technology have brought the education and training fields into the “information age” (Kinnaman, 1990). Online instruction is a form of distance education delivered over the Internet. For many people, this type of instruction is perceived as a major breakthrough in teaching and learning because it facilitates the exchange of information and expertise while providing opportunities for all types of learners (Hill, 1997; Webster & Hackey, 1997).

Despite the increasing popularity of online instruction, it does have its critics. One criticism surrounding online instruction is its accessibility. The issue of accessibility encompasses the speed at which computers run, the load ability of servers holding the information, the types of online connections available, and the limited bandwidth available to send information. This issue does not affect everyone the same. Newer computers and DSL or cable modem Internet service allow users to utilize streaming digitized video; however, older computers and dial up modems are not capable of using this technology.

There is a growing effort to increase bandwidth on the Internet, which will help video streaming and improve the commercial-quality of videos on the Internet (Porter, 2000). Until bandwidth is increased and computers can connect and process information at the same high speeds, low bandwidth alternatives for procedural instruction need to be used. One alternative is illustrated audio, which can be thought of as a narrated slide...
Illustrated audio can be sent to computer users with a conventional modem at a good level of viewing quality (Blumenfeld, 2000). The smaller file sizes associated with illustrated audio (as compared to video) allow for quicker downloads on lower bandwidths (20 to 42+ kbps). This is illustrated audio’s biggest advantage (Zakrzewski, Tyrrell, & Sammons, 2003).

Another advantage of illustrated audio is that it enhances procedural-based learning through computer-assisted instruction (Horton, 2000). Procedural knowledge is the term psychologists’ use for knowing how to do something. Procedural knowledge is gained through instruction, practice, and feedback (Herz & Schultz, 1999). Proceduralization is an active form of knowledge often involving automated or unconscious steps in the performance of a task. Conscious thought is not a requirement of performing the task and practice increases the level of performance and reduces the time needed to execute the task. Research has shown that computers are an effective means of learning lower-cognitive material that involve procedural based tasks (Cotton, 1987).

Computer assisted instruction (CAI) is a multimedia venue that promotes cognitive learning through animation and narration. CAI is geared to teaching tasks that are visually oriented and procedurally related. This can be accomplished through floppy disk, CD-ROM, or Web-based training. CAI allows learners to progress at their own pace, customize their leaning experience, and receive immediate feedback.

Hospitality educators and managers can use CAI to teach students and employees how to perform daily tasks of a repetitive nature – such as napkin folding, garnishing,
sanitation procedures, and basic cooking skills (Painter & Lee, 2002). Hospitality employers and educators have a cost effective means of teaching that allows the learner the flexibility of learning in the workplace, classroom, or at home.

The growth of computer-assisted instruction in the hospitality industry presents a dilemma for hospitality students and employees who do not have the most updated computer equipment. Many older computers cannot handle digitized video but are able to run illustrated audio. This study will address that issue by examining if there is a significant difference between the rate of replay, accuracy and timeliness of students using illustrated audio and digitized video in the acquisition of procedural knowledge.

Problem Statement

As a response to the accessibility issues of distance learning, this study will assess whether illustrated audio can transfer procedural knowledge as effectively as digitized video.

Purpose of Study

The purpose of this study is to examine the rate or replay, accuracy, and timeliness of students using digitized video and illustrated audio to acquire procedural knowledge.
Research Questions

1. Is there a significant difference in a learner’s acquisition of procedural knowledge when measured by rate of replay and timeliness when utilizing digitized video versus illustrated audio?

2. Is the acquisition of procedural knowledge moderated by specific demographic characteristics in the participants?

3. Is the acquisition of procedural knowledge moderated by a participant’s learning style?

Significance of Study

Issues of Internet bandwidth will continue for some time. Educators and trainers will have to find ways of delivering quality on-line instruction. By examining digitized video and illustrated audio, this study will assist in the decision making process when deciding which tool to use. This will be accomplished by providing the decision makers with empirical information about how affective illustrated audio and digitized video are as instructional tools.

Illustrated audio was chosen for its many benefits. First, it is a low bandwidth alternative to digitized video. This increased the accessibility of the instruction. Second, it has low production costs relative to digitized video. And finally, the programs to create illustrated audio require lower skill levels to produce as compared to video. These benefits and the empirical data should encourage more instructors to use illustrated audio files when creating online course work.
Definition of Terms

**Acceptable Product** An accurate replication of the item in which the instruction is intended to produce (Painter & Lee, 2002).

**Bandwidth** How much information can be carried in a given time period (usually a second) over a wired or wireless communications link (“Introduction”, 2003).

**Computer-based education (CBE) and computer-based instruction (CBI)** These terms refer to virtually any kind of computer use in educational settings, including drill and practice, tutorials, simulations, instructional management, supplementary exercises, programming, database development, writing using word processors, and to the applications. They may refer either to stand-alone computer learning activities or to computer activities which reinforce material introduced and taught by teachers (Cotton, 1987).

**Computer-assisted instruction (CAI)** A narrower term than CBE or CBI, and most often refers to drill-and-practice, tutorial, or simulation activities offered either by themselves or as supplements to traditional, teacher directed instruction (Cotton, 1987).

**Digitized video** Video that has been digitized so that it can be controlled from a PC and displayed directly on a computer monitor (Zakrzewski et al., 2003).

**Distance Learning** Education that is accessible at a time, place, and pace that is convenient to the user (Mangan, 2001).

**Illustrated audio** A slide show with an audio narration (Zakrzewski et al., 2003).
Learning Style The typical ways in which a person takes in and processes information, makes decisions, and forms values. A person’s style is reflected in his or her behavior (Gregorc, 1982).

Procedural Knowledge Dynamic and successful utilization of particular rules, algorithms or procedures within relevant representation form(s) (Kadijevich & Haapasalo, 2001).

Limitations

The population of this study is undergraduate students enrolled in two major southwest universities. A convenient sample of these students was chosen for the ease of administering the two instructional tools and self administered the demographic survey and Gregorc Style Delineator. Randomization did occur by students self-selecting themselves into the classes which will be used for the experiment.

The study was conducted in limited hospitality classes using a digitized napkin folding video and a napkin folding illustrated audio file. Napkin folding was chosen for the ability to measure learning in terms of rate, accuracy, timeliness, and to limit independent variables such as teaching style and content.

Organization of Thesis

This thesis is organized into five chapters. Chapter 1 introduced the purpose and research questions to be addressed in this study. Chapter 2 is a literature review regarding research on distance learning, computer-based learning, digitized video, illustrated audio, media, learning style and procedural knowledge. Chapter 3 describes the methodology used for the study. Chapter 4 discusses the results of the research. And
Chapter 5 concludes by providing a summary and offers suggestions for additional research.
CHAPTER 2

LITERATURE REVIEW

Introduction

For hospitality educators and industry decision-makers, investigation of the multiple uses of computer-assisted instruction (CAI) is of great importance. Due to high-turnover and high-training costs, the industry has a need to find a more cost effective means of delivering training programs. In operations, many training programs are delivered while employees are on the job. While CAI training may not take the place of on-the-job training, the systems can deliver the demonstration phase of training in an efficient and effective manner (Harris, 1994).

The hospitality industry is weighted heavily with tasks that are procedural in nature. CAI has shown to be an effective tool in teaching procedural knowledge (Cotton, 1987). CAI increases both the effectiveness and efficiency of instruction by allowing learners to progress at their own rate, enabling content to be adapted to meet the needs of each learner, and providing immediate feedback (Lynch, 1987).

Computer-Assisted Instruction

Research suggests the combined use of computer-assisted instruction and traditional, teacher-directed instruction produces achievement effects superior to those obtained with traditional instruction alone (Cotton, 1987). Researchers have also found
that CAI enhances the rate of learning. Students were able to learn the same amount of material in less time than the traditionally instructed students. In other words, they learn more material in the same time (Cotton, 1987). Capper and Copple’s 1985 study, which examined the rate of acquisition and retention, showed that CAI users sometimes learn as much as 40 percent faster than those receiving traditional, teacher-directed instruction.

Researchers have also conducted comparative studies to measure the effectiveness of CAI on different student populations. These studies have shown that CAI is more beneficial for younger students than for older ones (Bangert-Drowns, 1985; Becker, 1987; Bracey, 1987; Ehman & Glen, 1987) and that CAI is more effective for teaching lower-cognitive material than higher-cognitive material (Bahr & Rieth, 1989; Bialo & Sivin, 1990; Hall, Mclaughlin, & Bialozor, 1989). This can be directly related to younger students having grown up with computers and their pedagogical learning style. Younger students are taught to remember and recall a wide range of material, from specific facts to complete theories, but all that is required is recalling the appropriate information (Bloom, Engelhart, Furst, Hill, & Krathwohl 1956). This learned material and knowledge represents the lowest level of learning outcomes in the cognitive domain.

Procedural Knowledge

Another element of the cognitive domain is procedural knowledge or knowing how to do something. The “something” might range from completing fairly routine exercises to solving problems (Anderson & Krathwohl, 2001). Procedural knowledge often takes the form of a series of sequential steps to be followed. It allows the learner to apply their skills to perform a specific task. Procedural knowledge is specific to
particular subject matters or academic disciplines (Anderson & Krathwohl, 2001; Kadijevich & Haapasalo, 2001; McCormick, 1997).

One approach to understanding the attainment of knowledge is Anderson’s (1993) Adaptive Control of Thought-Rational (ACT-R) theory. ACT-R holds that long-term knowledge is declarative or procedural in nature. Declarative knowledge is comprised of facts, instructions, examples, and concepts. Declarative knowledge takes place when descriptions of the steps of a new cognitive task are added to long-term memory. As the cognitive task is repeatedly performed, proceduralization converts declarative knowledge into procedural knowledge.

Proceduralization builds declarative knowledge into productions, which underlie the ability to perform a task (Herz & Schultz Jr., 1999). Actually undertaking a task is the result of procedural memory containing the necessary knowledge to apply skills, techniques, and procedures. Procedural knowledge is the application of knowledge and skills through practice and repeated experience; it is learning by doing.

To develop instructional strategies that promote the acquisition of procedural knowledge, it is necessary to understand the steps involved in the acquisition of such knowledge. Anderson’s (1993) model of skill acquisition, shown in Figure 1, illustrates how procedural knowledge is not only represented in memory; it is processed.

The first step is the acquisition of declarative knowledge by direct encoding of instructions and observations. Transformation of declarative knowledge requires developing the ability to solve problems using past experiences. Procedural knowledge is acquired when the learner can apply the knowledge to solving new problems in an efficient manner. A basic premise of Anderson’s (1993) theory is that the learner’s
problem solving abilities continually improve as the learner acquires more pertinent experience and practice.

Figure 1: Model of Skill Acquisition

Research on Media

Teaching procedural skills and strategies can be done through the use of symbol systems and media (Salomon, 1983). Symbol systems are words, pictures, and diagrams that represent activities, people, objects, ideas, concepts, thoughts, and theories in a well thought-out manner that forms a storyline (Salomon, 1984). Media are the platforms that employ certain symbol systems to convey a message. Examples of different types of media are: books, radio, television, computers, and multi-media. Media can be compared and contrasted based on their ability to convey symbol systems. Radio is an auditory platform compared with television that uses audio and visual elements (Johnston, 1987). Computers and television share the use of pictorial and audio-linguistic symbol system capabilities. These characteristics are important in defining, distinguishing, and analyzing media because they are relevant to how information is committed to memory and processed by learners.

Generally, each new medium seems to attract its own set of advocates who make claims for improved learning and inspire research questions which are similar to those asked about the previously popular medium. Most of the radio research approaches suggested early on (Hovland, Lumsdaine, & Sheffield, 1949) were very similar to those employed by the television movement of the 1960’s (Schramm, 1977) and to the reports of the computer-assisted instruction studies of the 1970s and 1980s (Dixon & Judd, 1977; Kulik, Bangert, & Williams, 1983).

The influences of audio media, radio, phonographs, and telephones, have been around for nearly 120 years. From early phonographs to the modern radio, audio has played an educational role since the 1930’s. Research conducted in the 1960’s indicated...
that radio and audiotape were effective at duplicating traditional face-to-face instruction (Johnston, 1987; Meene, Klingenschmidt, & Nord, 1969). These same studies also revealed advantages when teaching music and foreign languages; since the audio track forced students to focus on the spoken word or musical arrangement and less on visual queues.

The next phase in the evolution of media as an instructional tool is the introduction of television into classrooms during the 50's. Television afforded educators the ability to combine audio with a visual medium. The early versions of educational television simply recreated the traditional classroom by allowing the instruction to be viewed in classrooms or at home. By the end of the 1960s a new form of instructional and entertainment television was emerging due to the success of “Sesame Street.” Shows of this type captured a large viewing audience in homes and schools during the 1970s (Johnston, 1987). Ball and Bogatz’s (1970) research demonstrated that the shows were effective in teaching literacy skills to pre-school viewers. It was not until the 1980s that studies were performed which compared the listening/viewing experience in terms of comprehension (Meringoff, 1980; Beagles-Roos & Gat, 1983). This type of comparative analysis showed that depending on the educational objectives different media may need to be employed.

Researchers have raised concerns about the amount of active learning that takes place during instruction using video (Soloman, 1983, 1984; Soloman & Leigh, 1984). The results suggested that learners view video as an easier form of learning than using print based materials. In 1992, Cennamo studied college students and found that they
perceived video better for lower cognitive learning and that print based materials better for higher levels of material.

Instruction using video is characterized by the transient nature of its presentation, which is the benefit of using recorded video rather than television. Hannafin (1986) found that the use of video commands the attention of the viewer and increases the learner's interest towards the subject matter.

Video simply builds on the use of audio by adding pictures and symbols in either still or motion format (Johnston, 1987). This gives the learner the ability to see an object being discussed. The advantage of being able to adjust instruction to conform to the need of the user, self-paced instruction, to restart as many times as needed, and to instruct a group while providing individualized attention, are some of the advantages of video. The ability to restart the instruction allows the learner the ability to practice and to view examples as many times as needed (Anderson, 1983).

Though there are many benefits to using digitized video, one disadvantage continues to come to the forefront when discussing the use of digitized video as an instructional tool. The disadvantage is its large file sizes. The large file sizes create a barrier to individuals with slower computers or have slow internet services.

Illustrated audio, a method of CAI, which works in conjunction with steaming technologies such as Real Player, Quicktime, and Windows Media Player, can be thought of as a slide show with a narrative. Presentations using Microsoft PowerPoint can be easily converted to illustrated audio lectures by recording the classroom lectures (preferably in digital format) and incorporating the existing PowerPoint slides with the captured audio (Zakrzewski et al., 2003). Developing illustrated audio presentations in
this manner allows the classroom activities to be shared with individuals not able to attend a particular lecture or those simply wishing to review the day's activities (Howles, 2002).

Audio content can be streamed to users at a sufficient level of quality to make the effort worthwhile (Blumenfeld, 2000). The smaller file sizes associated with illustrated audio (as compared to video) allow for quicker downloads on lower bandwidths. This is by far the most complimentary advantage of illustrated audio. In addition, illustrated audio requires very little in terms of production expertise as would be expected in a video presentation. Versions of PowerPoint from 2002 and on will work with Microsoft Producer, a free download. The relatively low cost and ability to incorporate the technology with existing classroom materials makes illustrated audio an interesting alternative to digitized video for reaching students via the web.

A powerful attribute to CAI is its capacity to individualize instruction to meet the specific needs of the learner (Rasmussen & Davidson, 1996). Thorndike (as cited in Hergenhahn & Olson, 1993) recognized that individuals learn differently. These differences can be defined by culture, emotional, personal, and biological factors. From these differences comes the concept of learning style. Learning style refers to a student's consistent way of addressing and using stimuli in the contest of learning (Hergenhahn & Olson, 1993).

Learning Theory

In a study by Friend and Cole (1990), CAI was found to have more favorable characteristics for those individuals who learn better in a sequential manner than those
individuals who think more in a random pattern. Enochs, Handley, & Wollenberg (1984) using Kolb’s *Learning Style Inventory* learned that concrete learners learned better from CAI than did abstract learners. Further support of these findings were suggested by Pritchard (1982) (as cited in Wood, Ford, Miller, Sobczyk, & Duffin 1996). He explains that CAI is best suited for individuals with an affinity for accuracy and attention to detail. He continues by stating that learners with certain learning styles may be more partial to learning with CAI than others and those individuals who excel with CAI tend to enjoy working alone.

According to Gregorc (1985), sequential students tend to prefer CAI because the computer is seen as an extension of the sequential person’s mind. Random individuals require environments which are flexible and provide opportunities for multidimensional thinking. Individuals who process information in an abstract and random fashion are inherently social and enjoy learning with others and tend to shy away from learning with computers (Butler, 1984). Moreover, because a computer requires sequential thinking in order to gain access to its content, many CR and AR individuals may become flustered and agitated when problems arise with the medium.

The Gregorc Style Delineator developed in 1979 by Anthony F. Gregorc, Ph.D. was created as a self-analysis tool. It is based on a mediation ability theory which states that the human mind has channels through which it receives and expresses information most efficiently and effectively. The power, capacity, and dexterity to utilize these channels are collectively termed mediation abilities. The outward appearance of an individual’s mediation ability is what is popularly termed “style.” The delineator is
designed to reveal two types of mediation abilities: perception and ordering (Gregorc, 1982).

"Perceptual abilities are the means through which you grasp information. These emerge as two qualities: abstractness and concreteness. Abstractness enables one to grasp, conceive, and mentally visualize data through the faculty of reason and to emotionally and intuitively register and deal with inner and subjective thoughts, ideas, concepts, feelings, drives, desires, and spiritual experiences. This quality permits one to apprehend and perceive that which is invisible and formless to your physical senses of sight, smell, touch, taste, and hearing" (Gregorc, 1982, p.5). Concreteness enables one to grasp and mentally register data through the direct use and application of the physical senses. This quality permits one to comprehend that which is visible in the concrete, physical world through your physical senses of sight, smell, touch, taste, and hearing.

Ordering abilities are the ways in which one authoritatively arranges, systematize, reference, and dispose of information. These emerge as two qualities: sequence and randomness (Gregorc, 1982).

Sequence disposes one's mind to grasp and organize information in a linear, step-by-step, methodical, and predetermined order. Information is assembled by gathering and linking elements of data and piecing them together in a chain-like fashion. This quality enables one to naturally sequence, arrange, and categorize discrete pieces of information. It further encourages one to express oneself in a precise, progressive, and logically systematic manner (Gregorc, 1982).

Randomness disposes one's mind to grasp and organize information in a nonlinear, galloping, leaping, and multifarious manner. Information is also held in
abeyance and, at any given time, each piece or chunk has equal opportunity of receiving one’s attention. Such information, when brought into order, may not adhere to any prior or previously agreed upon arrangement. This quality enables one to deal with numerous, diverse, and independent elements of information and activities. Multiplex patterns of data can be processed simultaneously and holistically. This quality encourages one to express oneself in an active, multifaceted and unconventional manner (Gregorc, 1982). The coupling of these qualities merged to form four distinct transaction ability channels designated as: Concrete/Sequential, CS; Abstract/Sequential, AS; Abstract/Random, AR; and Concrete/Random, CR (Gregorc, 1982).

In considering how to translate these principles into an instructional system delivered via multimedia; each medium’s strengths must be considered. Video is effective for setting context, modeling, motivating, and illustrating concepts and examples (Sabatini, 2001). Strengths of computer media include the capabilities of data processing, graphic design, spreadsheets, databases, and other programming. Computers can store and display print, graphics, photos, animation, and video. Networked computers provide the added capabilities of communication and access to wider informational resources. Internet connected computers provide access to vast amounts of information and resources that are otherwise unattainable in a single instructional setting (Sabatini, 2001). Over the years, researchers have taken many of these instructional delivery systems and conducted experiments to measure everything from satisfaction to the rate it takes someone to learn the information (Boling & Robinson, 1999; Carrell & Menzel, 2001; Gilmore & Fritsch, 2001; Horton, 2000; Li, 2002; Painter & Lee, 2002; Pane, Corbett, & John, 1996; Sambrook, 2001).
Measurement

Many research studies, journal articles, and reports focus on validation of methods, procedures, or programs (Binder, 2001). They present measures to demonstrate that a particular intervention or approach produced the desired effect (or failed to do so) or worked better than another. Due to the natural variability of the real world, a program or intervention may work in one setting and not another. Consequently, for the practitioner, validation data are not sufficient. One must continue to measure the variables in any new situation to determine whether the intervention actually works in that case (Binder, 2001).

Identifying and measuring a behavior or performance requires choosing a countable unit. This was the essence of Skinner’s measurement system which counts the critical effects or “accomplishments” of subjects in experimental situations and monitored those counts continuously over time (Gilbert, 1996).

Gilbert listed nine “requirements” or types of criteria that one might evaluate in efforts to define or improve human performance. Table 1 shows a simple translation of the countable units Gilbert speaks of which will be relevant to this study.
Table 1.

**Countable Unites Corresponding to Gilbert's Requirements.**

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<th>Measurement</th>
<th>Description</th>
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<tr>
<td>Quality</td>
<td>Accuracy</td>
<td>Count of accurate items</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Count of inaccurate items</td>
</tr>
<tr>
<td>Quantity</td>
<td>Rate</td>
<td>Count of any behavior or accomplishment per unit of time (minute, hour, day, week, etc.)</td>
</tr>
<tr>
<td>Timeliness</td>
<td></td>
<td>Count of timely events or items</td>
</tr>
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<td></td>
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<td>Count of untimely events or items</td>
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</tbody>
</table>


The traditional approach to measuring learning has been to assess accuracy only, using percent-correct scores. Such an approach entirely disconnects learning measurement from performance. The field of precision teaching (Binder & Watkins, 1990; Lindsley, 1997) and the FluencyBuilding™ methodology (Binder & Bloom, 1989) present robust models for using count-per-minute measures to assess progress in learning and coaching programs (Binder, 2001).

In 1993, Miller, McKenna, & Ramsey conducted a study entitled "An Evaluation of Student Content Learning and Affective Perceptions of a Two-way Interactive Video Learning Experience." In the study, the critical independent variable was location of instruction, operating at two levels: "live" and "remote." Since all students created data points under each of these conditions, a repeated measures design allowed them to act as their own control. Performances on three different dependent measures were indexed:

20
two attitudinal scores (1-10) and the percentage of items correct over lecture content (Miller et al., 1993).

Current Study

This current study builds on research completed by Carrell and Menzel (2001) and Painter and Lee (2002), which examined distance learning and computer-assisted instruction respectively. Both studies provided guidance towards the variables to be tested in this study. Painter and Lee (2002) used randomization to account for participant age, gender, and previous knowledge. The Carrell and Menzel (2001) study used the Gregorc Style Delineator as the assessment instrument for individual learning style.

Carrell and Menzel (2001) examined participant learning, motivation, and perceived immediacy. The researchers used the Gregorc Style Delineator to determine individual learning styles for the participants. Their results concluded that there was no such link between individual learning style and knowledge acquisition. The important factor from this study to the current study is participant learning.

Painter and Lee’s (2002) study assessed the effectiveness and efficiency of an Internet based CAI tutorial program for educating undergraduate students in napkin folding and garnishing skills. To compare the effectiveness and efficiency of the written diagrams with computer videos, they measured the students’ understanding of the tasks by their ability to produce acceptable products and the time required to complete the tasks. To avoid prior exposure to depictions that would compromise the study, the subjects were not shown written diagrams (Lynch, 1987) for the same napkin folds and garnishes that were viewed in the computer trials. The effects of order were controlled.
by having half the subjects start with the computer videos and the other half with the written diagrams. In the written diagrams and the computer videos, subjects were permitted to refer to the materials and replay the videos, repeatedly, as many times as they needed to learn the material within the allotted time (Painter & Lee, 2002).

Based on this previous research, five variables were chosen for examination in this study: age, gender, computer comfort level, previous napkin folding experience and learning style. Many comparative studies which compared CAI to traditional instruction concluded that CAI was more beneficial for younger students. In regards to gender Roblyer (1988) concluded after looking at 82 studies on computer-based education, that there was no statistical difference between the learning outcomes of males and females.

Research Questions and Hypotheses

The purpose of this study was to examine the rate, accuracy, and timeliness of students using digitized video and illustrated audio to produce an acceptable product. Additionally, the researcher examined specific demographic variables to see if they would moderate changes in the rate, accuracy, and timeliness of learning. This study can provide managers and educators in the hospitality industry with empirical information about how effective illustrated audio and digitized video are as instructional systems. The three research questions described in Chapter 1 were converted into research hypotheses.

1. Is there a significant difference in a learner’s acquisition of procedural knowledge when measured by rate of replay and timeliness when utilizing digitized video versus illustrated audio?
$H_{10}$: There is a significant difference in the learner's acquisition of procedural knowledge when utilizing digitized video and illustrated audio.

$H_{10}$: There is no difference in the learner's acquisition of procedural knowledge when utilizing digitized video and illustrated audio.

2. Is the acquisition of procedural knowledge moderated by specific demographic characteristics?

$H_{20}$: The acquisition of procedural knowledge is moderated by specific demographic characteristics.

$H_{20}$: The acquisition of procedural knowledge is not moderated by specific demographic characteristics.

3. Is the acquisition of procedural knowledge moderated by learning style?

$H_{30}$: The acquisition of procedural knowledge is moderated by learning style.

$H_{30}$: The acquisition of procedural knowledge is not moderated by learning style.

Summary

With the growing presence of distance learning as an alternative to traditional classroom teaching, this chapter examined the relevant research in the area of CAI. It also examined the relevant research in the area of media and computer-assisted instruction. The researcher also made a connection between instruction and the measurements used to evaluate learning. The performance indicators chosen after a review of the literature were rate of replay, accuracy, and timeliness. Finally, the hypotheses are developed from the literature reviewed and the questions addressed earlier in Chapter 1.
CHAPTER 3

METHODOLOGY

Introduction

The purpose of this study is to examine the rate or replay, accuracy, and timeliness of students using digitized video and illustrated audio to acquire procedural knowledge. These delivery technologies are commonly used with computer-based training and distance-learning (Horton, 2000). This study will provide educators and trainers in the foodservice industry with empirical information on the effectiveness of digitized video and illustrated audio.

Research Design

Subjects

The subjects for this study were a convenience sample of undergraduate students at two southwestern university hospitality programs. These participants were obtained by requesting volunteers out of five different upper level hospitality classes. Once the participants were identified they were randomly assigned to one of the two delivery methods.

Setting

The experiment was carried out in university computer labs. The computers were loaded with the two instructional tools. Headphones were provided to minimize
distractions from other computers and participants. The computers were also spaced far enough apart to limit participant interaction.

**Dependent Variables**

The dependent variables, as shown in Table 2, were accuracy, rate of replay, and the timeliness (Binder, 2001). Accuracy was defined by two different variables. The first was the number of steps the participants completed of the napkin fold. The second was whether the participants created an acceptable product. Acceptable product is defined as an accurate replication of the item in which the instruction is intended to produce (Painter & Lee, 2002). Rate of replay addresses how many times the participant restarted the instruction to achieve the acceptable product. Timeliness was the time from the initial starting of the instruction until the participant felt comfortable with their end product.

**Independent Moderating Variables**

Five moderating variables were chosen as seen in Table 2: previous napkin folding experience, computer comfort level, age, gender, and learning style. Napkin folding experience was chosen based on the study by Painter and Lee (2002). In their study, the authors controlled variation in the initial level of knowledge by randomly assigning the participants to the two treatments.
Table 2

*Dependent, Independent, and Moderating Variables and Descriptions*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Value or Category</th>
<th>Response Number</th>
<th>Used As</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>Steps Completed</td>
<td>1,2,3,4,5,6,7,8,9, 10,11,12,13,14</td>
<td>Nominal</td>
</tr>
<tr>
<td></td>
<td>Acceptable Product</td>
<td>1 = Yes, 2 = No</td>
<td>Categorical</td>
</tr>
<tr>
<td>Rate</td>
<td>Replay Instruction</td>
<td></td>
<td>Nominal</td>
</tr>
<tr>
<td>Timeliness</td>
<td>Length to complete</td>
<td></td>
<td>Nominal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Definition</th>
<th>Response Range</th>
<th>Used As</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digitized Video</td>
<td>Video</td>
<td>0</td>
<td>Nominal</td>
</tr>
<tr>
<td>Illustrated Audio</td>
<td>Audio with Narrative</td>
<td>1</td>
<td>Nominal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Independent Moderating Variables</th>
<th>Definition</th>
<th>Response Range</th>
<th>Used As</th>
</tr>
</thead>
<tbody>
<tr>
<td>Napkin Folding Experience</td>
<td>Napkin Folding</td>
<td>1 = Yes, 2 = No</td>
<td>Categorical</td>
</tr>
<tr>
<td></td>
<td>Experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Comfort Level (COMC)</td>
<td>Comfort Level</td>
<td>1 = Very Uncomfortable, 2 = Uncomfortable, 3 = Neutral, 4 = Comfortable, 5 = Very Comfortable</td>
<td>Categorical</td>
</tr>
<tr>
<td>Age (AGE)</td>
<td>Years Old</td>
<td>Self-reported</td>
<td>Continuous</td>
</tr>
<tr>
<td>Gender (GEN)</td>
<td>Male or Female</td>
<td>1 = Male, 2 = Female</td>
<td>Categorical</td>
</tr>
<tr>
<td>Learning Style (STYL)</td>
<td>Learning Style</td>
<td>1 = Concrete Sequential, 2 = Abstract Sequential, 3 = Concrete Random, 4 = Abstract Random</td>
<td>Categorical</td>
</tr>
</tbody>
</table>
The Gregorc Style Delineator

This assessment tool was selected, in part, for the following reasons: easy to administer, easy to interpret, self-scoring battery, relatively quick to administer, easily reportable scales, and validity and reliability measures have been supported by research as seen in Table 3.

Joniak and Isaken (1988) examined the internal consistency of the Style Delineator™. The data revealed alpha coefficients ranging from 0.23 to 0.66, below that which was reported by Gregorc (1982). O'Brien (1990) found similar results. Using a sample size of 263 undergraduate students, O'Brien reported alpha coefficients ranging from 0.51 for the abstract sequential (AS) scale to 0.64 for the concrete sequential (CS) scale, but concluded that internal consistency scales meet minimal requirements for factor definition (O'Brien, 1990).

Gregorc (1982) reported test-retest alpha coefficients of 0.85 to 0.88. In addition, Gregorc published internal consistency reliability coefficients ranging from 0.89 for the AS scale to 0.93 for the abstract random (AR) scale, and predictive validity correlations ranging from 0.55 to 0.76 (all figures significant at the p < 0.001 level). Results were based on a sample of 110 participants.
<table>
<thead>
<tr>
<th>Reasons</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-scoring Battery and Easy</td>
<td>The inventory’s scores are obtained by ranking four words at a time (‘1’</td>
</tr>
<tr>
<td>to Administer</td>
<td>indicating “least like me”, ‘4’ indicating “most like me”).</td>
</tr>
<tr>
<td></td>
<td>Ten categories of four words determine the scores for each of the four</td>
</tr>
<tr>
<td></td>
<td>mind-styles. Each word corresponds to a particular mediation channel, and</td>
</tr>
<tr>
<td></td>
<td>when summed, gives a measure of a person’s propensity for operating within</td>
</tr>
<tr>
<td></td>
<td>specific learning channels.</td>
</tr>
<tr>
<td>Easy to Interpret and easily</td>
<td>Gregorc (1982) divides the scores received on The Style Delineator into</td>
</tr>
<tr>
<td>Reportable Scales</td>
<td>three levels:</td>
</tr>
<tr>
<td>Relatively Quick to Administer</td>
<td>1) Strong orientation towards qualities associated with the particular</td>
</tr>
<tr>
<td></td>
<td>channel, indicated by a score of 27-40</td>
</tr>
<tr>
<td></td>
<td>2) Moderate ability, indicated by a score range of 16-26 on any one</td>
</tr>
<tr>
<td></td>
<td>mediation channel</td>
</tr>
<tr>
<td></td>
<td>3) Minimal capacity, indicated by a score of 10-15 in a specific channel</td>
</tr>
<tr>
<td>Validity and Reliability</td>
<td>The entire process from the participant completing the style delineator to</td>
</tr>
<tr>
<td></td>
<td>the time it is interpreted is less than ten minutes.</td>
</tr>
<tr>
<td></td>
<td>Predictive validity correlations ranging from 0.55 to 0.76 at a significance</td>
</tr>
<tr>
<td></td>
<td>level of p &lt; 0.001.</td>
</tr>
</tbody>
</table>
Experimental Design and Procedures

This experiment consisted of two treatments: (1) digitized video and (2) illustrated audio. A four minute napkin folding video was developed, which allowed the participants to start, stop, and replay the video with great ease. Once the video was developed, the audio track and still pictures from the video were separated and used for the illustrated audio, which minimized bias. Then the two delivery types were uploaded onto the universities' intranet sites.

The participants were first asked to complete a short demographic survey and the Gregorc Learning Style Delineator. These two items took about ten minutes to complete. Once completed the participants were instructed on the procedures for starting, stopping, and replaying the two types of instruction.

The participants were allowed to watch the instruction as many times as they desired until satisfied with their ability to create an acceptable product. Before viewing the instruction, the participants were requested to create an acceptable product when they felt comfortable with their knowledge on how to proceed. They were allowed to refold the napkin as many times as they needed to create the napkin fold.

The participants self-recorded their results. The two variables they were responsible for recording were how many times they had to restart the instruction and the time it required for them to achieve an acceptable product. The participants were given a form developed by the researcher for recording purposes. Once completed the participants were instructed to raise their hands. An observer would then record whether the napkin would be considered an acceptable product. To minimize bias there was only
one observer who would judge the participants final product. The observer was the individual who developed the napkin folding video and illustrated audio file.

Evaluation

This section describes the assessment instrument and model used to evaluate the effect digitized video and illustrated audio have on rate of replay and timeliness of students producing an acceptable product (see Figure 2). Additionally, this evaluation examined the moderating affect of specific demographic variables: age, gender, napkin folding experience, computer comfort level, and learning style. Carrell and Menzel (2001) looked at the variations in learning, motivation, and perceived immediacy between live and distance learning. To assess the variation in learning, the Gregorc Cognitive Style Delineator (Gregorc, 1982) was used to identify each participant’s individual learning style. This study will also use the delineator to examine the affect learning style has on rate of replay and timeliness of learning with digitized video and illustrated audio.
In an effort to evaluate the impact digitized video and illustrated audio have on the rate of replay and timeliness of learning, an instrument was designed to record rate of replay, accuracy, and timeliness of learning. The Gregorc Style Delineator and a small demographic survey created by the researcher were used to look at the impact that these variables have on the rate of replay and timeliness of the learner's acquisition of procedural knowledge. The Gregorc Style Delineator was chosen because it differentiates between styles by looking at how individuals order thoughts in their mind (Gregorc, 1985). The implementation of the Gregorc Style Delineator to assess learning style became the choice for this study since this research examines the acquisition of procedural knowledge, which has an ordering effect.
Demographics

The demographic survey consisted of four areas of interest: previous napkin folding experience, computer comfort level, age, and gender. These were chosen to assess their influence on the dependent variables rate of replay, accuracy, and timeliness (Karriker & Spaite, 1999; Carrell & Menzel, 2001). Participants were asked whether they had previous napkin folding experience. Painter and Lee (2002) in their research did not ask this question, they accounted for previous knowledge by using randomized sampling. Self-perceptions of computer comfort were measured using a five-point Likert-type scale. The scale ranged from low to high as follows: 1= “very uncomfortable” to 5= “very comfortable” (Karriker & Spaite, 1999).

Analysis

For analysis of the hypotheses, both descriptive and inferential statistics methods were used. Descriptive statistics, including frequencies and percentages, were used to describe or characterize the obtained data. Inferential statistics was used to test the three hypotheses for the mean differences using Multivariate Analysis of Variance (MANOVA).

The MANOVA, as seen in Figure 3, was run to compare the differences in means of the three independent variables, accuracy, rate of replay, and timeliness, to assess their affect on five dependent variables.

The two underlying assumptions when testing the hypothesis are as follows.

1. The two samples drawn from the respective populations are independent.
2. The variances of the two populations are equal.
\[ Y_{1+} Y_{2+} Y_{3+} = \mu + \text{Treatment} + \text{Age} + \text{Gender} + \text{Computer Comfort} + \text{Napkin Folding Experience} + \text{Learning Style} + \text{Treatment*Age} + \text{Treatment*Gender} + \text{Treatment*Computer Comfort Level} + \text{Treatment*Napkin Folding Experience} + \text{Treatment*Learning Style} + \varepsilon \]

Where:

\( Y_1 \) = Rate for \( Y \)-th individual

\( Y_2 \) = Timeliness for \( Y \)-th individual

\( Y_3 \) = Accuracy for \( Y \)-th individual

\( \mu \) = Overall Mean

Treatment = Fixed Effect = 0,1 (Digitized Video, Illustrated Audio)

Age = Fixed Effect = 1,2,3,4 (17-18, 19-20, 21-22, 23+)

Gender = Fixed Effect = 1,2 (Male, Female)

Computer Comfort Level = Fixed Effect = 1,2,3,4,5 (Very Uncomfortable, Uncomfortable, Neutral, Comfortable, Very Comfortable)

Napkin Folding Experience = Fixed Effect = 1,2 (Yes, No)

Learning Style = Fixed Effect = 1,2,3,4 (Concrete Sequential, Abstract Sequential, Concrete Random, Abstract Random)

\( \varepsilon \) = Error Term

Figure 3. Research design of the Multivariate Analysis of Variance (MANOVA).
CHAPTER IV

RESULTS

Introduction

Data collected in this study were analyzed to identify whether differences could be found in the accuracy, rate of replay, and timeliness of participants using digitized video and illustrated audio (delivery type) in the acquisition of procedural knowledge. The data was also analyzed to determine if any of the five characteristics of the participants (their responses to the demographic questions and their Gregorc Learning Style) could explain participants' variability in their dependent variable responses. In essence, we tried to determine if any assessed characteristics identified homogenous traits in some of the participants.

Profile of the Participants

Undergraduate students (n=174) from two southwestern universities volunteered to participate in this study. The participants were compiled from seven different hospitality classes from the two universities. Out of the 174 participants, 20 did not complete either the survey or the style delineator and 9 did not complete an accurate napkin fold; resulting in an 83% response rate.

All statistical analysis was done using SPSS, release 11.0.1 (2001) at the $\alpha = .05$ significance level. Participants were 58.6% female and 41.4% male (see Figure 4). Ages
ranged from 19 to 54 years. Just over 76% of the participants were between the ages of 19 and 24 as seen in Figure 5.

Figure 4. Percent of Participants Who Were Male and Female.

Figure 5. Percent of Participants Who Fell Within the Four Age Ranges.
Figure 6 illustrates that 56.6% of the participants reported having previous napkin folding experience. A majority of the participants (79.3%) reported their comfort level with computers to be at least comfortable (see Figure 7). The Gregorc Style Delineator identified 40% of participants as concrete sequential learners, 13.8% were abstract sequential, 22.8% were abstract random, and 23.4% were concrete random (see Figure 8).

![Figure 6. Percent of Participants Who Reported Previous Napkin Folding Experience.](image-url)
Figure 7. Participants Reported Computer Comfort Level by Percentage.
Figure 8. Frequency of Reported Learning Styles.

Results

The first research question was analyzed using MANOVA to observe the affect that delivery type had on the acquisition of procedural knowledge. First, the two dependent variables were analyzed for correlation using Pearson’s correlation coefficient (C). It was determined that both variables were correlated at $\alpha = 0.05$ significance level ($p = 0.00$).
The first research question was converted into a hypothesis for testing:

\[ H_1 = \text{There is no significant difference in the learners' acquisition of procedural knowledge when utilizing digitized video and illustrated audio.} \]

Procedural knowledge was measured using two dependant variables; rate of replay and the time it required the participants to complete the experiment. The analysis indicated that there was no significant difference (\( F = 0.018, p = .983 \)) in procedural knowledge scores in participants using either CAI at \( \alpha = 0.05 \) level of significance (Table 4). These results failed to reject hypothesis one.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Criterion</th>
<th>Value</th>
<th>F</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery Type</td>
<td>Wilk's</td>
<td>1.000</td>
<td>.018</td>
<td>(2, 142)</td>
<td>0.983</td>
</tr>
</tbody>
</table>

Note: Tested using Wilk's Lambda Generalized Likelihood Ratio Test

Additionally, the researchers examined if the acquisition of procedural knowledge was influenced by specific participant characteristics. It was hypothesized that four characteristics: age, gender, previous napkin folding experience, and computer comfort level would have no effect on the acquisition of procedural knowledge.
H$_2$ = There is no significant difference in the acquisition of procedural knowledge when moderated by specific participant characteristics.

MANOVA indicated that the participant characteristics had no significant impact on the acquisition of procedural knowledge as indicated in Table 5 with the variables having scores from (F = 2.184, p = 0.117) to (F = 0.411, p = 0.871). The hypothesis failed to be rejected.

Table 5

<table>
<thead>
<tr>
<th>Multivariate Analysis of Variance of Delivery Type by Participant Characteristics (MANOVA)</th>
<th>Value</th>
<th>F</th>
<th>d</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.758</td>
<td>.821</td>
<td>(38, 210)</td>
<td>0.762</td>
</tr>
<tr>
<td>Gender</td>
<td>0.960</td>
<td>2.187</td>
<td>(2, 105)</td>
<td>0.117</td>
</tr>
<tr>
<td>Previous Know.</td>
<td>0.973</td>
<td>1.452</td>
<td>(2, 105)</td>
<td>0.239</td>
</tr>
<tr>
<td>Comfort Level</td>
<td>0.924</td>
<td>1.414</td>
<td>(6, 210)</td>
<td>0.211</td>
</tr>
<tr>
<td>Delivery Type</td>
<td>0.981</td>
<td>0.994</td>
<td>(2, 105)</td>
<td>0.373</td>
</tr>
<tr>
<td>Delivery Type * Age</td>
<td>0.825</td>
<td>1.325</td>
<td>(16, 210)</td>
<td>0.184</td>
</tr>
<tr>
<td>Delivery Type * Gender</td>
<td>0.981</td>
<td>1.006</td>
<td>(2, 105)</td>
<td>0.369</td>
</tr>
<tr>
<td>Delivery Type * Previous Napkin Folding Experience</td>
<td>0.970</td>
<td>1.600</td>
<td>(2, 105)</td>
<td>0.207</td>
</tr>
<tr>
<td>Delivery Type * Computer Comfort Level</td>
<td>0.977</td>
<td>0.411</td>
<td>(6, 210)</td>
<td>0.871</td>
</tr>
</tbody>
</table>

Note: Tested using Wilk's Lambda Generalized Likelihood Ratio Test
Finally, the researchers hypothesized whether the participants' learning style had a significant impact on the acquisition of procedural knowledge.

\[ H_3 = \text{There is no significant difference between the acquisition of procedural knowledge based on learning style.} \]

After analyzing the data, the researchers failed to reject the null hypothesis with a score of \( F = 0.969, p = 0.635 \) at \( \alpha = 0.05 \) significance level (Table 6).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>F</th>
<th>d</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery Type</td>
<td>0.998</td>
<td>0.112</td>
<td>(2, 136)</td>
<td>0.894</td>
</tr>
<tr>
<td>Learning Style</td>
<td>0.969</td>
<td>0.719</td>
<td>(6, 272)</td>
<td>0.635</td>
</tr>
<tr>
<td>Delivery Type * Learning Style</td>
<td>0.947</td>
<td>1.257</td>
<td>(6, 272)</td>
<td>0.278</td>
</tr>
</tbody>
</table>

Note: Tested using Wilk's Lambda Generalized Likelihood Ratio Test

Summary of Findings

Hypotheses from three research questions were tested to determine whether differences existed in the acquisition of procedural knowledge when using digitized video and illustrated audio and the instructional tools. Acquisition was tested by looking at three variables; accuracy, rate of replay, and timelines. Once data was collected it was determined that accuracy was not a valid predictor of the acquisition of knowledge due to
participants having an accuracy rate of 93.7%. The researcher as a result decided to analyze the participants who completed an accurate product by examining their rate of replay and timeliness.

Hypothesis one derived from research question one focused on whether there was a difference in the acquisition of procedural knowledge when utilizing digitized video and illustrated audio as measured by rate of replay and timeliness. The results failed to reject the null hypothesis. The choice of delivery type had no impact on the rate of replay and timeliness.

Hypothesis two derived from research question two examined whether four demographic characteristics impacted rate of replay and timeliness. The results failed to reject the null hypothesis. This determined that the participants’ age, sex, previous napkin folding experience, or computer comfort level had no impact on rate of replay or timeliness.

Hypothesis three derived from research question three focused on whether the participant’s individual learning style impacted rate of replay and timeliness. The results failed to reject the null hypothesis. Learning styles did not affect the acquisition of procedural knowledge when measured by rate of replay and timeliness. These results determined that there were no significant differences between rate of replay and timeliness when utilizing digitized video or illustrated audio.
CHAPTER 5

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

This chapter includes a summary of the research design and research questions. Major findings of this study are listed and possible explanations are also provided in an attempt to explain the “no significant difference” between the use of digitized video and illustrated audio in the acquisition of procedural knowledge when measured by rate of replay and timeliness. Limitations of this study are discussed, followed by the significance of this study. The last section makes recommendations for future related research.

Summary

The use of CAI continues to have a growing presence in the hospitality industry, from training of new employees to the continuing education of current employees. The same growth can be seen in hospitality education. Universities are continuing to develop online courseware as a supplement and sometimes a replacement for the traditional classroom.

This is important to the hospitality industry, because CAI has been proven useful for teaching procedural knowledge (Cotton, 1987; Horton, 2000; Lynch, 1987; Painter & Lee, 2002). Procedural knowledge often takes the form of a series of sequential steps to be followed. These types of tasks can be seen in front-of-the-house operations in tasks
such as, napkin folding, setting tables, and opening bottles of wine. It can also be seen in
the back-of-the-house in such tasks as garnishing, completing recipes, and prepping raw
food product. The development of CAI using digitized video can be used to teach many
of these fore mentioned tasks.

This development continues to raise issues for the employees and students of the
industry and universities respectively. The first issue is the diversity of computer
equipment employees and students use from home. These differences include slower
processing computers as well as individuals using dial-up Internet service verses DSL or
cable modem. These equipment shortfalls make it more difficult for trainees or students
to download and view instructional video. An alternative to digitized video which
operate well with low bandwidths and slower computers is illustrated audio.

Summary of Key Findings

Hypothesis one examined whether an individuals rate of replay and/or timeliness
was affected when utilizing digitized video or illustrated audio. When the two delivery
methods were compared using MANOVA, the results indicated no significant difference
between digitized video and illustrated audio as a tool for the acquisition of procedural
knowledge when measured by rate of replay and timeliness. As a result, the research
failed to reject hypothesis one.

Hypothesis two stated that there would be no significant difference in the
acquisition of procedural knowledge when moderated by specific participant
characteristics. The characteristics tested where age, gender, computer comfort level, and
previous napkin folding experience. MANOVA was performed on the four
characteristics as well as the interactions between the characteristics and the delivery type. The results indicated no significant difference and the researcher failed to reject hypothesis two.

Hypothesis three examined whether the participant’s individual learning style would have an effect on the acquisition of procedural knowledge. The Gregorc Style Delineator was used to determine the individual learning styles. Using these results MANOVA was run to determine the effect. The results identified no significant difference and the research failed to reject hypothesis three.

These findings of “no significant differences” are a phenomenon that occurs in many studies comparing instructional methods or tools (Gagne & Shepherd, 2001; Green & Gentemann, 2001; Johnson, 2002; Klass & Crothers, 2000). These findings are important to the advancement of online instruction as a valid alternative to traditional classroom instruction. This will allow educators and trainers the flexibility when developing instruction.

Impact of the Study

Because illustrated audio and digitized video are equally effective as instructional tools; they offer a great deal of versatility in delivering instruction for educators and trainers. Depending on the situation CAI can be used to accommodate the learner’s personal and professional schedule, situation, or needs. Digitized video and illustrated audio make it possible for people to learn at home, the workplace, or just about anywhere a computer is found.
Illustrated audio’s strength is that it can be used on older computers because of its smaller file size and its ability to run at a low bandwidth. Viewing illustrated audio does not require any special software be on the learner’s computer. Educators do not have to possess or acquire any special skills to use illustrated audio. Its simplicity is what makes it valuable to the learner and educator as an educational tool. Illustrated audio is very portable because it can be used almost anywhere there is a computer and the internet. The major limitation of illustrated audio is that it fails to show motion; something digitized video does very well.

By illustrating motion digitized video holds the attention and interest of the learner during longer and more complex lessons or instruction. Just like illustrated audio it can be used in a variety of applications, but it does have certain limitations. Using digitized video is more costly because it requires production skills and editing ability. Viewing digitized video also means that the computer may need special hardware and software. Overcoming these limitations does offer the user a higher level of interactivity and integration with other types of media. Digital video is increasingly used as stand alone digital movies, embedded digital movies, quickstart and streaming digital movies, and in video conferencing formats.

Digital video’s complexity and illustrated audio’s simplicity can be used jointly to reach a wider audience of learners. Instructional lessons can be developed that give users the option of choosing one or both formats. Using the formats interchangeably may even enhance the learning process!
Limitations of the Study and Further Research

Just over eighty-five percent (85.6%) of the participants were under the age of 27. The participants were also undergraduate students from two southwestern universities. This means that the participants all had at least a high school education. This limits the generalizability of the study. Further research can address both of these issues by conducting this research with hospitality employees both from the front-of-house and back-of-house. This would allow for greater age and education disparity in the participants.

A second limitation is that this research did not address the issues of retention and transferability. It only looked at the acquisition of knowledge immediately after the instruction. Further research could be developed to test whether the participants retained the knowledge some period of time in the future as well as to assess the ability of the participants to take the knowledge and use it in their jobs or classes.

A third limitation is the use of napkin folding. Further research should investigate different tasks in the hospitality industry to assess the effectiveness digitized video and illustrated audio has on the acquisition of the skills required to complete the task. Tasks such as wine opening, garnishing, greeting guests, and setting tables all could be used to further the understanding of how CAI can assist trainers and educators with developing materials for the hospitality industry.

A fourth limitation to the study was the time length of the instruction, which eliminates the ability to assess how well digitized video and illustrated audio can hold the attention learners. This can be addressed by lengthening the instruction.
APPENDIX I

DEMOGRAPHIC SURVEY

AND

EXPERIMENT TRACKING SHEET
1. What is your age? ________

2. What is your Gender? Male Female
   *Circle Correct Response*

3. Do you have previous napkin folding experience? Yes No
   *Circle Correct Response*

4. How would you describe your computer comfort level?
   *Circle correct response*
   
   1. Very Comfortable
   2. Comfortable
   3. Neutral
   4. Uncomfortable
   5. Very Uncomfortable
5. Delivery type
   _____Digitized Video
   _____Illustrated Audio

6. Time Required

7. Restarts
   1 2 3 4 5 6 7 8 9 10 <_____

8. Number of Steps completed
   1 2 3 4 5 6 7 8 9 10 11 12 13 14

9. Acceptable Product
   Yes
   No
APPENDIX II

GREGORC STYLE DELINEATOR
Directions

Before starting with the word matrix on the next page, carefully read all seven of the following directions and suggestions:

1. **Reference Point.** You must assess the relative value of the words in each group using your SELF as a reference point; that is, who you are deep down. NOT who you are at home, at work, at school or who you would like to be or feel you ought to be. THE REAL YOU MUST BE THE REFERENCE POINT.

2. **Words.** The words used in the Gregorc Style Delineator matrix are not parallel in construction nor are they all adjectives or all nouns. This was done on purpose. Just react to the words as they are presented.

3. **Rank.** Rank in order the ten sets of four words. Put a “4” in the box above the word in each set which is the best and most powerful descriptor of your SELF. Put a “3” to the work which is the next most like you, a “2” to the next and a “1” to the word which is the least descriptive of you SELF. Each word in a set must have a ranking of 4, 3, 4, or 1. No two words in a set can have the same rank.

4. **React.** To rank the words in a set, react to your _first impression_. There are no “right” or “wrong” answers. The real, deep-down answers are best revealed through a first impression. **Go with it.** Analyzing each group will obscure the qualities of SELF sought by the Delineator.

5. **Proceed.** Continue to rank all ten vertical columns of words, one set at a time.

6. **Time.** Recommended time for work ranking: 4 minutes.

7. **Start.** Turn the page and start now.

4 = MOST descriptive of you
1 = LEAST descriptive of you

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a. 

b. 

c. 

d. 

Total of above

CS

AS

AR

CR

54
Consent Form

General Information:
I am Christopher E. Zakrzewski a graduate student from the UNLV William F. Harrah College of Hotel Administration. I am the researcher on this project. You are invited to participate in a research study. The purpose of this study is to examine the rate or replay, accuracy, and timeliness of students using digitized video and illustrated audio as instructional tools to produce an acceptable product.

Procedure:
If you volunteer to participate in this study you will be asked to do the following:
☐ Fill out a small demographic survey.
☐ Fill out a learning style delineator.
☐ Watch one of the two delivery types and complete the task demonstrated in the instructional video or illustrated audio.

Benefit of Participation:
By participating you will gain an understanding of the research process and gain some insight into what digitized video and illustrated audio are.

Risks of Participation:
You may experience an uncomfortable feeling with your performance producing an acceptable product. Please feel free to contact the research if you have any questions. You may also be uncomfortable answering some of the questions asked. You are encouraged to discuss this with me. I will explain the questions to you in more detail.

Contact Information:
If you have any questions about the study or if you believe you may have experienced harmful effects as a result of participation in this study, please contact Dr. Andrew Feinstein at 895-1795 or by email at andyf@nevada.edu, or Christopher E. Zakrzewski at 480-0979 or by email at cezak@msn.com.

For questions regarding the rights of research subjects, you may contact the UNLV Office for the Protection of Research Subjects at 895-2794.

Voluntary Participation:
Your participation in this study is voluntary. You may refuse to participate in this study or in any part of this study. You may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

Confidentiality:
All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you to his study. All records will be stored in a locked facility at UNLV for at least 3 years after completion of the study. After the storage time the information gathered will be destroyed.

Participant Consent:
I HAVE READ THE ABOVE INFORMATION AND AGREE TO PARTICIPATE IN THIS STUDY. I AM AT LEAST 18 YEARS OF AGE. A COPY OF THIS FORM HAS BEEN GIVEN TO ME.
REFERENCES


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