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UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

A COMPARISON OF THE EFFECTS OF PROCEDURAL AND
METACOGNITION INSTRUCTION ON THE TRANSFER OF
COMPUTER SOFTWARE SKILLS

A Dissertation

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

Doctor of Philosophy

By

MICHELLE A. MCKAY

Norman, Oklahoma

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A COMPARISON OF THE EFFECTS OF PROCEDURAL AND
METACOGNITION INSTRUCTION ON THE TRANSFER OF
COMPUTER SOFTWARE SKILLS

A Dissertation APPROVED FOR THE
DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

BY

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ABSTRACT

This study investigated the influence of instructional strategies on software application transfer. An introductory computer course was used to determine the impact of metacognitive strategies on transfer of software application skills. Students were given a pretest, post-test and transfer exams. Measures on word-processing, database, and mail merge exercises were collected for the three exams. Students were given a pretest at the beginning of the course. Students were then trained to use the software package ClarisWorks® which is a Macintosh application. Students were given a final exam using ClarisWorks®. Students were given a transfer exam in Microsoft® Office. Students who were taught metacognitive strategies scored higher on transfer exercises than students with procedural training. Thus, metacognitive strategy training may be an appropriate instructional strategy for software training.

CHAPTER1

Introduction

Background of the Project

Training teachers to transfer knowledge of computer applications has been identified as one of the cornerstones of successful implementation of technology into the classroom (Meltzer & Sherman, 1997). One of the difficulties of preservice teacher training is the inability to know what type of computer system the students will encounter in the schools. Some schools use IBM compatible PCs while other schools use Macintosh computers. Therefore, Northrup (1997) suggested training preservice teachers in both platforms whenever possible. Even with this suggestion, trained teachers may encounter new software applications with which they have no experience. Thus, teachers will need to transfer knowledge from one software application to the next.

Some research suggests that introductory computer courses can produce very highly specific and nongeneralizable skills (Beard, 1993; Smith, Zirkler, & Miynatt, 1985). Thus, learning to use one piece of software does not guarantee the easy mastery of another. The purpose of this study is to investigate learning transfer between computer applications using different computer applications that are on different computer operating systems. The computer applications that will be used in this study are ClarisWorks® 4.0 and Microsoft® Office. The computer platforms are Macintosh and Windows operating systems. In order for learners to transfer learning from one computer application to the next, the learner must be able to determine the differences and similarities between the two computer applications and the two

different operating systems (Butterfield & Nelson, 1989; Butterfield & Nelson, 1991; Misko, 1995).

Most empirical research on learning transfer of computer knowledge was focused on the transfer of computer programming skills (Bernardo & Morris, 1994; Etelapelto, 1993; Mayer, 1975; Shih & Alessi, 1994). Yet successful implementation of computers is focused around the use of software applications (Broadbent, 1997; Henry, 1987; Lowther & Morrison, 1998; Marcinkiewicz, 1996; Mayer, 1975). Thus, there is a gap in the research on how to train for the transfer of software application skills (Beard, 1993; Broadbent, 1997; Gattiker, 1991).

It is difficult for teachers to transfer software applications if they do not know how to use computer software in the first place (Clark, 1998; Reiser & Butzin, 1998; Weinburgh, Smith, & Smith, 1997). Therefore, the primary focus of this research project will be centered on how to train teachers to use computer applications and transfer existing knowledge to different software applications.

Definitions of Key Concepts from Literature

Technology in the instructional technology field can be defined broadly to include other technologies as well as computer-based technologies (Peck, 1998). Gattiker (1991) defines a computer user as a person who possesses the required skills to make efficient use of the various computer hardware and software without necessarily being a technical specialist. Computer skills are defined as learned behaviors needed for achieving desirable performance levels when doing job related tasks on the computer (Gattiker, 1991).

Learning Transfer Definitions. Transfer of knowledge means what is learned in a previous context is either repeated in a similar context or adapted some way to a new context (Butterfield & Nelson, 1991). Transfer may require new learning as well. Since transfer is commonly thought of as the goal of most education, much research has focused on the importance of the transfer of learning (Anderson, Reder & Simon, 1996; Brown & Kane, 1988; Butterfield & Nelson, 1989; Butterfield & Nelson, 1991; Clark & Voogel, 1985; Misko, 1995; Perkins & Salomon, 1988; Phye & Sanders, 1992). Transfer terms commonly used to describe the impact of prior knowledge on new learning are positive, negative, zero, near, and far transfer. When previous learning facilitates transfer to new learning situations, that is called “positive transfer” (Butterfield & Nelson, 1991). When previous learning interferes with new learning, it is called “negative transfer” (Butterfield & Nelson, 1989; Misko, 1995). When previous learning has no impact on new learning, it is called “zero transfer” (Phye & Sanders, 1992).

Two forms of transfer discussed in the literature are near and far transfer (Butterfield & Nelson, 1989; Misko, 1995). “Near transfer” involves skills that are learned in one task being applied to another task that is similar. “Far transfer” occurs when a skill learned in one context helps to develop skills in a context which is altogether different (Clark & Voogel, 1985). Applying general problem-solving skills learned while using one computer application and applying those skills to another computer application is an example of far transfer. Royer (1979) suggested transfer may be a continuous construct. Instead of asking whether transfer has occurred, the focus should be on the level or amount of transfer. He suggested the ends of the

transfer continuum should be labeled “near” and “far”. Near transfer occurs when the learners’ perform at the criterion levels on the tasks defined by training. Far transfer occurs when the learner can generalize the training to other tasks (Royer, 1979).

Perkins and Salomon discussed transfer in terms of “high road” and “low road” of transfer (Perkins & Salomon, 1988; Salomon & Perkins, 1987). Low road transfer reflects the automatic triggering of well practiced routines in circumstances where there is considerable perceptual similarity to the original learning. Thus, low road transfer is similar to the near transfer construct. This low road transfer is facilitated by the overlap of superficial stimulus between the situations in which is student is applying a skill or a piece of knowledge. For example, saving application files is a similar process in many software applications regardless of whether it is a Macintosh or Windows software application. High road transfer depends on deliberate mindful abstraction of skill or knowledge such as abstracting knowledge from one computer platform to another. Thus, high road transfer is similar to the far transfer construct. For example, the procedure for loading software onto the computer is similar but sufficiently different between the Windows and Macintosh platforms that it may confuse novice computer users.

There are two types of high road transfer. They are forward reaching and backward reaching transfer. Forward reaching high road transfer is when the learner learns something in preparation for applications elsewhere. In backward reaching high road transfer, the learner encounters a situation, and examines past experience for similarities. Both techniques require reflective thought in making connections between different situations. The advantage of high road transfer is the learner is not

dependent on superficial similarities to solve the problem. Deeper analogies can be used. High road transfer is important in computer software application transfer processes. The learners will need to use underlying principles and concepts to transfer knowledge instead of focusing on the superficial differences of the screens. When developing training, using a model that optimizes transfer training may be useful.

The ADAPT Design Model. Jelsma, Van Merriënboer, and Bijlstra (1990) developed the ADAPT (Apply Delayed Automatization for Positive Transfer) design model. The ADAPT model provides guidelines for developing instruction that facilitates the transfer of skills. The ADAPT model incorporates skill acquisition, near and far transfer, and procedural and declarative knowledge.

The ADAPT models gives rise to four categories of instructional strategies for the development of transfer (See Figure 1). They are:

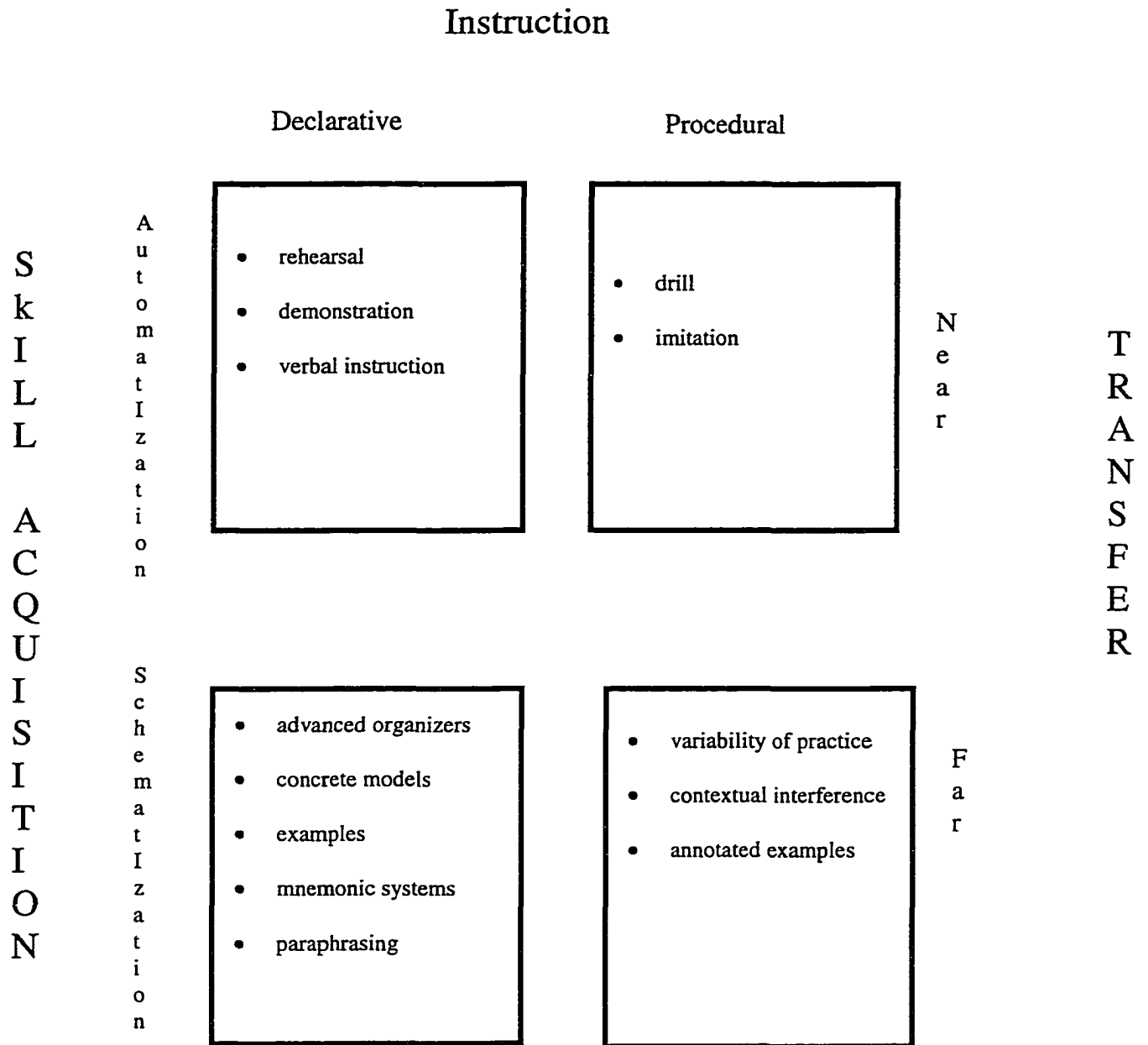
1. Strategies for declarative instruction that aim at near transfer.
2. Strategies for declarative instruction that aim at far transfer.
3. Strategies for procedural instruction that aim at near transfer.
4. Strategies for procedural instruction that aim at far transfer.

According to the model, one procedural strategy that promotes near transfer is consistent practice. This allows the learner to apply the knowledge which is relevant to the performance of the skill. Thus, consistent practice is expected to promote near transfer but not far transfer. Consistent practice which modifies declarative knowledge or representation into well organized schemata are more likely to produce far transfer than mechanically repeated performance on a particular task. One of the procedural strategies that learners can use to develop rich schemata of a specific

domain is variability of practice. Therefore, variability of practice is one strategy you can use if you want to facilitate far transfer skills.

According to this model, several predictions can be made. Instructing students with procedural knowledge will promote near transfer, but not far transfer. Giving students varied practice on an application should promote both near and far transfer. Instructing students with metacognitive strategies will promote both near and far transfer.

Figure 1. The ADAPT design model



Teacher Training of Computer Skills

One concern is how to develop preservice teacher technology courses to facilitate the development of computer skills (Broadbent, 1997). The primary goal of this aspect of an instructional technology course is to create a learning environment

that prepares preservice teachers for a computer-supported classroom. Several models have been developed to facilitate the integration of technology (Brown & Henscheld, 1997; Kovalchick, 1997; Lowther & Morrison, 1998; Weinburgh, Smith, & Smith, 1997). Some of the computer technology integration models are based on constructivist trends (Kovalchick, 1997). Other models are based on solving problems (Lowther & Morrison, 1998).

Many of the ideas of how to develop computer skills training for educators are based on philosophical ideas (Broadbent, 1997; Brown & Henscheld, 1997; Kovalchick, 1997; Lowther & Morrison, 1998; Weinburgh, Smith, & Smith, 1997). However, philosophical ideas have not been translated into instructional methods and subjected to research to provide empirical evidence of which instructional method is most effective in teaching preservice teachers how to use computer technology. Other disciplines such as work force training have been researching effective computer skills training (Gattiker, 1991). It may be possible to implement some of the ideas from this area of research towards the development of technology training of educators. Empirical research is needed to determine which instructional methods are effective in developing computer skills in the education work force. Empirical research also is needed to determine which factors facilitate transfer of computer skills. With the development of metacognitive skills, students become more productive learners who are more capable of assuming responsibility for their own learning.

Statement of the problem

The exposure to a variety of platforms and experiences is directly related to the level of comfort a teacher has with technology (Northrup, 1997). Students also

may not have access to the software packages for which they received training, therefore, it is important that technology skills transfer to other software applications that they may encounter in the work place. Cross platform and software training would require more computer equipment and software. Yet, one of the barriers to technology diffusion in the public school systems is the lack of financial resources (Holloway, 1996). Since it may not always be possible for all schools to train preservice teachers on both systems, one approach may be to train preservice teachers in such a way that facilitates transfer of knowledge about the use of one system or applications to use of other systems and applications. In addition, it is difficult to know which software applications preservice teachers will encounter. Therefore, students may need to transfer learning of one software application to another. Examination of instructional strategies to facilitate transfer seems warranted as there is limited evidence that current instructional practices facilitate transfer. With the development of metacognitive skills, students become more productive learners who are more capable of assuming responsibility for their own learning. Since this is one of the goals of technology implementation, emphasis will be on the development of metacognitive skills.

Significance of the Study

This study may contribute a greater understanding of how to facilitate learning transfer of software applications and platforms. Identification of instructional strategies of effective instruction of computer applications that facilitates learning transfer can help improve teacher training. Improving technology training for teachers may help facilitate the diffusion of technology into the classroom curriculum.

Research Questions

My research questions are:

1. Do instructional strategies used in this study facilitate computer application transfer in preservice computer courses?
2. Does the use of the metacognitive strategies and procedural instruction used in this study influence near learning transfer in computer application training as measured by the word processing exercise?
3. Does the use of metacognitive strategies and procedural instruction influence far learning transfer in computer application training as measured by database and mail merge exercises?

CHAPTER 2

Review of the Literature

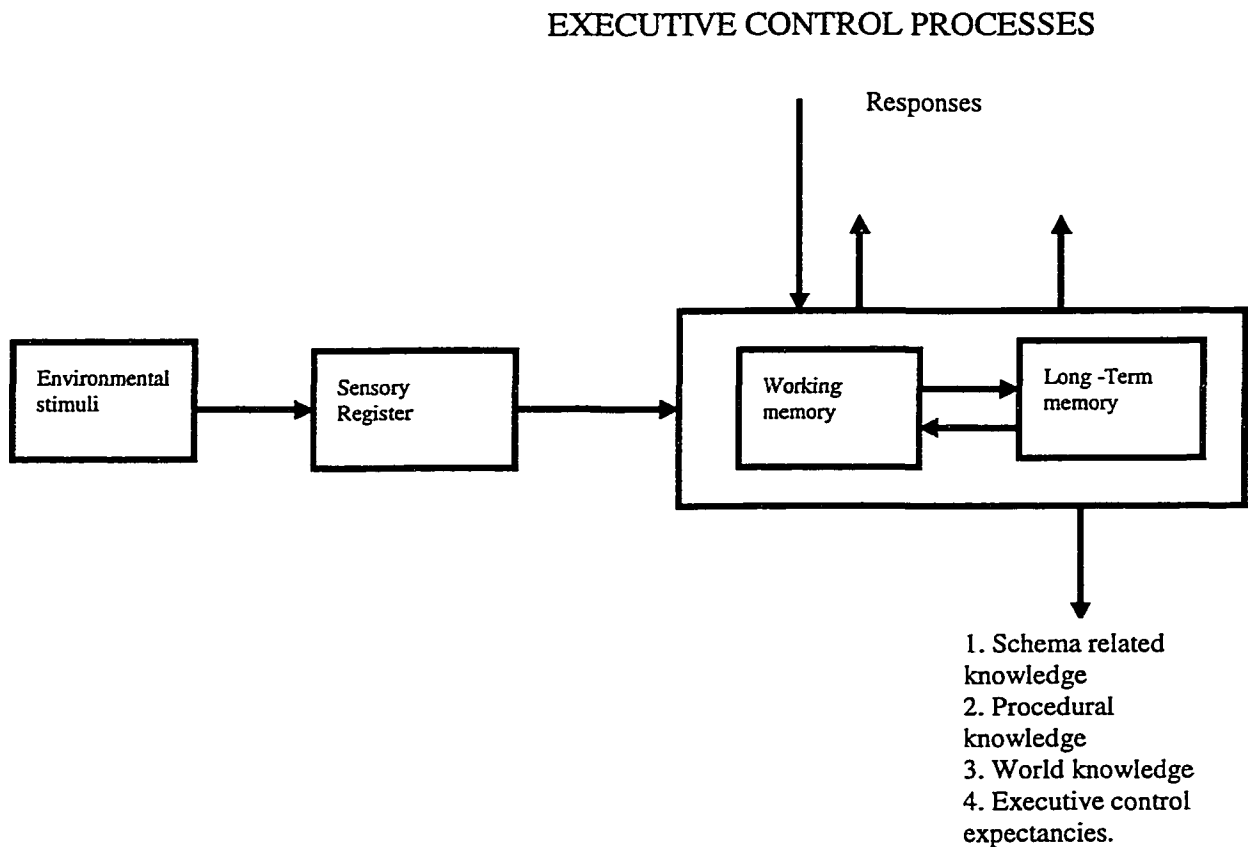
The purpose of this study was to investigate the question of how to develop computer instruction that will facilitate the transfer of computer knowledge and skills. The goal is for teachers to incorporate computer technology into the classroom. Part of the process is to teach preservice teachers how to use computer applications. Software applications that are to be used in the classroom include instruction with drill and practice exercises to instructional tools that could be used to construct knowledge (Jonassen, 1996; Jonassen & Reeves, 1996; Jonassen, Carr, & Hsiu-Ping, 1998; Peck, 1998). A review of the literature indicates there is need for naturalistic studies of the transfer of computer knowledge among actual software products (Beard, 1993).

This chapter is organized as follows. First, I review learning theories and expertise development models. Next, I present what is known about the transfer of knowledge including studies that investigate the transfer of computer skills. I discuss the relevant aspects of the GUI (graphic-user interface) of the two software applications. I discuss its predicted impact on transfer. I present a review of metacognition and its impact on learning. Then I review teacher training of technology. This includes the reasons why teacher training is so important and what standards have been developed. I conclude the chapter with a summary. Understanding the factors that influence transfer requires some understanding of how knowledge and skill are acquired in the first place.

Review of Learning Theory and Models

Information processing theory describes the transformation of information from the environment into long-term memory (see Figure 2). A person receives information from the environment through sensory receptors (i.e. eyes, ears, skin, nose, & tastebuds). Information stays for a very short time in the sensory registry. For example, visual information lasts less than a second while auditory information lasts two to four seconds (Anderson, 1990). The sensory register holds the information just long enough for it to undergo preliminary cognitive processing. The individual pays attention to a portion of the information through selective attention processes (Anderson, 1990).

Figure 2. Information Processing Model



Working memory has a limited capacity. The length of the memory span is controlled by the speed we rehearse the information (Baddely, 1986 cited from Anderson, 1995). The articulatory loop which is related to speech can keep 1.5 seconds of information. Baddaly (1986) also proposed we have a visuospatial sketch pad which is for rehearsing images. Executive control processes can control the information in the various systems such as the visuospatial system and articulatory loop. Executive control processes guide the flow of information through the system into long-term memory. One point derived from information processing theory is information does not have to spend time in the articulatory loop to get into long-term memory. The articulatory loop is a system to keep information available.

Some of the information in working memory will be available to our long-term memory. Most information is stored in terms of meaning not exactly as it was received. Information is most likely to be stored and retrieved from long-term memory when the information is understood, organized, and integrated with information that already exists. Several factors determine the activation of long-term memory. One factor is how recently we have used the memory. Other factors include how much and how long we have practiced the information (Anderson, 1990; Anderson, 1995). Therefore, recency and depth of processing are key factors in learning and transfer.

Learning is facilitated when the information is meaningful, relevant to the student, and the student is able to connect the new information to old information (Anderson, 1995; Keller, 1992). Memories that are relevant are retrieved from long-term memory to working memory. This allows the learner to integrate the new

information with the previous information and allows the use of deep processing strategies. If information is stored in long-term memory in a variety of meanings, it is more likely that information will be retrieved when it is needed. If the information can be recalled and applied at a later date, then the information has been stored in long-term memory and learning has occurred (Anderson, 1990; Anderson, 1995).

ACT* Theory

Anderson's ACT* theory explains how skill acquisition occurs (Anderson, 1995). Anderson made a distinction between two kinds of knowledge (declarative and procedural) used in the acquisition of a skill. Declarative knowledge is factual knowledge. Procedural knowledge is knowledge about how to do something. According to Anderson, instruction should include both kinds of knowledge.

The ACT* theory consists of three stages of procedural learning. They are: (1) Cognitive or Declarative stage, (2) Associative or Procedural stage, and (3) Autonomous or Tuning stage. Anderson suggested that learners experience these three stages of learning before the skill becomes automatic. In stage one, the learner commits to memory a set of facts relevant to the skill. For example, a student may learn how to use pull down menus from the title bar on a computer screen. Learners are typically using domain-free problem solving procedures. Generally, there is a heavy load on working memory. Actions may be slow and halting. In stage two, two main things happen. First, errors are gradually detected and eliminated. Second, the connections between elements necessary for successful performance are strengthened. For example, a student may learn how to save files onto a floppy disk. At first the student may have to search the title bar to know where the save function is. As the

student progresses, the student will know how to save and which pull down menu contains the save function. In this stage, knowledge is being compiled into complex schemes. In stage three, action is automatic when relevant conditions are present, but learning can still occur. The ADAPT model of transfer was based on ACT* (Jelsma, Van Merriënboer, & Bijlstra, 1990).

Sternberg's Developing Expertise Model

Although everybody starts off as a novice sometime, research from the literature on expertise development underscores the importance of building up knowledge bases for the development of skills and expertise (Misko, 1995). Experts have more context-specific knowledge, more experience, metacognitive skills, and the ability to focus their attention and thinking in ways which will give them the best results (Misko, 1995). Experts have schemas which contain procedural knowledge about problem solving strategies relevant to the problems needing a solution (Anderson, 1995).

The learners' knowledge influences transfer (Lovett & Anderson, 1996; Misko, 1995). The important influence of context-specific knowledge on transfer has been discussed in the literature through research on the differences between expert and novices (Misko, 1995). Experts have better organized and integrated knowledge structures which they can access readily and easily (Misko, 1995). Experts know more about what they know and do not know. Novices have less context specific knowledge and their knowledge structures are made up of discrete and fragmented pieces of information. Experts also appear to attend to the more relevant pieces of information. Therefore, they attend to the best information to solve the problem.

Experts are also able to think in terms of underlying principles that can be abstracted and used in other contexts. When experts use their skills or knowledge, they look for analogies that provide elaboration on the information presented. Experts spend more time in problem identification and planning what they are going to do before launching into a solution (Misko, 1995). These strategies help experts become more successful in transferring knowledge.

Sternberg (1998) outlined some of the processes learners engage in while developing expertise. Learners must:

- Receive direct instruction in how to solve test-like problems, usually through schooling
- Engage in actual problem solving in academic contexts
- Engage or observe role modeling of problem solving
- Think about problem solving including mental representation of what they may do if they encounter a problem
- Receive rewards for successful solution of successful problem solving reinforcing the behavior.

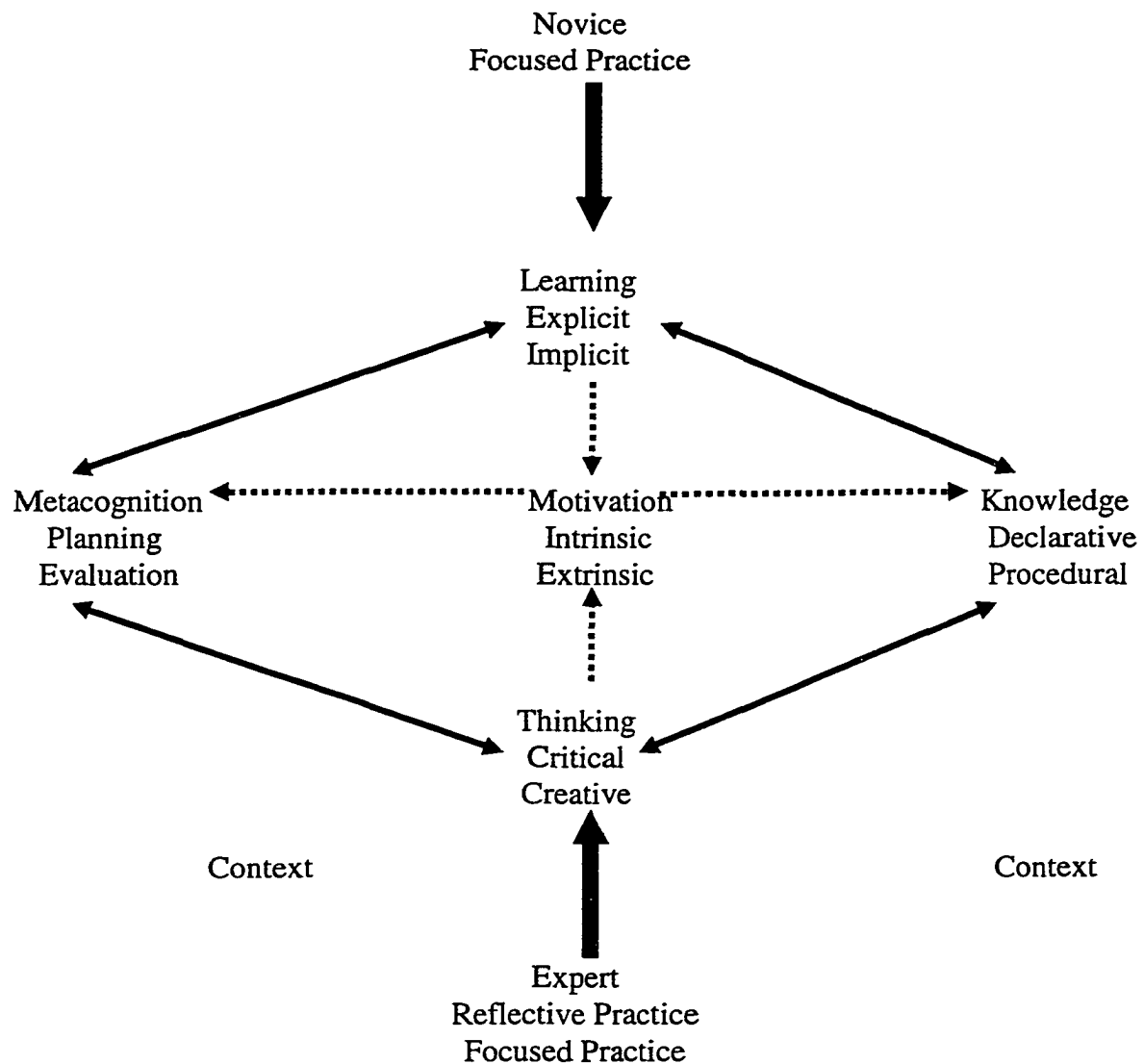
When students learn some new information, their learning is influenced by what is going on around them. External factors such as the physical environment, the instructor, the equipment being used, and other learners can influence the learning process. These external factors can either inhibit or facilitate our ability to receive and understand information throughout the learning process. Learning also is influenced by what is going on within the individuals. Factors such as motivation or interest influence the readiness to receive the new information. How the information will be

retrieved depends on how the information is stored (Anderson, 1990; Misko, 1995).

How information is stored also will influence the transfer process (Mikulecky, 1994).

Sternberg (1998) has advanced the developing-expertise model (see Figure 3). This model incorporates the concept that expertise development includes purposeful engagement involving direct instruction, active participation, role modeling, and reward. This model includes five key elements of the development of expertise. They are metacognitive skills, learning skills, thinking skills, knowledge, and motivation. These elements are interactive, in that they influence each other directly and indirectly.

Figure 3. Sternberg's Developing-Expertise Model



The elements listed in the Sternberg's model are influential in the learning process and learning transfer. Novices become experts through deliberate practice. The learning process is the result of interaction of all the key elements of the model. In this model, motivation interacts with metacognitive skills, which in turn interacts with learning and thinking skills. The declarative and procedural knowledge acquired through the extension of these thinking exercises result in these skills being used

more effectively in the future. All of these skills are affected by the context in which they are operating (Sternberg, 1998). This model is useful for transfer training because the emphasis is developing reflective, analytical, creative, and practical thinking with a knowledge base. This model is consistent with the ADAPT model (Jelsma, Van Merrienboer, & Bijlstra, 1990) described in Chapter 1.

Facilitation and Inhibition of Transfer

A transfer paradigm pertains to expertise development. A novice computer user works towards expertise development through deliberate practice (Sternberg, 1998). A transfer paradigm differs from acquisition of memory retention in one major respect. Cognitive transfer typically requires the application of a previously demonstrated knowledge to a different problem in the same context or a different context (Butterfield & Nelson, 1991; Misko, 1995). Learning acquisition, memory retention, and learning transfer are not independent processes. Efforts have been made to incorporate all three processes using a cognitive training and transfer paradigm (Gick & Holyoak, 1987).

Researchers with different theoretical assumptions disagree on whether the transfer of knowledge is relatively difficult or easy (Grabinger, 1996). Researchers who support the situative perspective argue for a rich learning environment to facilitate the transfer process because transfer is difficult (Grabinger, 1996; Greeno, 1997). Other researchers argue transfer occurs often when certain cognitive conditions are met. Some researchers suggest the transfer of knowledge can be relatively easy under the right conditions. Goldstein (1986) suggested that the ease or difficulty of

transfer depend to some extent on how new knowledge differs from old knowledge. The similarities between old and new concepts influence the transfer. The greater the similarity between tasks the easier the transfer between tasks. One of the problems with this approach is that it is difficult to anticipate and design for all the variables the learner is going to encounter.

There is evidence that what is learned can only be applied to problems or situations that are similar to those experienced in the training context (Clark & Voogel, 1985). Thus, some research indicates transfer does not occur in some learning situations. Several explanations are possible to explain lack of transfer. Tasks may not transfer simply because the skills have not been learned well in the first place. Students may not have been taught when to use the skill that is to be transferred or that a skill is relevant to the new task (Perkins & Salomon, 1988).

There also is evidence that transfer can occur across a variety of settings (Anderson, Reder, & Simon, 1996; Bernardo & Morris, 1994; Brown, Collins, & Duguid, 1989; Brown & Kane, 1988; Butterfield & Nelson, 1989; Butterfield & Nelson, 1991; Clark & Voogel, 1985; Lovett & Anderson, 1996; Misko, 1995; Phyte & Sanders, 1992; Shih & Alessi, 1994). Several factors appear to influence transfer. They are motivation, prior knowledge, repeated and varied practice, task familiarity, task similarity, context similarity, and ability (Brown & Kane, 1988; Butterfield & Nelson, 1991; Clark & Voogel, 1985; Lovett & Anderson, 1996; Misko, 1995; Phyte & Sanders, 1992; Shih & Alessi, 1994). Thus, characteristics about the task, learner, and the environment influence the transfer process.

Learners' Characteristics that influence the Transfer Process

Individual characteristics of the learner may influence the transfer process. An individual may be motivated to look for commonalities in previous and subsequent tasks (Misko, 1995). They may be interested in searching for strategies that have been successful in the past (Carr, Alexander, & Folds-Bennett, 1994). The ability of transfer skills between different contexts also may be influenced by the similarity between the two tasks (Lovett & Anderson, 1996). A transfer task may be perceived as similar if it calls up similar goals, processing procedures, and look like a task that is familiar (Misko, 1995). Other factors may indirectly influence the transfer process by influencing the learning process. One factor that can influence the learning process is the instructional strategy use.

Instructional Characteristics that Transfer

The way instruction is delivered can affect the performance of learners on transfer tasks (Mayer, 1975). Mayer examined how different instructional strategies influenced students learning to program a computer. One group of students was taught about computer functions with the use of advanced organizers. Students also were given everyday analogies of the different functions. Another group was given the text to read before they heard about how the computer functions. On the transfer test, the group taught about computer functions was able to perform a wider range of tasks. They could better explain what a new program could do and write programs of a type they had not encountered before. The other group was better able to write programs similar to those they had come across in the text. These results indicated the advanced

organizer group excelled on far transfer items while the control group excelled on near transfer.

These findings have implications for the delivery of instruction in computer application training. If the purpose of the instruction is to facilitate transfer, then the training should help students connect their learning to applications in which they are already familiar. If students only acquire facts without strategies about how, when, or where to apply the facts in other contexts, then transfer is less likely to occur (Perkins & Salomon, 1988).

Perkins and Salomon (1988) suggested designing instruction to foster the transfer of knowledge and skills. Two techniques maybe used to facilitate transfer. They are “hugging” and “bridging.” The hugging technique encourages teaching tasks so that students can apply surface similarities. The bridging technique teaches students how to abstract the knowledge and make connections of abstract principles. Taken together, the two techniques provide a way to encourage transfer. The instructor determines the type of transfer the students need to make. The trainer shapes the instruction to cover surface similarities to encourage the transfer desired. The instruction also may help bridge the transfer of abstract principles. Other approaches include confronting students with problems outside of the context boundaries. Research is needed to determine which techniques are the most effective in technology courses to promote transfer of procedures.

Jelsma, Van Merrienboer, and Bijlstra (1990) recommended the following instructional guidelines that should be incorporated with their theoretical framework of the ADAPT model. First, new information provided with instruction should be

encoded correctly. Any procedures compiled with incorrect representation will be detrimental to later performance. The declarative representation is critical to the initial stages of skill acquisition, therefore it should be encoded correctly. Second, the instruction should present a relatively small amount of new information at a time in order to prevent processing overload. In addition, information should be held in working memory for a relatively short time in order to prevent working memory failures. Working memory failures may result in incorrect compilations that can have a negative impact on the performance of the skill. Third, in a system in which skills can be learned only by doing them, the importance of formal instruction decreases and the importance of practice increases. Jelsma and associates (1990) noted that declarative knowledge provided by verbal instruction could sometimes be unhelpful to the process of skill acquisition. Therefore, the necessary instruction should be compacted into its bare essentials and gradually elaborated during the skill acquisition process. These guidelines are consistent with Gattiker's (1991) recommendations for computer skills training.

Teaching students to manipulate the information presented to them is one way to increase the original learning which may influence transfer (Mayer, 1975).

Redefining problems can help students to reflect on information and organize it in ways which can help learners in other situations. Giving students successful strategies to elaborate is one way to increase their acquisition of knowledge. When new information is viewed in terms of partial similarities to concepts we already know, then the student is using analogies (Misko, 1995).

One strategy recommended by some researchers would be to cultivate general cognitive skills by bringing together context-specific knowledge with general strategic knowledge (Perkins & Salomon, 1989). Mihman and Tishman (1988) developed the connections approach in which thinking strategies are woven into the regular curriculum. Their strategy involves a 3-to-5 step process that guides the learner through decision making or problem solving goals. They suggest teaching students these cognitive strategies may increase the transfer of knowledge.

Metacognition

Metacognition is most broadly defined as awareness and control of one's learning (Gourgey, 1998). Metacognition refers to the learners' ability to understand their own cognitive processes. It is concerned with what the learners do and do not know and the ability to discern between the two (Williamson, 1996). The learner also activates knowledge of how to use available information necessary to achieve a goal. Other factors include assessing one's progress both during and after the task is completed. The difference between cognitive and metacognitive strategies is that while cognitive strategies help the learner to build knowledge and make progress, metacognitive strategies allow the learners to monitor and improve their progress. Therefore, metacognitive processes impact cognitive processes.

Empirical evidence indicates that metacognition influences the learning process (Brown, Hedberg, & Harper, 1994; Brown & Kane, 1988; Carr, Alexander, & Folds-Bennett, 1994; Etelapelto, 1993; Everson, 1997; Lytle, 1990). Thus, effective metacognitive skills should influence transfer processes as well (Everson, 1997). Metacognition is generally considered to be two complementary processes. The first

process is the students' ability to monitor their own progress as they learn. The second process is the students' ability to change strategies if they realize they are not doing well (Winn & Snyder, 1996). Research indicates students with effective metacognitive skills accurately estimate their knowledge, monitor their on-going learning, update their knowledge, and develop effective plans for new learning (Brown & Kane, 1988; Carr, Alexander, & Folds-Bennett, 1994; Sternberg, 1998). Accurate monitoring of new learning enables students with effective metacognitive strategies to concentrate on new content and adjust their learning goals (Everson, 1997).

Researchers have reported differences in metacognitive abilities between capable and less capable learners (Etelaapelto, 1993; Sternberg, 1998). Etelaapelto (1993) investigated the influence of metacognition on the comprehension of the computer programming language COBOL. A comparison between experts and novice COBOL programmers' knowledge was made when given a series of COBOL code to debug. Results indicated experts were superior to the novices in their metacognitive knowledge of the program task. The experts also used more effective working strategies.

Students can be taught to use strategies (Carr, Alexander, & Folds-Bennett, 1994; Sternberg, 1998). Metacognition can influence and improve strategy use (Brown, Hedberg, & Harper, 1994; King, 1998; Brown & Kane, 1988; Carr, Alexander, & Folds-Bennett, 1994; Williamson, 1996). Researchers suggest metacognition improves strategy use by providing the learner with knowledge about

when, where, and why they should use different strategies (Carr, Alexander, & Folds-Bennett, 1994; Sternberg, 1998).

Educators are exploring ways to develop metacognitive skills among students (Blakey & Spence, 1998; Carr, Alexander, Folds-Bennett, 1994; Hartman, 1998; King, 1998; Williamson, 1996). An important part of process of developing the students' metacognition is asking students to identify what they know and don't know. This can be done by having teachers ask students to explain what they know (Williamson, 1996). This also can be done by having students use think aloud procedures to explain what they are doing (Royer, Cisero, & Carlo, 1993). This also can be done by grouping students into pairs and having the students explain to each other the concepts of the lesson (King, 1998).

Blakely and Spence (1990) described several basic strategies that can be used to develop metacognitive behaviors. These strategies are consistent with the "ASK to THINK-TELL WHY" model outlined by King (1998). Three suggestions could be implemented in this study to promote the development of metacognitive skills. They are:

1. Students should be asked to identify consciously what they "know" as opposed to "what they do not know"
2. Students should keep journals or logs in which they reflect on their learning processes, thinking about what works and what does not work.
3. Students should participate in guided self-evaluation through individual conferences and checklists to help them focus.

Some of these strategies suggested by Blakely & Spence (1990) are implemented in the present study by including exercises that encourage the students to identify what they know. It appears from the literature that an important part of activating the metacognitive process is having some method that encourages the student to identify what they know and do not know.

The Influence of Context on Transfer

Many training decisions are based on the assumption that learning which has occurred in one context will transfer to another (Misko, 1995). Some instructional designers assume the learner will transfer the skills learned in a training setting and apply them to different problems or different settings (Clark & Voogel, 1985). Perkins and Salomon (1988) call this the “Bo Peep” theory of transfer. “Let them alone and they’ll come home, wagging their tails behind them.” Since knowledge and skills are expected to transfer to new tasks and situations in an automatic way, most training leaves the student to make the necessary connections between contexts. Unfortunately, some students do not make the connections between contexts. Thus, one of the goals of training should be to encourage the transfer of knowledge from one situation to the next (Dick, 1996).

Researchers are debating how context of the learning environment influences learning, retention, and the transfer of information (Anderson, 1996; Anderson, Reder, & Simon, 1996; Brown, Collins, & Duguid, 1989; Greeno, 1997; Perkins & Salomon, 1989; Reder & Klatzky, 1994). One claim of the situative perspective is that learning is situationally grounded (Brown, Collins, & Duguid, 1989). Anderson, Reder, and Simon (1996) acknowledged that some learning could be bound to the

specific context because of the nature of the instruction. Therefore, some knowledge is contextualized, but all knowledge is not contextualized. Anderson and associates (1996) reasoned that reading this dissertation indicates the transferability and context independence of reading skills. Some researchers argue some skills are trained to be context independent such as reading, writing, and math skills (Greeno, 1997).

According to Greeno, the heart of the debate of situated cognition is the following question: How tightly is knowledge bound to the context of the learning environment? This issue underlies the question of whether knowledge can transfer. If the learning context is playing a role in learning, then its influence needs to be examined (Greeno, 1997).

One way context may influence the learning and transfer process in computer training is the influence of the screen designs of computer applications. Gattiker (1991) predicts the person-computer interface may have a greater impact on novice computer users than for experienced computer users. Thus, the differences in screen layouts of computer application may influence the performance of novice computer users more than experienced computer users.

Graphic User Interface

Graphic User Interface (GUI) is an alternative to character based computer interface (Simonson & Thompson, 1997). One example of character based computer interface is MS-DOS. The Macintosh and Microsoft® window operating system are two examples of GUI. GUI is changing the way computers are being used. Recent changes in GUI represent a shift verbal access and manipulation of commands. Standard GUI conventions include the use of icons such as trash cans, folders, a

printer graphic, and a magnifying glass. These standard icons are the similar for both the Macintosh and Windows 95 or later operating systems. Currently, screen geography is somewhat standardized (Branden, 1996). There are drop-down menus that are controlled by a mouse-controlled arrow. But the desktop geography between the Mac and Windows operating systems differs. This difference may inhibit a novice computer user.

One reason many computer users believe Macintosh programs are easy to learn is many computer applications share a similar look (Branden, 1996). Computer applications can have a similar look in the Windows environment as well. GUI similarities and differences occur in different computer applications. For example, ClarisWorks® and Microsoft® GUI are very similar in the word processing applications. But, the database applications GUI are quite different between the ClarisWorks® and Microsoft® applications.

The person-computer interface may have a greater effect upon learning performance for novice learners than for experienced computer users (Gattiker, 1991). Although the surface features of the ClarisWorks® and Microsoft® programs appear to be different, the computer applications underlying functions are similar. If computer users focus on the surface features of the screens instead of the underlying functions of the icons, then differences in surface features may decrease successful use of software applications of the novice computer users.

Word Processing GUI of ClarisWorks® and Microsoft® Word

Learning transfer occurs at the GUI between computer applications. For example, initial examination of the GUI for word processing programs indicates the

screen designs are not that different. For example, Microsoft® Word is the software application in Microsoft® Office (see Figure 4). ClarisWorks® has a similar word processing application (see Figure 5). The title bars are very similar. They both begin with the File drop-down menu which allows the user to manage files such as saving and printing. Both title bars end with the Help drop-down menu. If the user is uncertain on how to perform a word processing procedure, they can find help through the help menu. The procedure to modify text from the title bar is similar. They both have text alignment on the tool bar.

Differences in the GUI interface occur with the different options on the title bar. Many of the same procedures are available. The difference is where they are located on the drop-down menus of the title bar. Some of the differences of the screen interface also include how to quickly close files. Microsoft® Word has an X on the right hand corner. ClarisWorks® has a square at the left-hand corner. They both function the same, but they look different. Another difference is formatting text. Some of format functions are on the tool bar in Microsoft® office. Format functions are under the Style drop-down menu of ClarisWorks®.

Figure 4. Microsoft® Word.

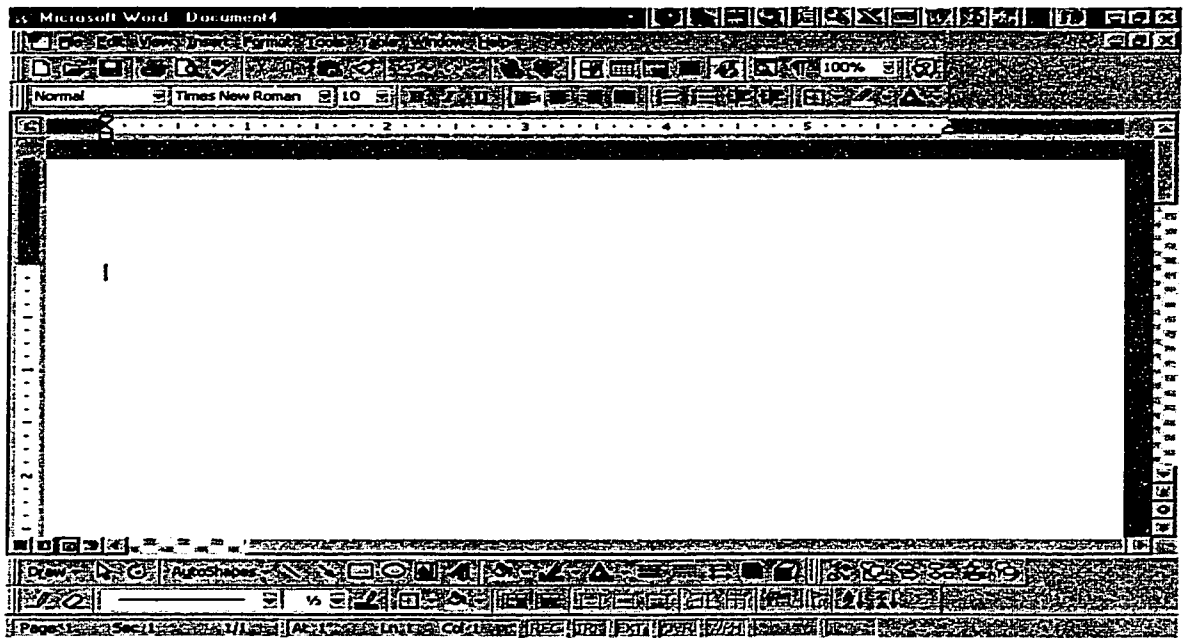
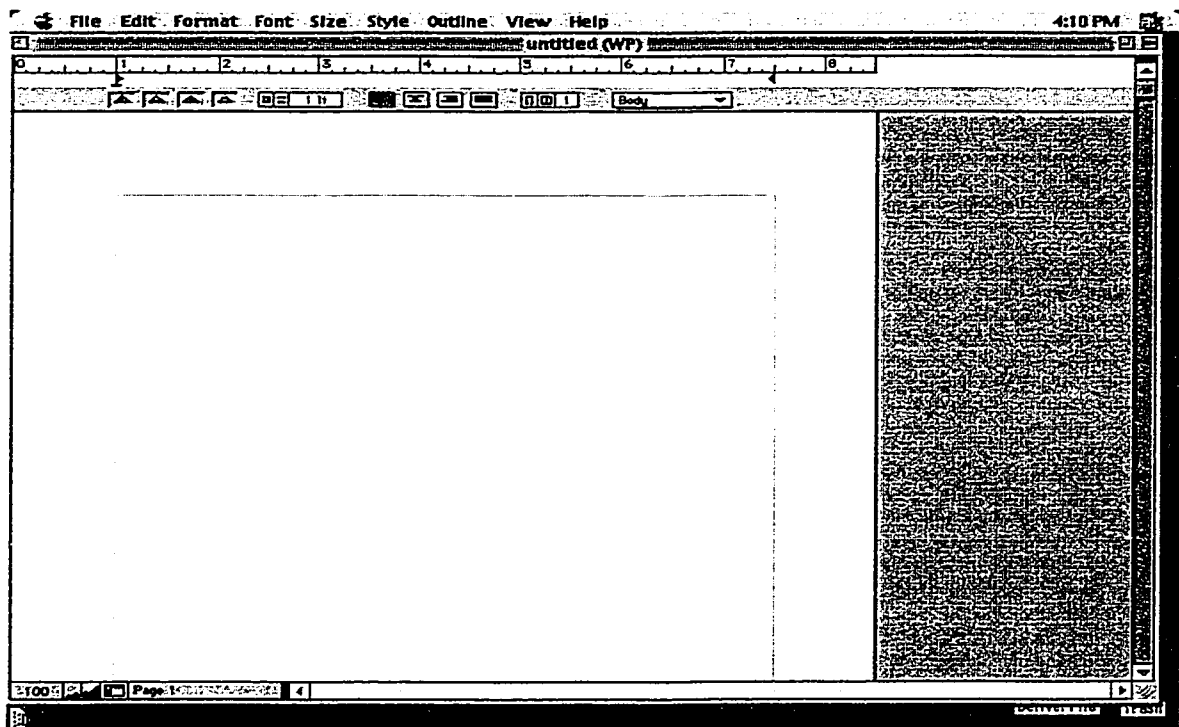


Figure 5. ClarisWorks® word processing application.



Database GUI of ClarisWorks® and Microsoft® Access

The GUI begins to differ more when you examine a different application such as databases. For example, to open a database in a ClarisWorks® software package, you select database from the open dialog menu (See Figure 6). The next screen is the opening screen for the database. It allows you to begin defining fields (See Figure 7). After the fields are defined, the user then can fill in the records on the following screen (See Figure 8). Thus, in the ClarisWorks® database application, the opening screen allows the user to begin defining fields.

Figure 6. ClarisWorks® open dialogue menu.

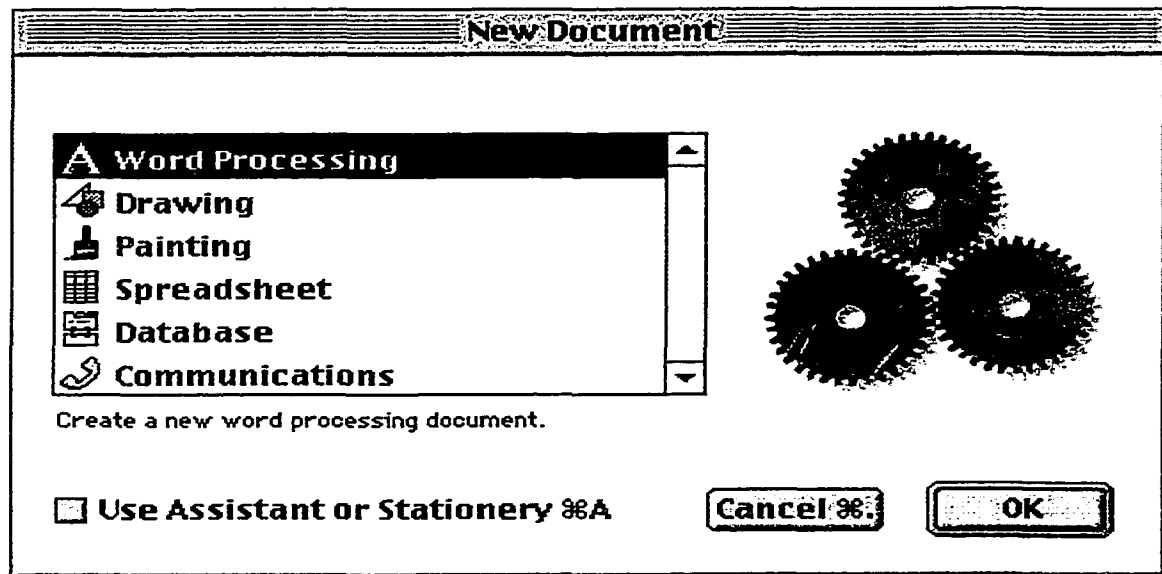


Figure 7. Opening screen for Database in ClarisWorks®.

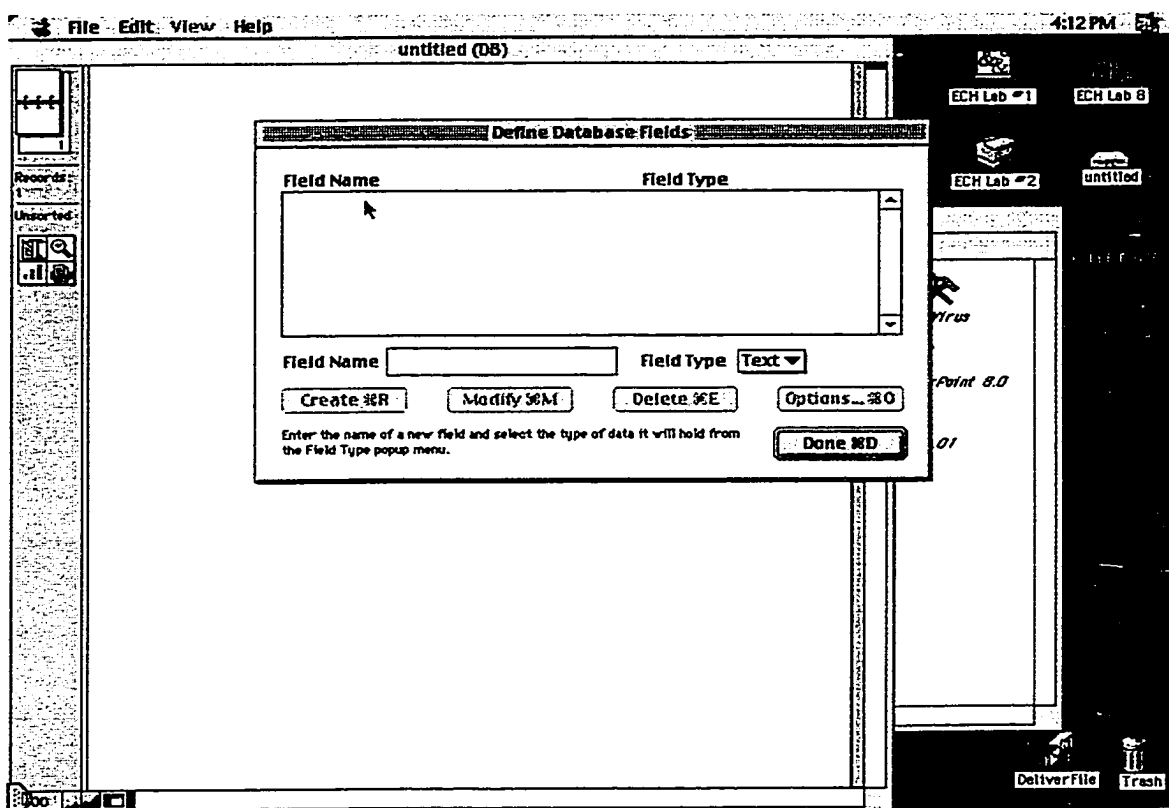
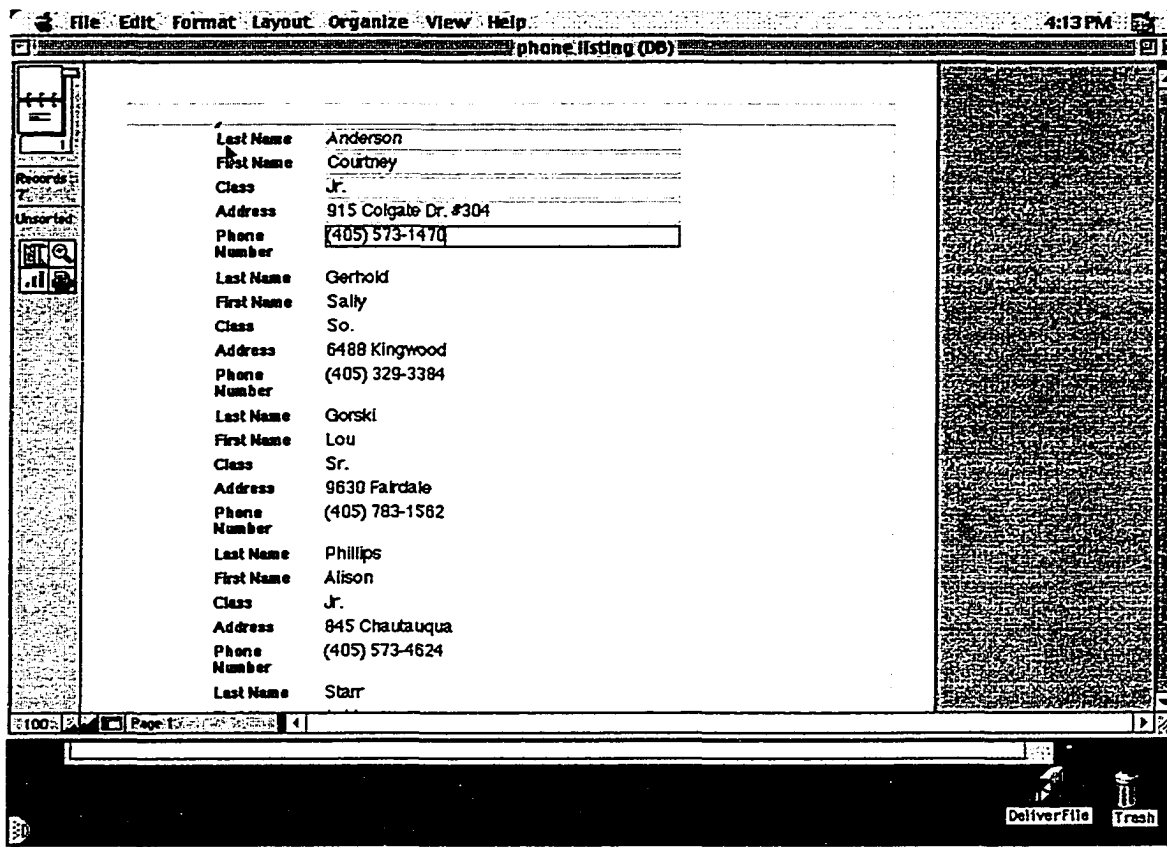


Figure 8. Placing information into the screen fields in ClarisWorks®.



Microsoft® Access is the database application for Microsoft® Office. The interface for Microsoft® Access is different from ClarisWorks® database. The opening screen for the database, the user then must select which procedure to develop a database (See Figure 9). Once the procedure is selected, the user needs to decide immediately where to save the file (See figure 10). Once this is selected, the user cannot change where a database can be saved unless they use the Windows explorer program.

Figure 9. Opening screen for Microsoft® Access.

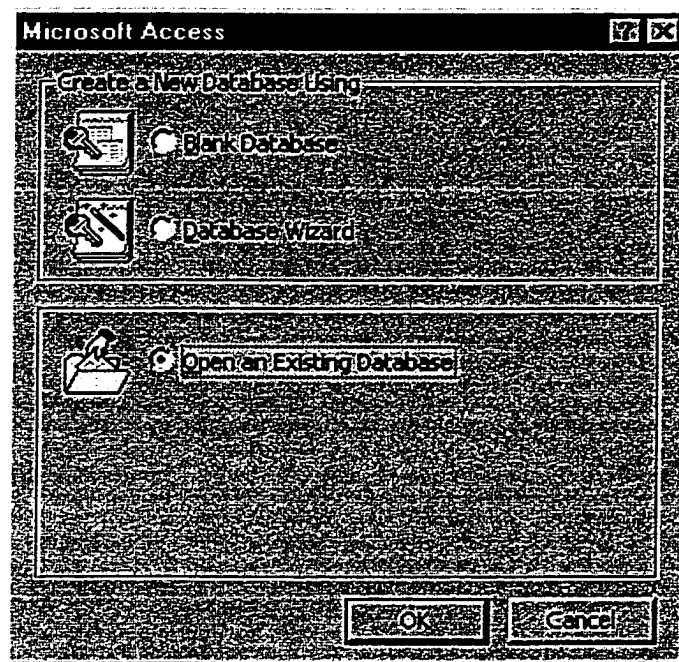


Figure 10. Dialogue box that allows a user to save files in Microsoft® Office.

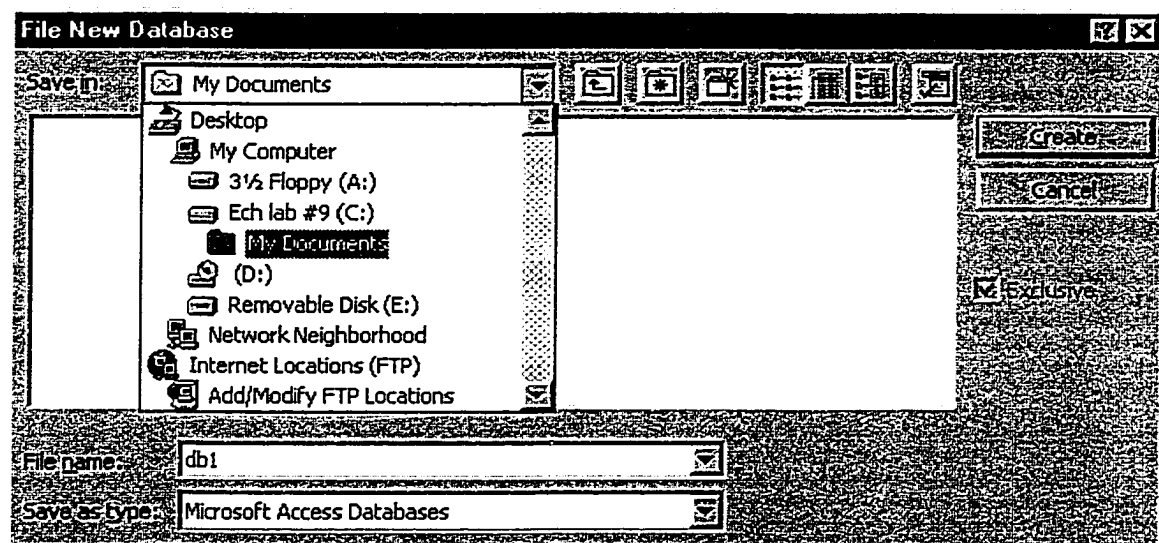
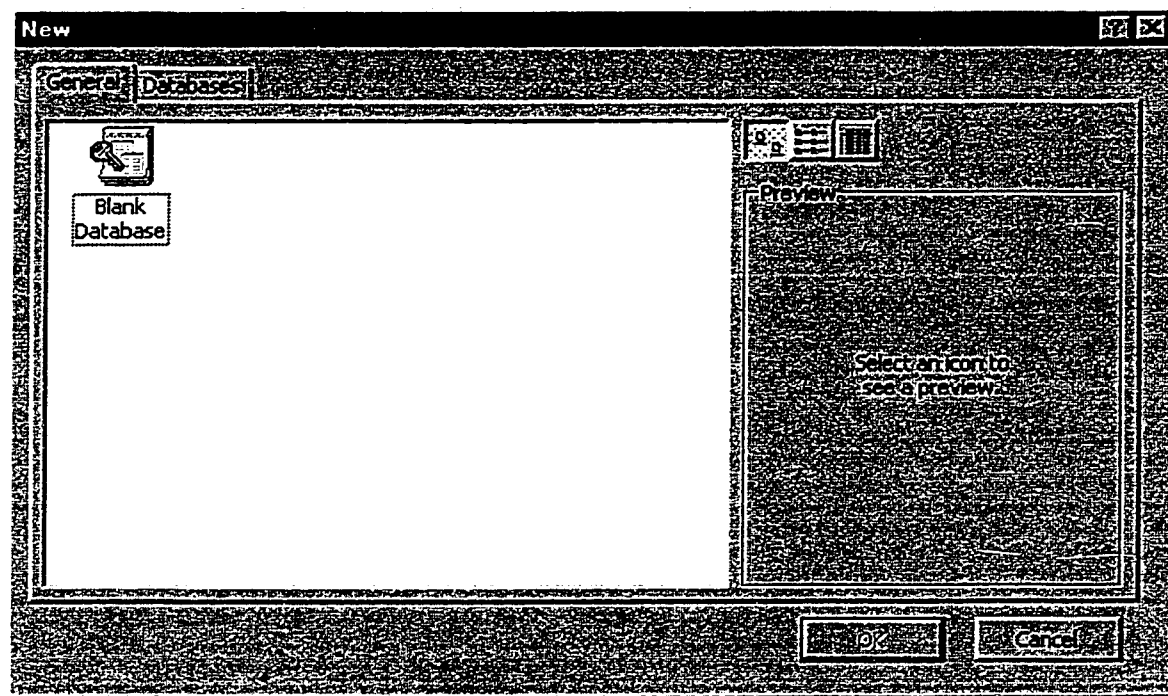


Figure 11. New database file in Microsoft® Access

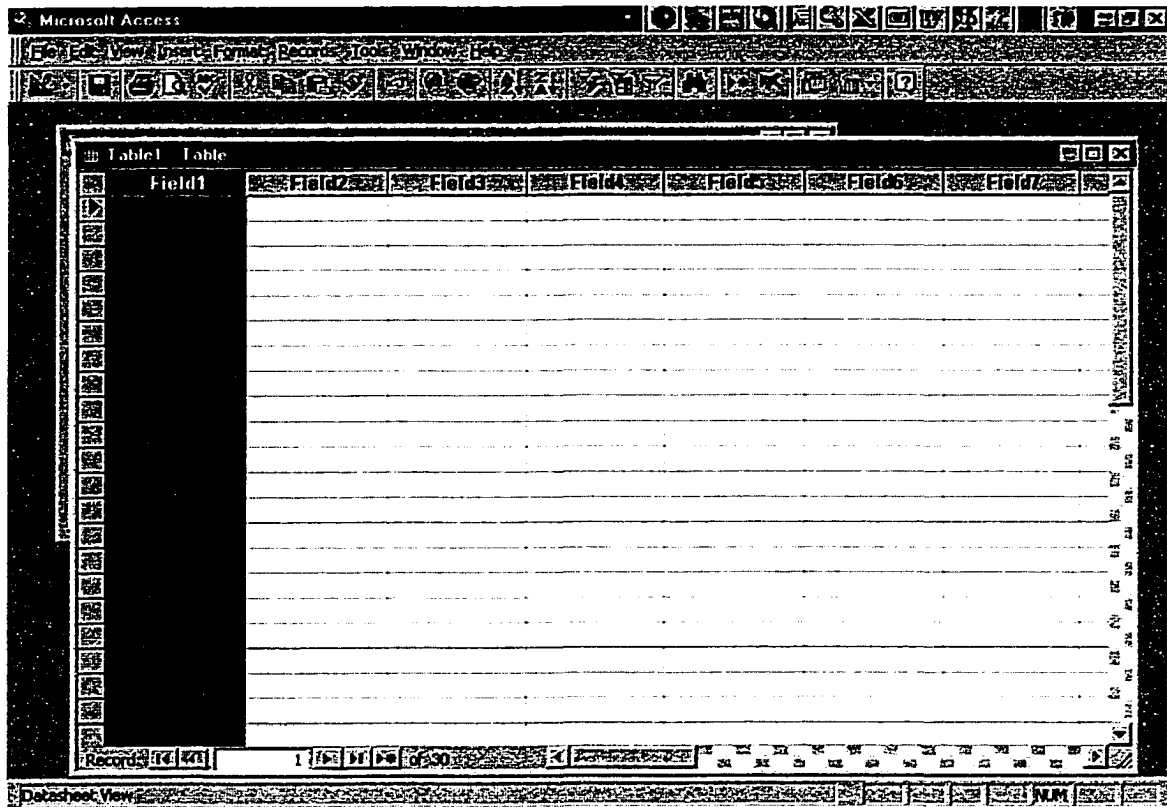


If the user selects the blank database screen (see Figure 9), the following screen appears (See Figure 11). The user then has a choice to select one of databases in the files or open a blank database. If the user selects a blank database from this screen, then the following screen appears (See figure 12). The user must select the new button to open a new table. The following screen appears where the user can begin to name fields and entering data by clicking on the fields (See Figure 13).

Figure 12. Selecting New Table in Microsoft® Access.



Figure 13. Blank database file in Access.



The user can name the field by right clicking on the field. For example, if the user wants to name the first column, they would right click on Field1. Then the user can input data into the fields by clicking on the fields they want and entering the information (see Figure 13).

If the user selects the database table wizard (see Figure 9), then a screen pops up that allows the user to select the type of database needed (see Figure 14). The wizard has a selection of databases that have already been created with field names. The type of databases available includes a variety such as an address book to music collections (see Figure 14).

Figure 14. Selecting database fields from the database wizard in Microsoft® Office.

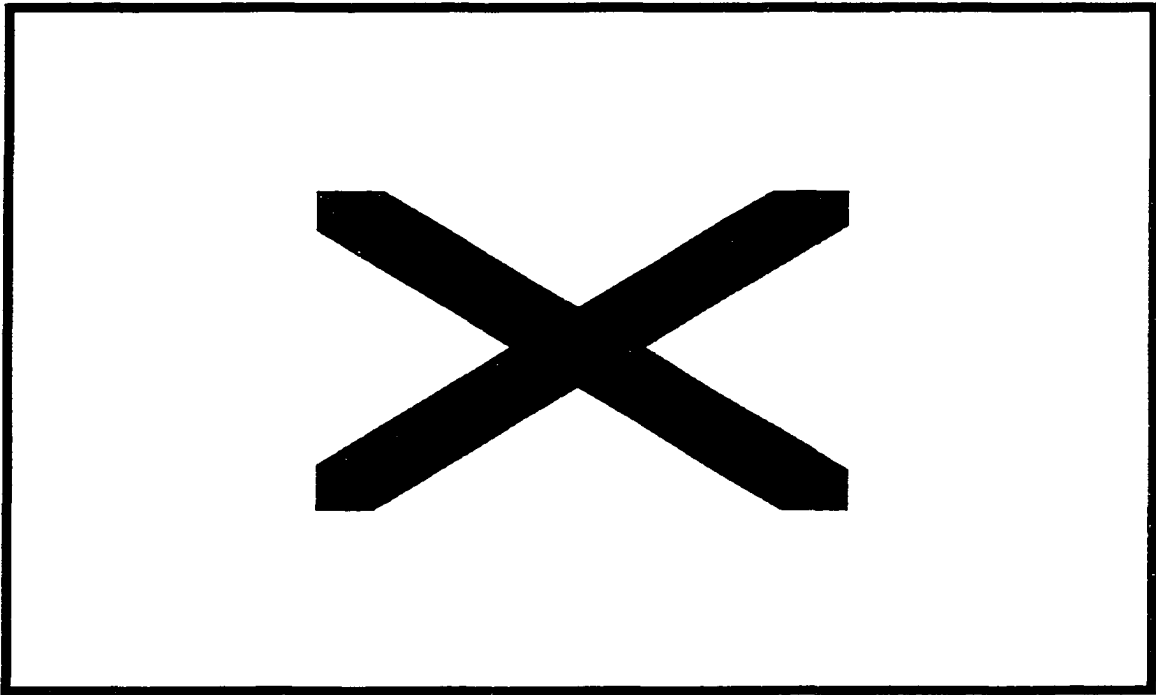
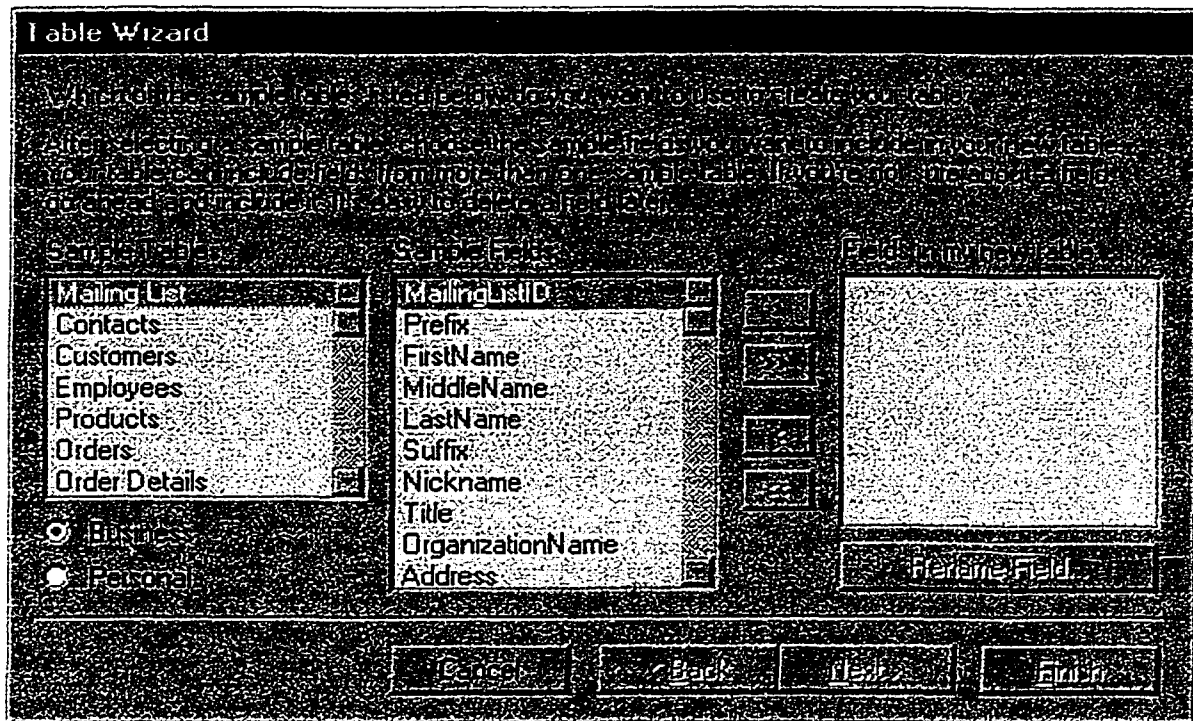


Figure 15. Selecting fields from the database table wizard.

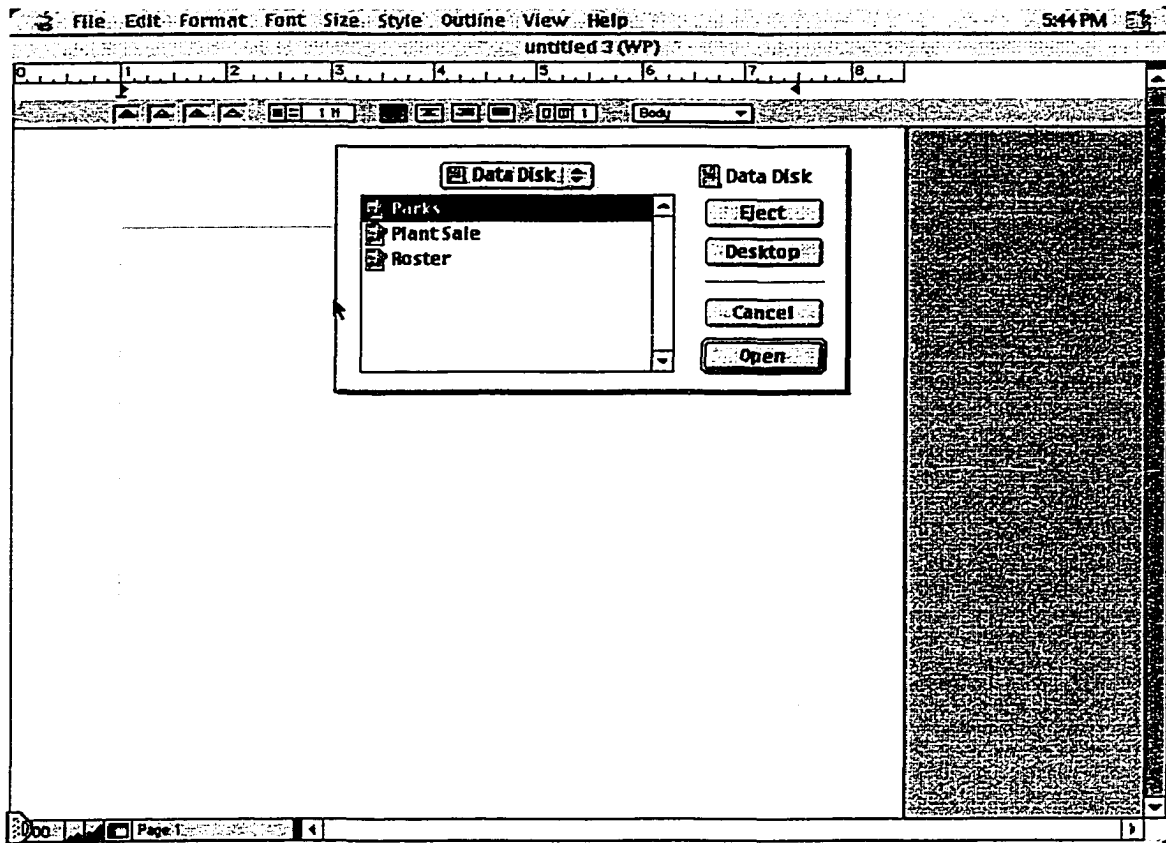


Once a database is selected, then the user can select the fields needed by highlighting the field and clicking on the arrow that points to the right (see Figure 15). This will move the field over into the “Fields in my new table” box. When the users are finished selecting fields, they click on the finish button in the right hand bottom corner. The user can enter data into the fields at this point.

GUI for Mail Merge Process for ClarisWorks® and Microsoft® Word

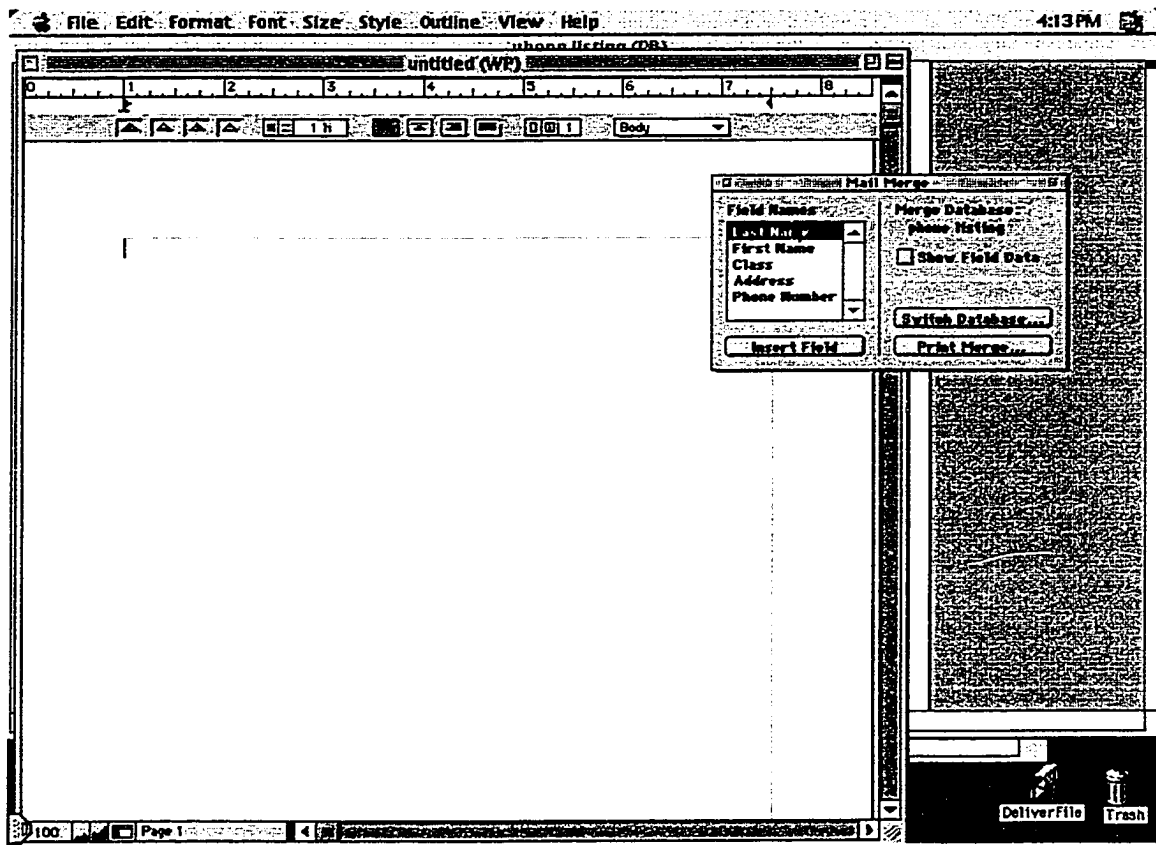
There is a difference between the procedures for mail merge between ClarisWorks® and Microsoft® office. In both programs, the user must open a word processing file. In ClarisWorks®, the user opens a new word processing document. The user then selects mail merge from the file menu. The user selects a database from the dialogue box (See Figure 16).

Figure 16. Selecting database in ClarisWorks® mail merge.



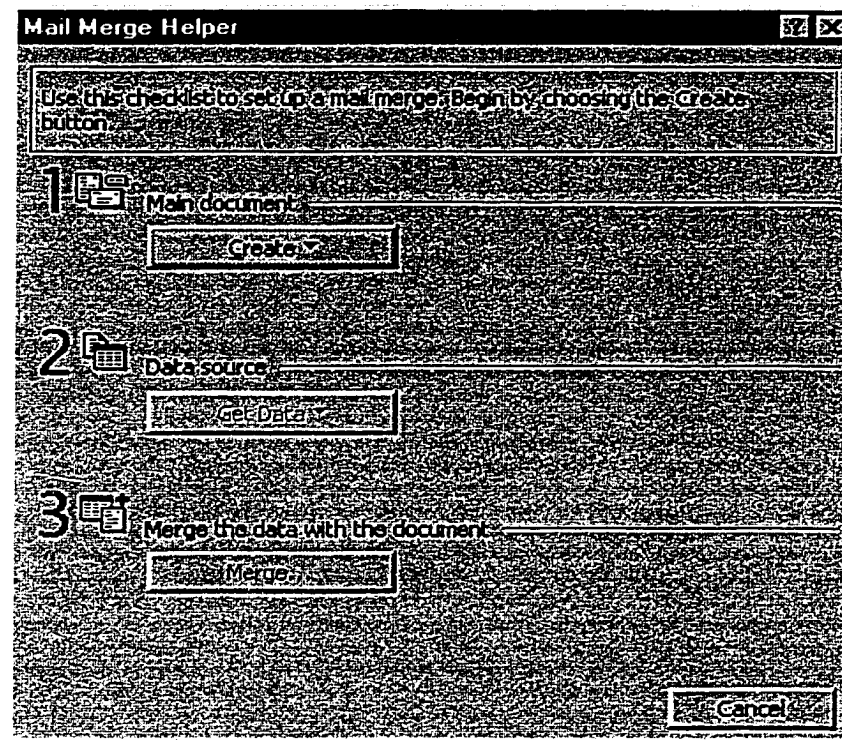
Once the database is selected a dialogue box appears where the student can begin inserting fields into the word processing document (See Figure 17).

Figure 17. Word processing document with mail merge dialogue box.



The mail merge procedure is different in Microsoft® Office. The user begins the mail merge process by opening a blank word document. Once Word is open, the user must select mail merge from the tools menu. The following dialogue box appears (See Figure 18). The user must select a word document. This can be an existing file or a new file they are creating.

Figure 18. Mail merge dialogue box that user selects word document and database file.



After selecting the word processing document, the user selects the get data button. The user must select the database needed (see Figure 18). Some knowledge of how files are stored in Microsoft® office are saved is needed at this point. The dialogue box ask for word files under file type (see Figure 19). The user must click the down arrow and select database files. Once the database file is selected, it is merged with the word document. A mail merge title bar is created (see Figure 20). The user then must click on "Insert Merge Field" on the title bar to select merge fields to place into the document.

Figure 19. Selecting data from the mail merge menu in Microsoft® Office.

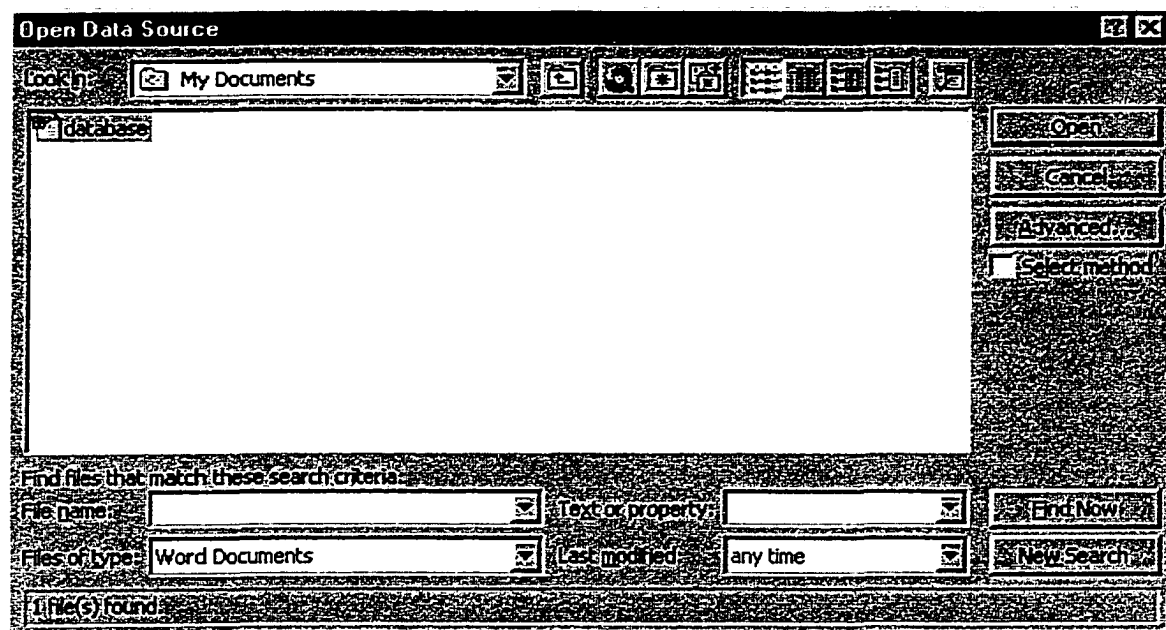
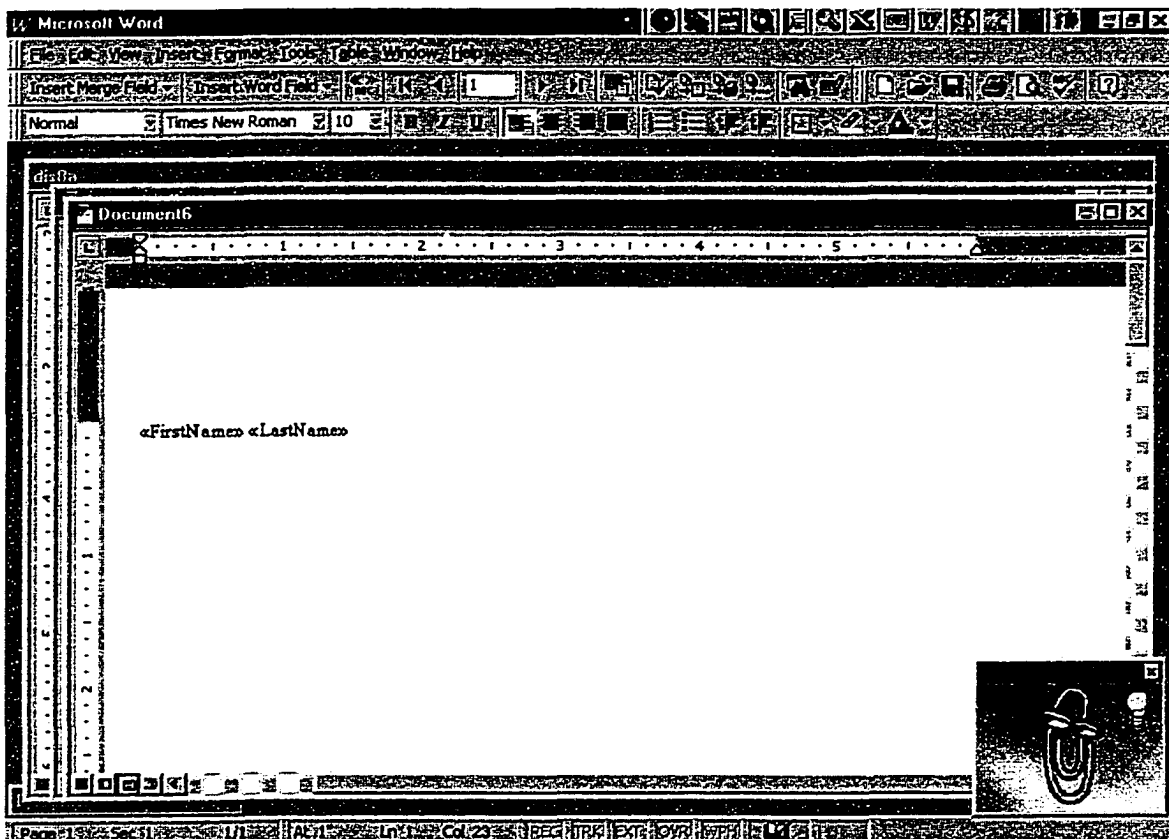


Figure 20. Word processing document with merge fields



Based on the GUI, there is little difference between the two word processing applications. The process of creating and editing word processing documents differs very little. Therefore, if students transfer knowledge from one application to the next, the transfer will be considered a near transfer. The GUI difference between the database applications is different. In ClarisWorks® database, the user must define fields. In Microsoft® Office, the user can select fields through the wizard or create a database from a blank database. Therefore if students transfer knowledge from one application to the next, the transfer will be considered a far transfer. There is significant difference between the process of creating mail merge letters in the two software packages. The knowledge transfer between the two applications would be considered far transfer.

Instructional Strategies

Instructional strategies may be developed to teach learners to work past the differences in the surface features of the screens. For example, Brown & Kane (1988) found preschool children could be trained to develop a strategy to look for analogous solutions to problems that differed on surface features but share deeper relational commonalities. Transfer was facilitated when the children were encouraged to explain the relationships. Researchers suggested deeper processing occurred when the children elaborated or developed explanations about the relationships.

Shih and Alessi (1994) investigated the influence of mental models on the transfer of the procedural skills of computer programming. The three experimental groups were code evaluation with conceptual models, code evaluation without

conceptual models and code generation. This study produced three preliminary findings. First, practicing code evaluation with the help of conceptual models promoted conceptual understanding. Conceptual understanding also transferred to generation skills. Second, practicing in the generation and conceptual understanding groups improved the automatization of the programming skills as well as improved conceptual understanding of programming. Third, the quality of the mental models influenced the students' ability to solve transfer problems. Thus, the higher the quality of learners' mental models, the more likely they were able to solve transfer problems. This research is consistent with the theoretical prediction that the depth of processing can have a positive impact on transfer (Anderson, 1995).

Teacher Training of Technology

Increasing pressure is being placed on the public school system to incorporate computer use in the classroom. Cuban (1993) suggests three forces are placing pressure on schools to incorporate technology reform. One of the primary drives of the reform is the belief that students will be unprepared to compete in the job market if they cannot use computers. The other two drives are increased belief in self-directed learning by educators and the idea technology can increase teachers' productivity. Thus, societal pressure is one of the primary forces facilitating the technology reform (Cuban, 1986; Cuban, 1996; Holloway, 1996).

Currently, computer technology is not being fully utilized in the classroom (Baldwin, 1997; National Education Association, 1993; Northrup, 1997). Many public school teachers report they have not received adequate training in using technology effectively (Baldwin, 1997; Leggett & Persichitte, 1998; Northrup, 1997).

Recent surveys indicate that most teachers still need access and training on how to use modern technology in the classroom (Balwin, 1997; Henry, 1987; Leggett & Persichitte, 1998).

Many factors influence the lack of training of teachers. One possible reason for the lack of training is most funds are spent on computer hardware and software and not on technical training (Department of Education, 1996). Another reason is the lack of time given to computer skills training. Only 14% of K-12 teachers have had 8 or more clock hours of computer training (Department of Education, 1996). In addition, most computer skills training were conducted in the form of a one shot seminar. Gattiker (1991) suggested that this type of training is inadequate for computer skills training because it overwhelms the novice computer user. Gattiker recommended intermittent training might be more effective with novice computer users than trying to train learners how to use a computer in one day. Thus, inadequate training may influence transfer because learners are not given an opportunity to process the information in sufficient depth and breadth to learn the computer skills in the first. Therefore, this type of training does not facilitate the transfer of computer skills.

Technology Goals and Standards

The National Council of Accreditation of Teacher Education (NCATE) in conjunction with the International Society of Technology in Education (ISTE) has developed their standards of knowledge and use of technology. It is clear by the new standards set that using computer applications to teach curriculum goals is one of the primary goals of the technology reform movement (Department of Education, 1996,

Northrup, 1997; Peck, 1998). The K-12 educational system needs to undergo a change to include computers in the classroom. Part of the problem with the K-12 reform movement is teachers are not prepared to put these technologies to work in the classroom (Peck, 1998). Yet, research indicates that teacher training is one of the three factors which show up consistently in successful diffusion of technology into the public school (Holloway, 1996; Lowther & Morrison, 1998). Professional development and training were found to be an integral part of effective technology integration. Therefore, it is important to develop technical training that results in meaningful implementation of computers in the classroom (Holloway, 1996; Jonassen, 1996). One suggestion to increase technical skills of teachers is to increase training of both preservice and inservice teachers (Department of Education, 1996). Developing undergraduate courses that help preservice teachers meet the technology goals discussed is one approach to increasing teachers' technology use.

Technology Skills Needed

In order to develop technology training, the specific technology skills need to be identified. Northrup (1997) used a four analysis approach to establish benchmarks for teacher preparation programs. The analysis included: (a) a critical review of prominent guidelines, (b) a key informant study, (c) an instructional technology survey, and (d) a review of instructional technology literature. Information for the review of technology guidelines and key informant meetings was used to develop a survey. Northrup surveyed 300 K-12 teachers and administrators working in surrounding school districts. The survey asked the educators what computer skills and technology applications should be taught in preservice teacher preparation programs.

Educators responded to specific areas of instructional technology use. For example, this survey indicated that 72% of the teachers responded indicated word processing was a skill needed prior to entering the classroom. The most critically rated productivity tools were word processing, graphics programs, desktop publishing, spreadsheets, and databases. Multimedia tools identified were CD-ROM and laserdisc.

Preservice training of technology can make a difference in the technology use in the classroom if the training is effective (Henry, 1987; Holloway, 1996). To develop effective technology training, Northrup (1997) discussed the need to identify specific benchmarks in technology training. Specific goals are needed in order to develop preservice teachers' programs that provide adequate technical skills training. Northrup (1997) reviewed current guidelines which included: (a) The National Council for the Accreditation of Teacher Education (NCATE), (b) International Society for Technology in Education's Educational Computing (ISTE) and (c) Florida's Accomplished Practices for Instructional Technology. A key informant study was conducted with teachers representing all grades, school-based media specialists, special education educators, school-based administrators, district-level administrators, and the Director of Technology for each district. Data were analyzed using a qualitative approach clustering key concepts into categories. Currently, the benchmarks identified are being used at the University of West Florida in preservice teacher training programs (see Table 1 in Appendix A).

The benchmarks identified by Northrup (1997) are the computer skills that should be taught in an introduction computer course for teachers. What is missing

from the empirical research is which instructional strategies also should be employed to facilitate the learning and the transfer of these computer skills.

Task Analysis

Instructional design can be used to develop teacher technology training. Information about the goals, tasks, and learners will influence several steps in the design process (Dick, 1996; Dick & Carey, 1990; Smith & Ragan, 1993). In order to develop technology training, the type of computer skills used in the learning process need to be identified. Computer technology training involves both declarative and procedural knowledge. Procedural knowledge is knowing how to perform an operation. Declarative knowledge is knowledge about an operation. Choosing the instructional strategy is an important part of the design process of developing a technology course. Instructional strategies are plans for assisting learners with their study efforts for each performance goal (Gagné, Briggs, & Wager, 1992). A task analysis was conducted to identify the concepts, procedures, and principles needed to instruct students on how to use word processors and databases. A task analysis was conducted on word processing skills (see Figure 21). A task analysis also was conducted on database skills (see Figure 22).

Figure 21. Task Analysis for Word Processors

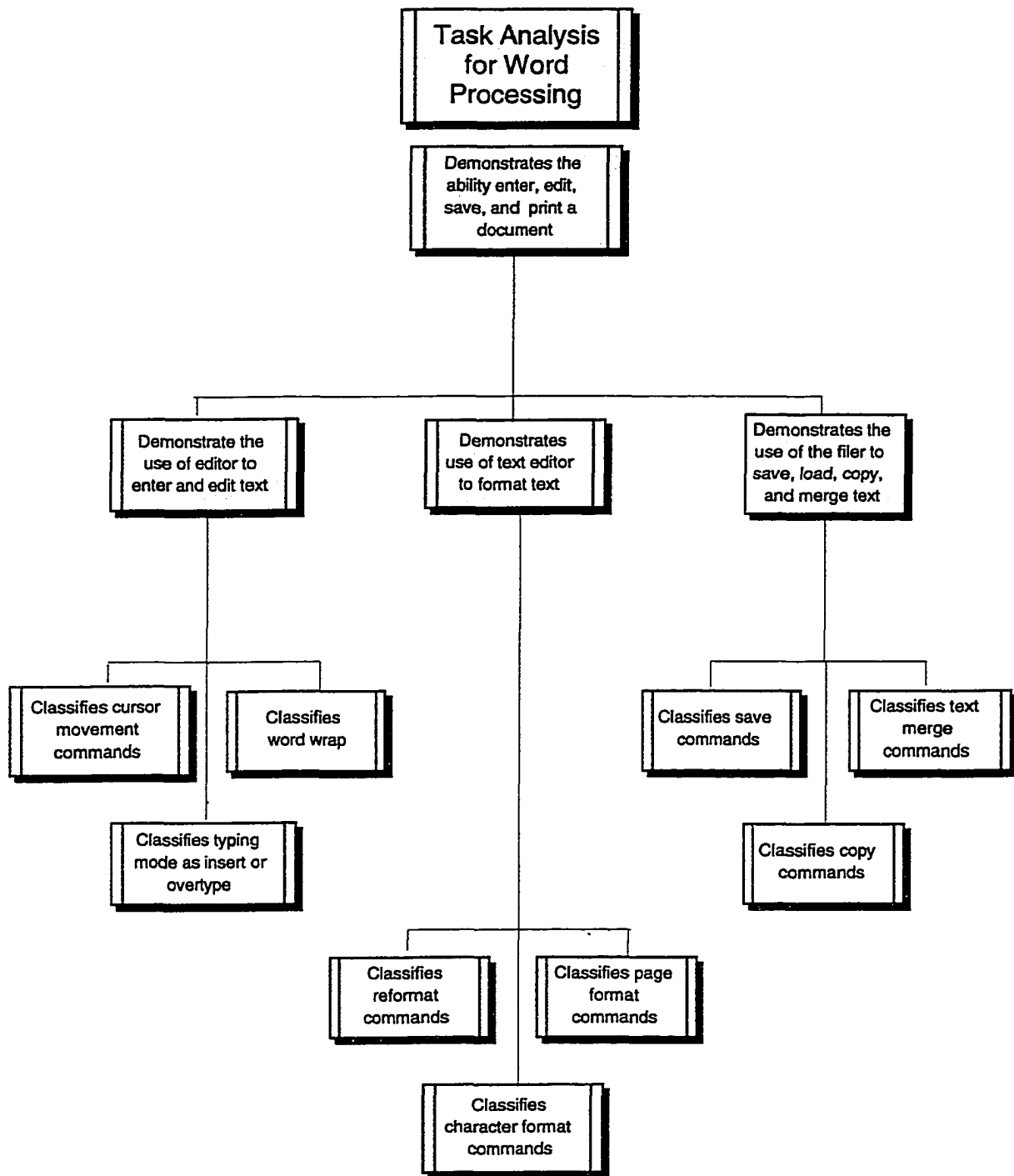
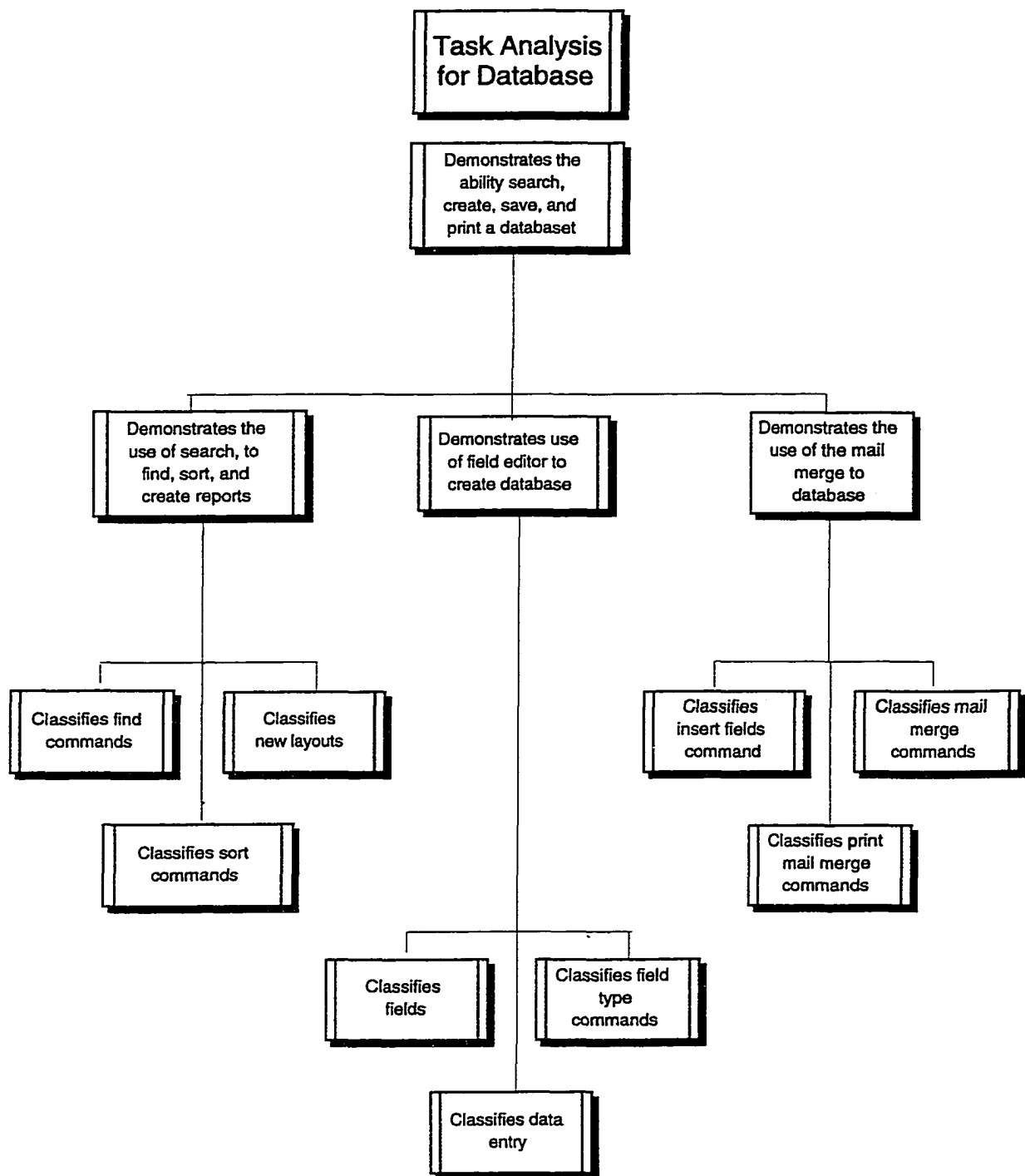


Figure 22. Task Analysis for Databases.



Skills Training and Computer Skills Training

Several variables influence college students' computer use. They are computer experience (Scott, 1995), computer knowledge (Anderson, 1996), gender (Maurer, 1994), personality traits (Maurer, 1994), academic major (Maurer, 1994), and age (Gattiker, 1991). Computer knowledge, computer experience, and personality characteristics such as internal locus of control appear to facilitate the use of computers (Anderson, 1996; Maurer, 1994; Scott, 1995). Lack of knowledge, little experience, and external locus of control appear to inhibit the use of computers (Anderson, 1996; Maurer, 1994; Scott, 1995).

Anderson's (1995) ACT* can be used here to help design instruction for the acquisition of computer skills. According to Anderson, instruction should include both declarative and procedural knowledge. Adequate learning of both should facilitate the transfer of computer skills.

In procedural training, transfer can be enhanced by using a simulation that is similar to the training. Transfer also can be facilitated by the development of conceptual models. For example, Shih and Alessi (1994) found there was a positive relationship between the quality of the learners' mental models and their ability to transfer knowledge. In this study, students succeeded on transfer items when they had developed conceptual models of the programming languages (Shih & Alessi, 1994).

Research conducted by Mayer (1975) indicated that using conceptual models to enhance students' conceptual understanding enhanced the transfer of programming skills. Learning and transfer of procedural skills were investigated by comparing the performance of three groups. Subjects who did not know how to program practiced

either code evaluation or code evaluation with the aide of conceptual models.

Practicing code evaluation with conceptual models was found to facilitate conceptual understanding, learning of code evaluation, and transfer to code generation. These results are consistent with research conducted by Shih & Alessi (1994).

Bernardo and Morris (1994) compared the transfer effects of skills in mathematical modeling, procedural comprehension, and verbal problem solution of a high school programming course. No differences were found for mathematical modeling and procedural learning between the students. Students in the programming group scored higher on verbal problem solution. Researchers suggested the positive effect of programming course work on the verbal problem-solving may be linked to metacognitive processes that take place during the program process.

Research indicates two instructional methods appear to facilitate the transfer of knowledge (Brown & Kane, 1988; Mayer, 1975; Mirman & Tishman, 1988; Perkins & Solomon, 1989; Phye & Sanders, 1992; Shih & Alessi, 1994). The first method is instructing students about the underlying principles and concepts (Mayer, 1975; Shih & Alessi, 1994). The other instructional strategy is to help students to develop metacognitive strategies (Brown & Kane, 1988; Mihman & Tishman, 1988; Perkins & Solomon, 1989; Phyte & Sanders, 1992). These results are consistent with the ADAPT model (Jelsma, Van Merrienboer, Bijlstra, 1990). Although these instructional strategies have facilitated the development of complex skills such as computer programming and reading skills, there is little research on whether these strategies facilitate the development of software application skills.

Summary

Transfer of knowledge obtained in the classroom is one of the primary goals of education. Empirical research and theories reviewed here helped me to understand some of the factors that may influence the transfer of computer skills. Variables such as self-efficacy, task similarity, and varied practice appear to impact the transfer of knowledge and skills (Butterfield & Nelson, 1991; Clark & Voogel, 1985; Misko, 1995). For example, the greater the similarity between tasks, the more likely there will be transfer between two tasks. For the present study, only variables related to instruction will be examined.

Metacognition consists of self-appraisal and self-management. Metacognition influences the learning process (Sternberg, 1998). Students who use metacognitive strategies appear to learn the material faster and understand the material better (Carr, Alexander, & Folds-Bennett, 1994). Metacognition can influence the transfer process as well (Brown & Kane, 1988). Students who were taught to use strategies performed better than students who were not taught to use strategies. Thus, research supports the idea that metacognition may have a positive impact on transfer of computer skills training. Yet, little empirical research exists on how metacognition influences software application training. Thus, research is needed to investigate the impact of metacognition on software application skills training.

Current Study

Clear goals for infusing technology into preservice teachers training have been identified (Department of Education, 1996; Northrup, 1997). Empirical research is needed to determine which instructional strategies or combination of strategies are

effective in teaching preservice teachers computer skills. According to the ADAPT model, different instructional strategies will influence near and far transfer (Jelsma, Van Merriënboer, & Bijlstra, 1990). Employing cognitive strategies such as understanding underlying concepts and metacognitive strategies will influence both the near and far transfer processes. According to the ADAPT model, teaching procedural knowledge will influence the near transfer process and may have little or no influence on far transfer. This study will investigate how different instructional strategies in a computer course will impact the transfer of computer software application knowledge. Two different instructional strategies will be used. They are:

1. Teaching procedural skills of computer applications. .
2. Teaching procedural skills with the development of metacognitive skills.

Predictions

The following is the prediction that will be tested in this study. Students with metacognitive strategies will perform better on far transfer tasks than students with only procedural instructions.

CHAPTER III

Methods

Research Design

The current study was designed to examine different instructional strategies in a computer technology course and their influence on near and far transfer of computer knowledge. A repeated measures design with multiple dependent variables was used to examine whether instructional strategy training was effective in promoting near and far transfer. The between subjects groups were the procedural learning and procedural learning with metacognitive strategies. The within subjects variable was student scores on the pretest, post-test, and transfer test. The three exams were scored on word processing, database, and mail merge exercises. The pretest and post-test score comparison determined whether students learned how to use the ClarisWorks® computer applications. The transfer test scores determined whether the student could transfer knowledge from ClarisWorks® to applications in Microsoft® office. The word processing scores were used to determine whether the students could complete near transfer exercises. The database and mail merge exercises were used to determine whether the students could complete far transfer exercises.

Variables

The independent variable in this study was the different instructional methods. The dependent variables were the students' performance on pretest, post-test and transfer test scores. The pre-, post-, and transfer tests were scored on the word processing, database, and mail merge exercises. Thus, there were multiple measures for each exam.

Participants

Data were collected during the fall semester of 1998. “The Productivity Tools for Teachers” undergraduate technology course at the University of Oklahoma was used to investigate the effective of instructional techniques on transfer of learning of computer applications. “The Productivity Tools for Teachers” technology course included students who have little or no knowledge about how to use computers and productivity software. There were four sections with two course structures. Two sections met for 3.75 hours for 4 weeks. Two sections met for 1 hour for 15 weeks. The two course structures eliminated the option to randomly assign the two instructional strategy groups to the four sections. To prevent confounds of the course structure, each course structure had one experimental group and one control group.

Equipment

Students were instructed on Power Macintosh and G3 computers. Power Macintosh computers contain a Dos card as well as a Macintosh operating system. G3 Macintosh computers contained a program called virtual PC which simulated the Windows 95 operating system. Therefore, students had access to both Macintosh and Windows operating systems and computer applications. Microsoft® Office was loaded on the Windows operating system. ClarisWorks® 4.0 was loaded on the Macintosh operating system.

Microsoft® Office and ClarisWorks® applications are integrated software packages that have several applications that interact with each other. ClarisWorks® software package contains word processing, paint, drawing, database, spreadsheet and communication software. Microsoft® Office software package contains word

processing, spreadsheet, database, and presentation software. These two integrated software packages were chosen because they both contained word processing and database applications.

Material

Two instructional packets were developed for the two experimental groups (see Appendix I, J). The homework packets differed in the following ways. The procedural group was given two practice exercises and 4 short answer questions per software application (see Appendix I). The metacognitive group was given one practice exercise and 10 short answer questions to fill out per software application (see Appendix J). This was done so that students would spend the same approximate time on each application.

Instructional Groups

Instructions with emphasis on Procedural Skills

Students completed homework exercises out of a packet that students purchased at the beginning of the course. The exercises were taken from *A Mac for the Teacher ClarisWorks® version (Second Edition)* textbook. The textbook provides step by step directions on how to use each of the applications in ClarisWorks® 4.0. Direct instruction also was given on how to use each of the computer applications with a brief lecture at the beginning of each new application. For example, the students were given step-by-step instructions on how to save files from the ClarisWorks® application onto their floppy disks. The rest of the class time was used by allowing the students to practice using the application and completing the homework exercises. Students were taught how to create documents in each particular

application of the productivity tools software package. For example, students were taught how to create a newsletter that can be sent to their students' parents. Students must utilize a variety of features of the word processing application such as incorporating a header, columns, and clip art to complete the newsletter exercise. The students were given a brief demonstration how to incorporate the different elements of the newsletter (see Appendix K for an example). Students were then allowed to practice. The instructor responded to students' questions by explaining how to do the particular function being asked about. For example, if a student did know how to change the format to double space, the instructor explained how to select the double space icon on the title bar.

Students also had short answer questions that they must complete after completing the computer exercises. The following gives the short answer questions they completed.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. What is your current skill level with this computer application? (i.e. beginner, intermediate, or advanced)?
2. How can this computer application be used towards an instructional goal?
3. Why does this computer application lend itself towards the instructional goal?
4. How can you extend the use of this computer application to other audiences, content areas, or purposes?

Metacognition Instructions

As well as completing homework assignments on different computer applications, students were asked to fill out worksheets that address metacognitive

strategies for each assignment. Class time was provided for students to complete homework assignments as well as complete worksheets. Generally, think aloud procedures are used to encourage the development of metacognition (Royer, Cisero, & Carlo, 1993). However, homework sheets were selected instead because think aloud procedures were considered too noisy and distracting inside the computer classroom.

Strategy instruction was developed following the guidelines outlined by the metacognition literature (Blakey and Spence, 1998; Carr, Alexander, Folds-Bennett, 1994; Williamson, 1996). Questions on the homework sheets were developed to encourage students to reflect on what they are learning. The questions were designed to encourage students to identify what they know and don't know (Williamson, 1996). In addition, the instruction on the homework sheets was designed to encourage subjects to rely on similarities among tasks in solution strategies. Strategy similarity instruction was designed to promote positive transfer. To be effective, strategy similarity instruction followed the introduction of the computer applications. This was done to encourage students to approach the situation like experts do instead of focusing on surface differences among the tasks as novices do. The following is the homework sheet that was developed. Discussion of the answers was done after each software application. The discussion encouraged students to spend some time thinking about strategies.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your skill level with this computer application? (i.e. beginner, intermediate, or advanced)?
2. What are some of the similarities between this computer application you are currently working on and previous computer application covered in the course?
3. What are some to the differences between this computer application you are currently working on and previous computer application covered in the course?
4. What were some of the skills you used in this homework assignment that you used in previous homework assignments?
5. Where can you go to find information if you do not know how to do something? Please make a list.
6. Circle any of the responses from number 5 that you actually used while completing the homework exercise.
7. How can this computer application be used towards an instructional goal?
8. Why does this computer application lend itself towards the instructional goal?
9. How can you extend the use of this computer application to other audiences, content areas, or purposes?
10. Now that you finished the homework exercise, do you feel like you have mastered this application?

Instruments

A biographical questionnaire was administered to collect data on gender, computer experience, and other biographical data (see Appendix B). Pre-, post-, and transfer tests were developed along with a checklist to grade each test (see Appendix C, D, E). Items selected for the pretest were selected from a pretest that was previously administered in EIPT 3113 “Microcomputers in Teaching” technology course (see Appendix C). The pretest consisted of four exercises covering three software applications. The first exercise was a word processing exercise. The students

were required to edit a word processing document according to directions. The second exercise was a spreadsheet exercise. Students were required to modify a spreadsheet and compute total scores and averages. There were two database exercises. The first database exercise required students to create a database with nine fields. The students were then instructed to fill out to records with information provided. The last database exercise instructed the students to create a columnar report with an existing database.

Items selected for the post-test were selected from a final exam that was administered as the final exam in EIPT 3011 “Productivity Tools for Teachers” technology course (see Appendix D). The word processing exercise required the students to edit an existing document. Students also created a short word processing document for the mail merge exercise. The students were required to create a database with nine fields. Students completed two records with the information provided. Students used the database and word processing document created to complete the mail merge exercise. Students merged the word processing document with the database.

Items from the transfer exam were developed to be equivalent exercises of the final exam with the exception of using a different software application. The mail merge exercise was selected because it incorporated both the database and word processing as well as mail merge. The mail merge exercise from the post-test was adapted to Microsoft® office (see Appendix E). Thus, the exercise was identical to the post-test except Microsoft® Office applications were substituted in the instructions for the software application. Students created a database and completed two records.

They created a short word processing document and merged the document with the database.

Checklists were developed to score the three exams (see Appendixes F, G, H). Points were assigned to the word processing, database, and mail merge exercises based on points available in the course. The points were assigned to the tasks on the checklists based on the difficulty of the task. The points for the word processing, database and mail merge exercises were distributed to be consistent across the three exams.

Pilot Study

Pre-, post-, and transfer tests have been developed along with a checklist to grade each test (see Appendixes C, D, E). Three subject matter experts reviewed the pre-, post-, and transfer tests. Subject matter experts read the tests and made suggestions on how to improve instructions. One-on-one trials also were conducted. Three students took each of the exams. Suggestions for improvement were written on each exam. Revisions on each test were made based on suggestions from the subject matter experts and the one-on-one trials. The pre-, post-, and transfer tests were piloted in the June session of the EIPT 3011 course.

Pilot Results

Biographical analysis from the pilot of the June session of “Productivity Tools for Teachers” technology course indicate 83.3% of the subjects were female and 16.7% of the subjects were male. The age range of the subjects varied from age 17 to 36 and over. The majority of the subjects (66.7%) were age 17-20. Students’ classifications were juniors (66.7%), seniors (16.7%), and graduate students (16.7%).

A pilot study was conducted to determine how to administer the exams within the EIPT 3011 curriculum. Six students were given the pilot exams during the summer session. Prior to data collection, subjects were provided with consent forms. Those who signed the consent forms were allowed to participate in the study. At the time of data collection, subjects were explained the confidentiality of the study. Students who wished to participate in the study completed the exams. The pretest was administered during the first class prior to instruction. The post-test was the final exam of the course. Therefore, it was administered during regular schedule time. The transfer exam was given to the students after they completed the final exam. Students were instructed that the score on the transfer exam would not impact their grades. They were instructed to do the best they could and return the exam when they were finished with the exam or they have gone as far as they could.

Six students were administered the pre-, post-, and transfer exams. Two students completed the transfer exam. Two students began the transfer exam, became frustrated and quit the exam after 20 minutes. Two students partially completed the exam before they ran out of time. Administrative details also were worked out such as formatting exam disks in Dos format so that all files for each student could be stored on the same disk.

Procedure

The students were given a pretest at the beginning of the course to measure their technical knowledge and skills. The pretest was administered the first day of class. Items on the pretest consisted of word processing, database, and spreadsheet exercises. Students who added the course after the first week of class were given an

opportunity to make-up the pretest exam by appointment. One student did not complete the pretest exam.

Students from the two experimental groups were given two different homework packets based on their experimental groups (see Appendixes I, J). Students completed the homework exercises and short answer questions. The homework and questions were reviewed the next week prior to the next instruction.

The exams were administered according to the course format. The students' learning also was measured by a final exam at the end of the course for the four week sections. Items on the post-test consisted of items of hardware/software compatibility, word processing, graphics, database, email, and internet exercises. A test with transfer items also was administered at the time of the post-test. Mail merge exercises were chosen because they incorporate aspects of both word processing and database exercises. A midterm and transfer exam were administered during week 8 of the 15 week course structure. Students were allowed to come in one hour early or stay late to complete both exams. Students also were given an option to complete the transfer exam. Students were informed at the time of testing that they would earn extra credit points if they completed the transfer exam.

Biographical data and Questionnaires were administered at the time of the final exam for all sections. Subject information about the gender, computer experience, and education major were collected at that time. The pre-, post-, and transfer tests were graded by a checklist (see Appendixes F, G, H).

CHAPTER IV

Results

Thirty-nine students were enrolled in the “Productivity Tools for Teachers” course during the Fall Semester of 1998. Eighteen students were enrolled in the procedural group. Twenty-one students were enrolled in the metacognitive group. Two students in the procedural group did not complete the pretest. One student in the metacognitive group did not complete the pretest. One student did not complete the transfer test in the procedural group. Five students did not complete the transfer test in the metacognitive group. This subject mortality resulted in 15 students participating in each experimental group for the word processing and database exercises. There were 16 subjects in each experimental group for the mail merge exercise.

A 2 (metacognitive and procedural) x 3 (pre-, post-, and transfer exams) repeated measures MANOVA was computed for the word processing and database because the scores for those sections of the exam were equivalent across the three exams. However, a 2 x 3 repeated measures MANOVA could not be used for the mail merge because the measure for the spreadsheet pretest score differed from the mail merge post-test and transfer exam scores. Thus, a 2 (metacognitive and procedural) x 2 (post and transfer exams) repeated measures ANOVA was computed for the mail merge scores. Three comparisons were made, therefore alpha was set as .0167. Wilks’ Lambda \underline{F} tests were reported for the multivariate \underline{F} scores.

Violation of the Sphericity Assumption

The sphericity assumption was violated for the pre-, post-, and transfer scores, therefore the Huynh-Feldt \underline{F} tests were reported (Tabachnick & Fidell, 1996). This

procedure was used to adjust the degrees of freedom by multiplying an estimate of epsilon by the degrees of freedom. The result was fractional degrees of freedom.

Pairwise comparisons were hand computed using the Bonferroni technique (Maxwell, 1980). This was done because the sphericity assumption was not met. Two dependent sample t values were calculated using the formulas listed in Toothaker and Miller (1996, p. 428). Hand calculated t - values were compared to critical values for the Dunn Multiple Comparison procedure (Toothaker & Miller, 1996, p. 653).

Analysis of Initial Skills Compatibility

Students' pretest scores were examined to determine whether the students entered the course with the same approximate level of skill and knowledge by computing a one-way ANOVA on the word processing, database, and spreadsheet exercise scores. No significant differences were found between the different sections on the pretest scores with alpha set at 0.05. The results for word processing, spreadsheets, and database were $F(1,35)=1.39$, $p=.25$, $F(1, 35)=2.78$, $p=.10$, $F(1,35)=.06$, $p=.81$, respectively.

Analyses Testing Mean Differences

Mean scores, standard deviation, and ranges for all three types of exercises on exams (word processing, database, and mail merge), at each time taken, are shown in Table 1 for both the procedural and metacognitive groups. The means also are graphed in Figures 23 to 25. From Table 1, it can be seen that most students entered the course with some word processing knowledge as means are above 3. The students' scores improved on the post-test, but students did not do as well on the transfer exercise as the pretest on the word processing exercise (see Figure 23).

Students did not do well on the database pretest exercise as mean scores were below 1 (see Table 1). Students did well on the database post-test exercise. The students did better than the pretest but not as well as the post-test on the transfer database exercise (see Figure 24). Students did well on the mail merge post-test exercise (See Figure 25). The groups scores differed on the mail merge transfer exercise in that the students in the metacognitive strategy instruction group performed better than students with just procedural instruction. A series of analyses were conducted to analyze the mean differences. These analyses are reported in terms of each of the research questions they address.

Do instructional strategies used in this study facilitate computer application transfer in preservice computer courses? A 2 X 3 repeated measure MANOVA was computed for the word processing and database scores. The multivariate main effect for exams was significant for word processing and database exercises. The scores differed across the three exams, $F(4, 25) = 51.046, p = .0001$. The multivariate main effect for groups was not significant, $F(2, 27) = 2.32, p = .117$ for word processing and database exercises. The multivariate interaction for database and word processing was not significant, $F(3, 25) = 3.26, p = .028$. A 2 X 2 repeated measures was computed for the mail merge scores. The main effect for exams was significant for the mail merge exercises, $F(1, 30) = 62.80, p = .0001$. There also was a significant interaction, $F(1, 30) = 10.71, p = .0001$.

Univariate tests were examined to investigate the different sections of the exams. The word processing pre-, post-, and transfer scores differed, $F(1.9, 26.38) = 28.20, p = .0001$. Scores on the post-test were higher than the pre- and transfer exam.

Pairwise comparisons were computed to determine where the differences were. The word processing pretest and post-test scores differed, $t(3, 30) = 4.34 > 3.19$. The difference indicates learning occurred during the course. The word processing pretest and transfer scores did not differ, $t(3, 30) = 3.08 < 3.19$. The word processing post-test and transfer scores differed, $t(3, 30) = 6.61 > 3.19$. Word processing scores were higher on the post-test than on the transfer exam.

There was a significant interaction for word processing scores, $F(1.9, 26.38) = 22.21$, $p = .010$. Two correlated-sample t scores were hand-computed to compare cell mean scores between groups (Toothaker, 1991, p. 134). Hand calculated t - values were compared to critical values for the Dunn Multiple Comparison procedure (Toothaker & Miller, 1996, p. 653). The word processing pre- and post-tests scores did not differ significantly. The t scores for the pre- and post-tests were $t(3, 28) = 1.48 < 3.21$, $t(3, 28) = 0.46 < 3.21$, respectively. The word processing transfer scores between groups differed significantly, $t(3, 28) = 3.25 > 3.21$. The metacognitive group scored significantly higher on the transfer tests than the procedural learning group.

The database pre-, post-, and transfer scores also differed, $F(1.88, 23.8) = 51.20$, $p = .0001$. Scores on the pretest were lower than the post- and transfer test. The database pretest and post-test scores differed, $t(3, 30) = 13.58 > 3.19$ indicating learning occurred during the course. The database pretest and transfer scores differed, $t(3, 30) = 4.8 > 3.19$ with the pretest scores being lower than the transfer scores. The database post-test and transfer scores differed, $t(3, 30) = 4.14 > 3.19$. Scores on the post-test were higher than the transfer exam. There was not a significant interaction for database scores, $F(1.88, 23.8) = 3.14$, $p = .129$.

The post-test and transfer mail merge scores also differed, $F(1, 30) = 62.80$, $p = .0001$. Scores on the post-test were higher than the transfer exam. There was a significant interaction, $F(1, 30) = 10.71$, $p = .003$. An univariate ANOVA was computed on the mail merge test scores. The word processing and database pretest scores were covaried with the mail merge scores on the ANOVA. The transfer mail merge scores differed between the groups, $F(3, 26) = 6.94$, $p = .001$. The metacognitive group scored significantly higher on the transfer mail merge section than the procedural group.

Does the use of the metacognitive strategies and procedural instruction used in this study influence near learning transfer in computer application training as measured by the word processing exercise? There was no main effect for instructional group; the groups scores did not differ on the word processing exercise, $F(1, 28) = 4.70$, $p = .04$. Thus, there were no differences in transfer between the groups on word processing exercises. There was a significant interaction for word processing scores, $F(1.9, 26.38) = 22.21$, $p = .010$. The metacognitive group scored higher on the pretest, but this difference was not significant, $t(3, 28) = 1.48 < 3.21$. There was no difference on the post-test score, $t(3, 28) = 0.46 < 3.21$. The metacognitive group scored significantly higher on the transfer test than the procedural learning group, $t(3, 28) = 3.25 > 3.21$.

Does the use of metacognitive strategies and procedural instruction influence far learning transfer in computer application training as measured by database and mail merge exercises? There was no main effect for instructional groups on the database exercise. The groups scores did not differ on the database exercises,

$F(1, 28)=1.43, p=.24$. Thus, there were no differences in transfer between the groups on the database exercises. There was not a significant interaction, $F(4, 25)=3.26, p=.028$. Although the scores in the metacognitive group were higher, they were not significantly higher, $t(3, 28) = 2.70 < 3.21$.

There was a main effect for instructional group for the mail merge exercise. The mail merge scores differed between the two groups, $F(1, 30)=11.6, p=.002$. There was a significant interaction, $F(1, 30) = 10.71, p = .003$. The post-test scores did not differ $t(3, 30) = .34 < 3.19$. The metacognitive group scored higher on the transfer mail merge section than the procedural group, $F(3, 26) = 6.94. p = .001$.

Table 1.

Means, Standard Deviation, Ranges for Procedural and Metacognitive Strategy
Training Scores on Pre-, Post-, and Transfer Exams.

Measure	Group	Time	Mean	Standard	Range	
				Deviation	Min	max
Word processing	Procedural	Pretest	3.93	2.84	0	7
	Training	Post-test	6.90	0.28	6	7
		Transfer	1.3	2.77	0	7
	Procedural +	Pretest	5.53	1.99	0	7
	Metacognitive	Post-test	6.40	1.78	5	7
	Training	Transfer	4.13	3.04	0	7
Database	Procedural	Pretest	0.77	1.66	0	4.5
	Training	Post-test	4.87	0.35	4	5
		Transfer	2.80	2.48	0	5
	Procedural +	Pretest	0.83	1.77	0	5
	Metacognitive	Post-test	5.00	0.00	3.5	5
	Training	Transfer	3.93	2.05	0	5
Mail Merge	Procedural	Post-test	4.93	0.25	4	5
	Training	Transfer	0.60	1.74	0	5
	Procedural +	Post-test	5.00	0.00	4	5
	Metacognitive	Transfer	3.20	2.33	0	5
	Training					

Figure 23. Word processing scores on pre-, post-, and transfer exams.

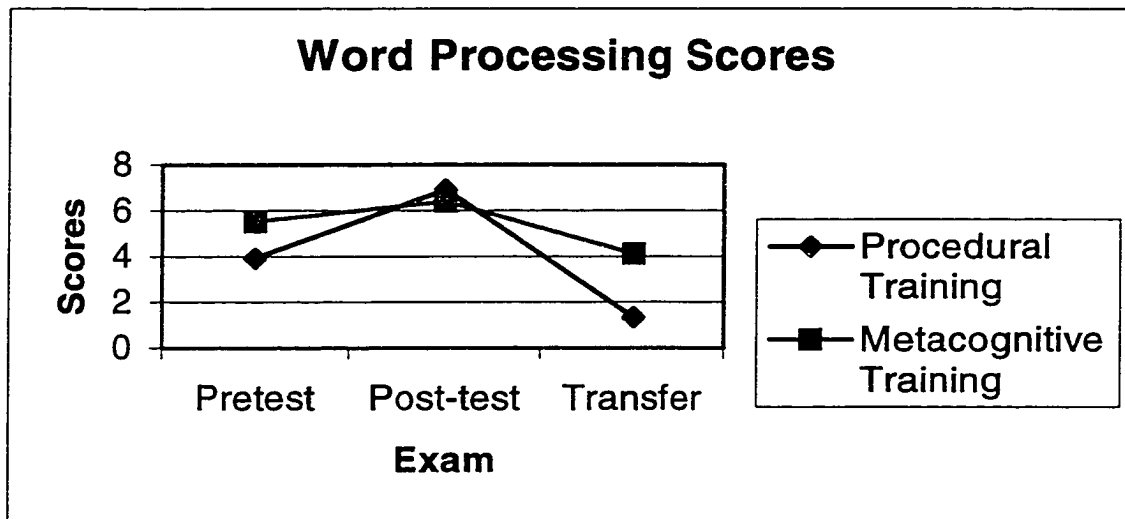


Figure 24. Database scores on pre-, post-, and transfer exams.

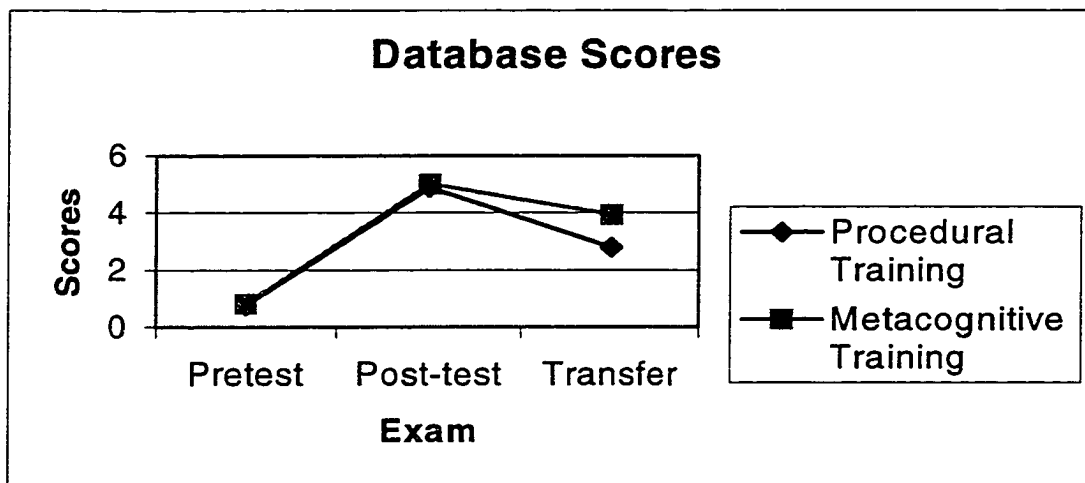
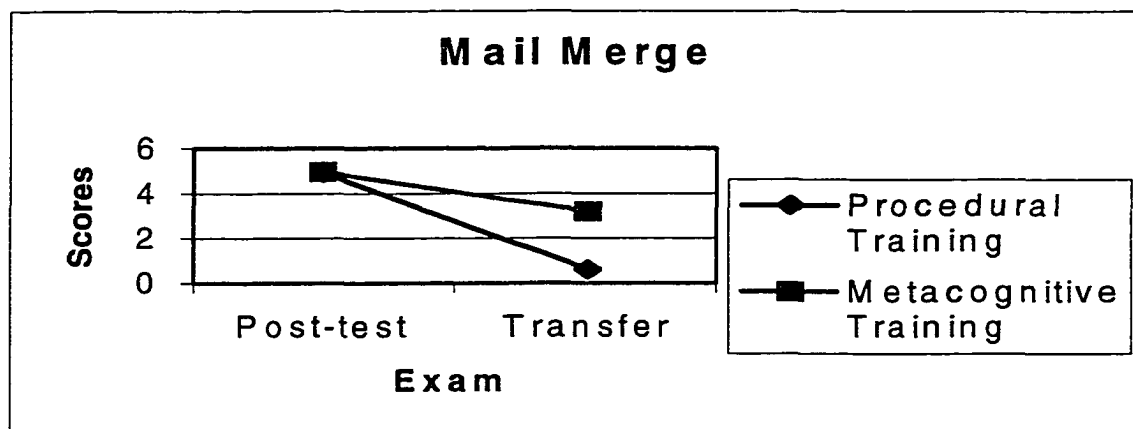


Figure 25. Database scores on post-test and transfer exam.



CHAPTER V

Discussion

The purpose of this project was to investigate the impact of metacognitive strategy instruction on the transfer of computer knowledge. A pre-, post-, and transfer exams design was used to investigate the influence of instructional strategies on learning transfer. Students' scores differed across the pre-, post-, and transfer exams on the word processing, database, and mail merge exercises. Differences in the pre- and post-exam scores indicated learning had occurred during the course. Differences in the post- and transfer exam scores indicated students did not perform as well on the transfer exam as they did on the post-test.

Students in the metacognitive group were encouraged to identify what they knew and did not know through the short answer questions and in class discussions. They also were encouraged to think about where to go for help if they did not know how to do a procedure on the computer. In this study, students in the metacognitive group scored higher on the word processing, database, and mail merge transfer exam exercises than students who were given only procedural instruction. A significant increase of computer knowledge transfer occurred in the group with metacognitive instructional strategies on the mail merge exercise. The mail merge exercise was one of the most difficult tasks on the post-test and transfer exams. Thus, students in the metacognitive group were more successful in interacting with a new computer application than students with procedural learning.

Metacognitive strategy instruction has been shown to increase learning (Brown, Hedberg, & Harper, 1994; Brown & Kane, 1988; Carr, Alexander, & Folds-

Bennett, 1994; Etelapelto, 1993; Everson, 1997; Lytle, 1990). Direct instruction of these strategies has been proven to be useful and independent use of these skills may develop over time. Learning and transfer are connected. Thus, it is likely that metacognition impacted transfer as well. It is likely that metacognition impacts transfer in two ways. It is difficult to transfer knowledge if learning does not occur. Since metacognition improves learning, this would have a positive impact on learning transfer. Metacognitive strategies encourage students to identify what they know and don't know. Therefore, metacognitive skills also come into play when learned responses will not be successful for the current problem. This procedure may cause students to focus on relevant features of the software application to complete the procedure.

Connections with Previous Research

The results were consistent with the ADAPT model (Jelsma, Van Merrienboer, Bijlstra, 1990). The model predicted that students who performed drill exercises would do well on near transfer exercises. The model predicted that students with varied practice would do well on far transfer exercises. There was no difference on the near transfer of the word processing skills. The students with varied practice did not differ from students with strategy instruction. It was possible because of the different GUI that there would be a difference on the database scores, but no difference occurred. The students with varied practice scored as high on average as the students with strategy instruction, but the scores did not differ significantly. Again, this is consistent with the ADAPT model. It is possible that if the students chose to use the database wizard in Microsoft® Office, there was little difference

between the two applications after the students selected which fields to include in the database.

Students with metacognitive instruction did better on the mail merge exercise. The ADAPT model does not include metacognition in the model (Jelsma, Van Merrienboer, & Bijlstra, 1990). Students with varied practice should have done just as well as students with strategy instruction. There was a significant difference in the mail merge process between Microsoft® Office and ClarisWorks®. In ClarisWorks®, the student opens a new word processing document. They select mail merge from the file menu. At this point, a dialogue box ask them to select the database that they will be working with. After they select the database, they can begin inserting fields into the document. In Microsoft® Office, the students open a blank word document. They select mail merge from the tools menu. Then a dialogue page asks them to select the word document with which they will be working. The student must identify the database with which they will be working. It is at this point that a novice computer user will have the most difficulty because they must understand how documents are saved in the Windows environment to find the database. Once the database is selected or created, then the student can begin to insert fields into the document.

According to the Sternberg's Model, metacognitive skills encompass a variety of skills including problem recognition and strategy use (Sternberg, 1998). Experts select more relevant pieces of information to solve problems (Misko, 1995). This generally means they start problem solving at a more advanced level. Encouraging novice computer users to use strategies similar to experts may encourage them to focus on relevant aspects of the computer interface. Thus, the students will be focused

on what icon or drop-down menu they are looking for instead of focusing on the fact the screen looks different.

This research extends the research of learning transfer of computer knowledge. Previous research was focused on the transfer of computer programming skills (Bernardo & Morris, 1994; Etelapelto, 1993; Shih & Alessi, 1994). This project was centered on the transfer of existing knowledge of software applications to different software applications. This research indicates learning transfer can be facilitated in software training with strategy use.

Changing Computer Skills

Computer application skills differ from other skills such as reading and math. Computer operating systems and applications change on a regular basis. Perkins and Salomon's (1988) concept of forward reaching high road transfer is important for computer trainers. The trainer should encourage the learner to be flexible and not to focus only on the procedure and screen interface. Some of the skills that a technology trainer should be facilitating include "learning to learn". This technique requires reflective thought in making connections between different computer applications.

Computer training should encourage computer users not to be resistant to upgrades because they do not want to learn the new interface. The skills that a computer user learns today may be obsolete in a few years. This can have a negative impact on computer users if they fail to transfer some of their skills to the new applications. The most frequent change that the user encounters is the GUI. Metacognitive skills may help the user look past the computer interface by identifying what they know and don't know.

Personal Observation

From personal observation of students completing the transfer exam, students that successfully completed the transfer exam took several approaches. Some students activated the help function from the title bar. This allowed students to have instructions on how to complete the mail merge process available while completing the mail merge exercise. Other students systematically searched the drop down menus until they found what they were looking for. Unsuccessful students' responses varied also. Some students quit immediately after perceiving the GUI was different and they did not immediately know how to complete the exercise. Some students tried to complete the exercise the same way they did in the ClarisWorks® application. They repeated this behavior over and over again even though it was not successful. Some students tried to complete the task unsuccessfully by randomly clicking around until they ran out of time.

Future Implications

Improving computer skills training for preservice teachers may help facilitate the use of computers in the classroom. One of the barriers to successful integration is the lack of knowledge of how to use computer applications. It is difficult to write a lesson plan integrating technology into the exercises if the teacher does not know how to use the application. Improving training may influence other factors that inhibit computer use. Successful training has been shown to reduce computer anxiety and to improve self-efficacy towards computer use. Reduced anxiety is related to students' perception of computer use in the classroom and how much they use computers.

Improving computer knowledge may help increase teachers' awareness of the relevancy of computer use in classroom. Teachers may be more likely to understand how a particular software application can be used to fulfill a curriculum goal.

Understanding the relevancy also may help facilitate the change process that is taking place in the K-12 classrooms. Improving training also may improve the significance of training to the change process. As successful training influences teachers use of computers in the classroom, it may be more likely that additional funding will be allocated to teacher training. It is less likely that more funding will be allocated if training is not successful in improving computer implementation in the classroom.

Some research indicates that computer skills training does not transfer from one software application to the next (Beard, 1993). Integrating strategies that facilitate the transfer of knowledge from one application to the next should improve learning of new software applications. Integrating strategies also should be an integral part of training because of the length of time that computer knowledge of a software application is relevant.

Limitations of the Study

Although the three exams were designed to be equivalent, some problems existed with the instruments. The spreadsheet exercise was an inadequate measure on the pretest. The word processing exercise on the transfer exam was slightly more difficult because students were required to create a short document instead of edit an existing document. Although students were given extra time to complete the transfer exam, some students may not have had enough time to complete all the exercises on

the transfer exam. Another confound is students were required to work in a Windows environment on the transfer exam.

Future Research

There are several follow up studies suggested by these findings. One study that could be done would investigate the impact of use of metacognitive strategies on computer self-efficacy. Self-efficacy could be measured at the beginning and end of the course. Self-efficacy could be examined to see if there is a change in self-efficacy and if there is a difference between the two groups. Another follow up study that could be done is a qualitative study. Students would be taught an introductory computer course using the metacognition instructional strategies. Think aloud protocols and exit interviews could be conducted to find out which strategies the students used during the transfer exams. Other questions would focus on the transfer issues concerning the GUI. Students could be asked what features of the screen interface they focused on.

Another study would be to implement the metacognitive strategies in a teacher training program along with a control group. Teachers use of computers could be tracked within the classroom to see if there is a difference in implementation of computers into the curriculum. Another follow up study would examine whether the teachers taught the students to use metacognitive strategies within the classroom.

Conclusion

This research indicates students can be taught strategies towards software application use. Students with strategy training scored higher on all transfer scores. Therefore, strategy training may be an appropriate instructional strategy for software

trainers who want to facilitate transfer knowledge between applications. More research is needed on metacognitive strategy training in this area.

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Appendix A

Table 1

Benchmark: Preservice Teacher And Teacher Preparation

- Operating a microcomputer system including powering-up a computer, installing programs, accessing programs in other drives, saving files to disk, and deleting files in context of a Macintosh, Windows, and Dos-based system
- Set up and operate peripherals such as scanners, laserdisc players, CD-ROM, modems, and printers
- Use productivity software to include word processors, spreadsheets, databases, desktop publishing, and graphics to perform basic tasks such as mail merge, grading, and creating basic newsletters
- Incorporate productivity software including word processors, spreadsheets, databases, desktop publishing, and graphics into a classroom curriculum assignment
- Use presentation software to present group integration projects
- Set up a telecommunication station by installing communication software and by configuring the modem to appropriate settings
- Use telecommunication including electronic communication and information access to the World Wide Web (WWW)
- Integrate telecommunication including electronic communication and information access into a classroom curriculum assignment. (following the migration of whales on WhaleNet
- Use multimedia authoring tools to create instructional lessons
- Use multimedia CD-ROM, laserdisc, and digital photography to access and store information
- Integrate multimedia including authoring tools, CD-ROM laserdiscs, and digital photography into a classroom curriculum assignment
- Apply principles of instructional design to evaluate and select software appropriate to a given grade level, and subject
- Promote ethical and legal behavior in the use of instructional technology for school and home use

Appendix B

Biographical Information Sheet

Please circle the answer that is appropriate or fill in the blank with an appropriate answer.

Please identify your gender group

1. male
2. female

In which of the following age groups are you?

1. 18-20 years
2. 21-24 years
3. 25-30 years
4. 31-35 years
5. 36 or over

With which of the following ethnic groups do you most identify?

1. Native American
2. Asian or Pacific Islander (i.e. China... India.... Samoa)
3. African American
4. Hispanic
5. White
6. Other

What is your student classification?

1. Freshman
2. Sophomore
3. Junior
4. Senior
5. Graduate Student

What is your expected or present teaching area?

1. English (Journalism.. Literature... Writing.. Second Language)
2. Fine Arts (Dance... Music... Theater....Drawing.. Speech)
3. Elementary Education
4. Language
5. Mathematics
6. Physical Education
7. Science
8. Social Studies
9. Other

What grade level(s) do you plan to teach _____

How often do you USE computers and computer technologies for anything?

1. Never
2. Occasionally
3. Weekly
4. Daily

In a normal week, how many hours do you spend on a computer? _____

On a scale from 1 to 10 (1 being a novice with no experience and 10 being a expert),
what would you rank as your experience level using productivity software?

Do you own a computer? YES NO

Appendix C

EIPT 3011 Pretest

Directions: For the tasks on this test you will not have to print anything on paper. You will need to save a copy of the files you are to create and/or edit on your Test Disk. Be sure to complete each part of the test in order. Complete each of the steps and save periodically (every 5 to 10 minutes) as you move along. **DO NOT SKIP ANY STEPS.**

YOU HAVE 1 HOUR TO COMPLETE THIS TEST!!

Before you turn in your disk make sure you have the following files and always end your file name with your own name:

Part 1.	WP#1/yourname
Part 2.	SS#1/yourname
Part 3.	DB#1/yourname
Part 4.	DB#2/yourname

Part 1: Word Processing

For this part of the test, you will open a text file named "Earthday" in folder "EIPT 3011" contained on your test disk. Format the text so that it meets all the requirements below.

1. The original file on your test disk should not be changed.
2. The entire file should be saved under the name "WP#1/yourname" on your test disk.
3. All the text should be the size of 14 point and in Times font.
4. The title should be centered at the top of the page and in bold style.
5. All paragraphs should have 1/4 inch first line indent and be double spaced.
6. There should be one blank line between each paragraph.
7. You should insert a footer that contains your full name on the left side and today's date on the right side in Times font and 10 point.
8. Delete the last paragraph of the letter.

9. The reference page should have a heading with the word reference underlined and centered in 12 point and Times font.
10. There should be no spelling errors (use your spell checker and proofread).
11. Save all changes on your test disk under the file name "WP#1/yourname". For example if your name is Sally, the file name would be WP#1/Sally

Part 2: Spreadsheet

For this part of the test you will need to open the file named "Read-a-Thon" from your test disk and rename it SS#1/yourname. "Read-a-Thon" contains information you are keeping for the weekly read-a-thon contest in your classroom. Your spreadsheet file contains each student's reading hours for weeks 1 through 4. You now need to enter the hours for week 5 for each student and tally their individual and group totals and percent of goal reached. Follow the instructions below to complete the spreadsheet calculations.

1. Insert a column after week 4 and title the column "Week 5 Points." (This should be column F).
2. Enter the students' reading hours in column

Bearden, Andy	100
Bote, Michelle	105
Byers, Jack	95
Compton, Anna	200
Crane, Alan	150

Dewers, Billy	90
Dodge, Jamie	100
Dunn, Carmen	200
Farmer, Betty	150
Grant, Ronita	200

3. Use formulas in the appropriate rows and columns that do the following:
 - a. Add the total points for each week for each team.
 - b. Add the total hours for each individual student and each team for all 5 weeks.

- c. If you used the fill command to copy the formulas, make sure you clean up cells that should not have anything in them.
4. **Save your file as SS#1/yourname onto your test disk.**

Part 3: Database

You are team teaching. In your group, you are known for your superior computer proficiency. Your colleagues ask you to help them to collect and maintain the information about all the computer software in the computer labs for administrative use. You decide to use ClarisWorks® Database tool. You are to create a database file with ClarisWorks® and meet the following requirements:

1. Create a database file that has all of the following nine fields: **title, publisher, media, subject, grade level, location, platform, copies, and description.**
2. Set the data type for the field Copies as number rather than text.
3. Enter the following information into the database:
4. TITLE: Oregon Trail 1.1
PUBLISHER: MECC
MEDIA: 2-3.5" disks
SUBJECT: History/Social Studies
GRADE LEVEL: 4-12
LOCATION: ECH325
PLATFORM: MAC Plus or Later
COPIES: 1
DESCRIPTION: Challenge the cross-country trek from Independence Missouri to Oregon in 1848.
4. Add one record to the database and enter the following information:
TITLE: Nigel's World
PUBLISHER: Broderbund
MEDIA: 7-3.5" disks
SUBJECT: Geography
GRADE LEVEL: 2-8
LOCATION: ECH 325
PLATFORM: MAC II, LC
COPIES: 1
DESCRIPTION: Teaches a variety of geography and map skills.

5. Save your database file as "DB#1/your name" on your test disk. Check it for accuracy. Save it again if you make any changes.
6. Stop here and check the database file to see if you have all the described requirements for the database.

Part 4: Database

You must have completed Part 3 in order to begin working in this section of the test. Now that you have created the software database file, the complete version is saved under the name "Kaleidoscope" on your test disk in folder EIPT 3011. For this part of the exam, you will need to complete the following.

1. Open the file "Kaleidoscope."
2. Select all the records of software published by the company "Edmark".
3. Create a report of the software selected in #2 published by Edmark. Call the report "Report 1". The report should be a column listing of the software published by Edmark using only the field names: **title**, **publisher**, **subject**, and **grade** in that order.
4. Sort the records in REPORT 1 alphabetically by the title.
5. Save your database file as "DB#2/your name" on your test disk. Check it for accuracy. Save it again if you make any changes.

Appendix D

Productivity Tools Performance Exam

Directions: For the tasks on this test you will not have to print anything on paper. You will need to save a copy of the files you are to create and/or edit on your Test Disk. Be sure to complete each part of the test in order. Complete each of the steps and save periodically (every 5 to 10 minutes) as you move along. **DO NOT SKIP ANY STEPS.**

YOU HAVE 2 HOURS TO COMPLETE THIS TEST!!

Before you turn in your disk make sure you have the following files and always end your file name with your own name:

Part 1.	WP#1/yourname
Part 2.	GR#1/yourname
Part 3.	SS#1/yourname
Part 4.	DB#1/yourname
Part 5.	MM#1/yourname

Part 1: Word Processing (WP)

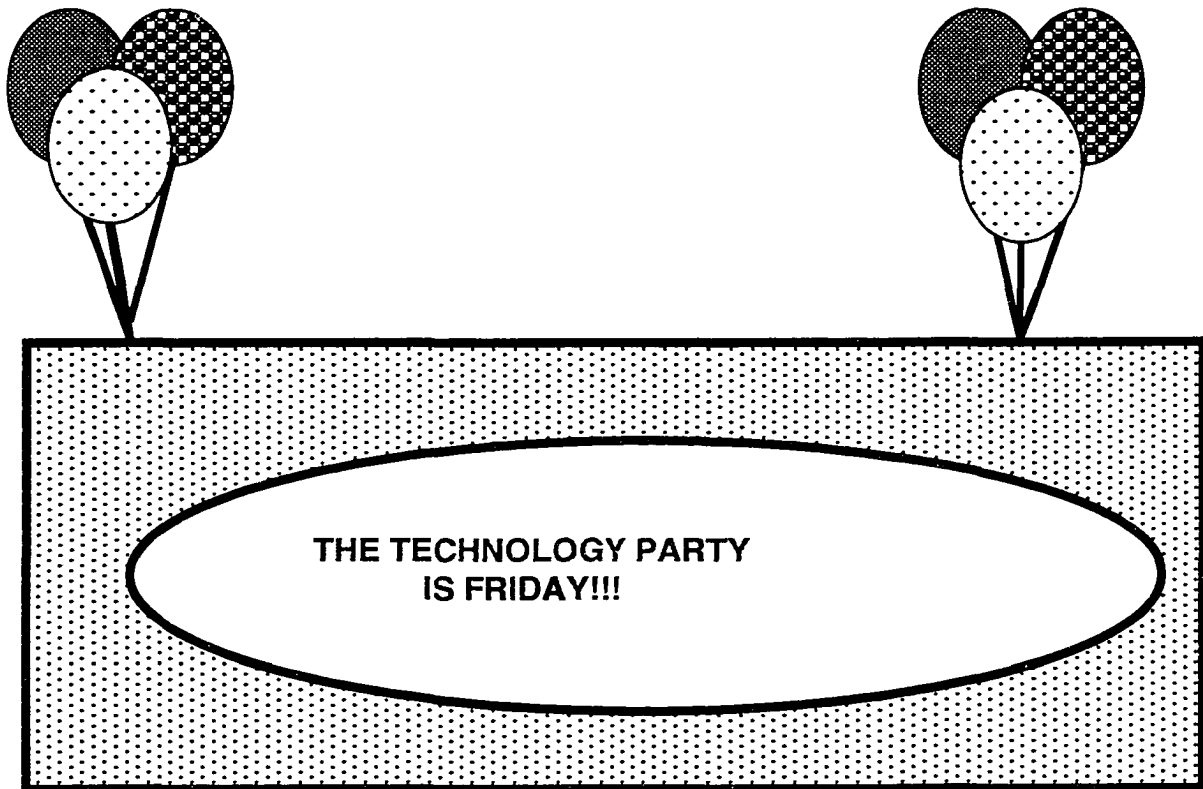
For this part of the test, you will open a text file named "A Welcome" in folder "EIPT 3011" from your test disk. Format the text so that it meets all the requirements below.

1. The original file "A Welcome" on your test disk should not be changed.
2. The entire file "A Welcome" should be copied and saved under the name "WP#1/yourownname" on your test disk. Make the required changes to the file.
3. All the text should be the size of 14 point and in Times font.
4. The title should be centered at the top of the page and in bold style.
5. Delete the first paragraph of the letter.
6. All paragraphs should have 1/4 inch first line indent and be double spaced.
7. There should be one blank line between each paragraph.
8. You should insert a footer that contains your full name on the left side and today's date on the right side in Times font and 10 point.

9. Delete the last paragraph of the letter.
10. There should be no spelling errors (use your spell checker and proofread).
11. Save all changes on your test disk under the file name "WP#1/youname".
- 12.

PART 2: Graphics (GR)

For this part of the test you are to recreate the Technology banner below using draw or paint. Save the file on your test disk under the file name "GR#1/yourownname".



Part 3: Spreadsheet (SS)

For this part of the test you will need to open the file named Gradebook on your test disk and rename it SS#1/youname. Gradebook contains your students' scores on quizzes and exams. You are keeping this spreadsheet for your grades in your classroom. Your spreadsheet file contains each student's grades for quizzes 1, 2, and test 1. You now need to enter the scores for test 2 for each student and tally their totals points and their grade percent. Follow

the instructions below to complete the spreadsheet calculations.

1. Insert 2 rows into the student names
2. Insert the names Sandy Castle and David Jones
3. Enter the following scores for the two students

4.		Quiz 1	Quiz 2	Test 1
	Sandy Castle	8	9	90
	David Jones	7	8	87

4. Insert a column after Test 1 and title the column "Test 2."
5. Enter the students' scores in column "Test 2."

Johnson, Sara	88
Chu, Arnold	98
Brown, John	69
Zimmerman, Chris	75
Kimmel, Ann	95
Gonzales, Rita	89
Lambert, Cheryl	76
Smith, John	84
Sandy Castle	90
David Jones	95

6. Use formulas in the appropriate rows and columns that do the following:
 - a. Add the total points for each student for quiz 1, quiz 2, test 1, and test 2.
 - b. Calculate each student's grade average. Display the grade averages as percentages.
 - c. Calculate average points made on each quiz and test.
 - d. If you used the fill command to copy the formulas, make sure you clean up cells that should not have anything in them.
7. Save your file as SS#1/yourownname onto your test disk.

Part 4: Database (DB)

You are team teaching. In your group, you are known for your superior computer proficiency. Your colleagues ask you to help them to collect and maintain information about all the computer students in the computer labs for administrative use. You decide to use ClarisWorks® Database tool. You are to create a database file with ClarisWorks® and meet the following requirements:

1. Create a database file that has each of the following nine fields: **last name, first name, address, city, state, zip code, phone number, major, and student.**
2. Set the data type for the field ZIP CODE as number rather than text.
3. Enter the following information into the database:
LAST NAME: Smith
FIRST NAME: Jane
ADDRESS: 204 E. Sunnyslane Road
CITY: Norman
STATE: OK
ZIP CODE: 73069
PHONE NUMBER: 325-0000
MAJOR: Science
STUDENT: Joey
4. Add one record to the database and enter the following information:
LAST NAME: Jones
FIRST NAME: Bill
ADDRESS: 564C Cardinal Creek
CITY: Norman
STATE: OK
ZIP CODE: 73072
PHONE NUMBER: 360-0901
MAJOR: Math
STUDENT: Beth
5. Save your database file as "DB#1/your name" on your test disk. Check it for accuracy. Save it again if you make any changes.
6. Stop here and check the database file to see if you have all the described requirements for the database.

PART 5: Mail Merge (MM)

For this part of the test you are to create letters using ClarisWorks® Mail Merge. Save the file on your test disk under the file name "MM#1/yourname". Print the letters.

1. Open the file "DB#1/ Your name."
2. Choose New from file menu. Choose Word Processing.
3. Recreate the following letter using the appropriate mail merge fields.
4. Print the letters using mail merge.
5. Save your mail merge file as MM#1/your name" on your test disk. Check it for accuracy. Save it again if you make any changes.

Part 6: Internet

Using Netscape Navigator and a search engine or your choice, locate a web page that contains information about using Technology in the classroom. After locating the web page, print a copy of the first page. Remember: the web page must contain information using technology in the classroom.

Part 7: Email

For this part of the test, you are to send e-mail to your instructor using Netscape mail. The address is **MAMckay@ou.edu**. Make sure the mail and news preferences have been modified with your name. The address will also be on the board. For the subject, you should put **EIPT 3011 Test**. In the message you should respond to the following question.

Now that you have mastered word processing, graphics, database, spreadsheets, and email, what are some uses for these productivity tools in your classroom? You should give one example for each application.

You will be evaluated on your success at sending the e-mail message and on the content of the message itself.

February 24, 1999

<<First Name>> <<Last Name>>
<<Address>>
<<City>>, <<State>> <<Zip Code>>

Dear Parent,

I am pleased to inform you that your child, <<Student>> has passed the Iowa Basic Skills test. << Student>> will be allowed to enroll in the 7th grade next year.

The Iowa Basic Skills test was used to place students in different levels of basic curriculum courses based on their test scores. <<Student>> will be allowed to enroll in an advanced math course based on the math test score. I hope you are pleased with your child's success.

Sincerely,

(type your name here)

Appendix E

Productivity Tools Microsoft® Exam

Directions: For the tasks on this test you will use Microsoft® Office to complete the following exercise. You will need to save a copy of the files you are to create and/or edit on your Test Disk. Be sure to complete each part of the test in order. Complete each of the steps and save periodically (every 5 to 10 minutes) as you move along. **DO NOT SKIP ANY STEPS.**

YOU HAVE 1 HOUR TO COMPLETE THIS TEST!!

Before you turn in your disk make sure you have the following files and always end your file name with your own name:

Part 1. DB#1your iast name

Part 2. MM#1your last name

What time did you begin the exam?_____

Part 1: Database

You are team teaching in a group in which you are known for your superior computer proficiency. Your colleagues ask you to help them to collect and maintain the information about all the computer students in the computer labs for administrative use. You decide to use Microsoft® Office Database tool which is Microsoft® Access. You are to create a database file with Microsoft® Access and meet the following requirements:

1. Create a database file that has each of the following nine fields: **last name, first name, address, city, state, zip code, phone number, major and student.**
2. Set the data type for the field ZIP CODE as number rather than text.
3. Enter the following information into the database:

4.

LAST NAME: Smith
FIRST NAME: Jane
ADDRESS: 204 E. Sunnyslane Road
CITY: Norman
STATE: OK
ZIP CODE: 73069
PHONE NUMBER: 325-0000
MAJOR: Science
STUDENT: Ann

4. Add one record to the database and enter the following information:

LAST NAME: Jones
FIRST NAME: Bill
ADDRESS: 564C Cardinal Creek
CITY: Norman
STATE: OK
ZIP CODE: 73072
PHONE NUMBER: 360-0901
MAJOR: Math
STUDENT: Bob

5. Save your database file as "DB#1" on your test disk. Check it for accuracy. Save it again if you make any changes.
6. Stop here and check the database file to see if you have all the described requirements for the database.

What time did you begin mail merge?_____

PART 5: Mail Merge

For this part of the test you are to create letters using ClarisWorks® Mail Merge. Save the file on your test disk under the file name "MM#1". Print the letters.

1. Select Mail Merge from the Tools pull down menu. Follow the prompts to develop mail merge letter.
2. Select the DB#1
3. Recreate the following letter using the appropriate mail merge fields in Word.
4. Choose the "Merge Merge to Word" button to print the mail merge.
5. Save your mail merge file as MM#1" on your test disk. Check it for accuracy. Save it again if you make any changes.

What time did you end mail merge?_____

February 24, 1999

<<First Name>> <<Last Name>>
<<Address>>
<<City>>, <<State>> <<Zip Code>>

Dear Parent,

I am pleased to inform you that your child, <<Student>> has passed the Iowa Basic Skills test. <<Student>> will be allowed to enroll in the 7th grade next year.

The Iowa Basic Skills test was used to place students in different levels of basic curriculum courses based on their test scores. <<Student>> will be allowed to enroll in an advanced math course based on the math test score. I hope you are pleased with your child's success.

Sincerely,

(type your name here)

Appendix F

Name _____ Section _____

Grading Criteria for Pretest Exam

Operating System 5 points possible

Power up a Macintosh	1
Insert a Floppy disk	1
Locate ClarisWorks and open application	1
Locate Earthday doc	1
Save files	<u>1</u>

Total=

Part 1: Word Processing - 7 points possible

File saved under WP#1/youname on test disk	.5
Original File was not changed	.5
All text 14 point	.5
All text in Times font	.5
Title centered	.5
Title in bold	.5
All paragraphs 1/4 inch indent	.5
All paragraphs doubled space	.5
One blank line between each paragraph	.5
Footer includes name and date	1
Footer in 10 point and times font	.5
No spelling errors (from spell checking)	<u>1</u>

Total=

Part 3: Spreadsheet 5 points possible

File called "SS1/youname"	.5
New column created for Week 5 points	.5
Scores entered for Week 5 points	1
Teams total points for each week correctly computed	1
Students' total hours correctly computed	1
Teams' total hours correctly computed	<u>1</u>

Total =

Part 3: Database 5 points possible

File called "DB#1/Youname"	1
Database includes all 9 fields	1
Copies field is set data type as number	.5
All other fields have data type set as text	.5
First record is included and information is complete	1
Second record is included and information is complete	<u>1</u>

Total=

Part 4: Database 5 points possible

File called "DB#2/yourname"	1
Database includes Layout 1	.5
Database includes Report 1	.5
Report is a column listing	.5
Report includes only software published by Edmark (8 titles)	.5
Report includes fields: title, company, subject, and grade in order	1
Report is listed in alphabetically order by title	<u>1</u>
Total=	

Appendix G

Name _____ Section _____

Productivity Exam Grading Criteria for Written and Performance Exam

Part 1: Operating System 5 points possible

Power up a Macintosh	1
Insert a Floppy disk	1
Locate Microsoft Word and open application	.5
Locate Findme.doc	.5
hard disk drive capacity correct	.5
Hard disk drive available correct	.5
Shut down the system appropriately	1
Total=	

Part 2: Hardware and Software Requirements-10 points

1.	5
2.	5
Total=	

Part 1: Word Processing - 7 points possible

File saved under WP#1/youname on test disk	.5
Original File was not changed	.5
All text 14 point	.5
All text in Times font	.5
Title centered	.5
Title in bold	.5
All paragraphs 1/4 inch indent	.5
All paragraphs doubled space	.5
One blank line between each paragraph	.5
Footer includes name and date	.5
Footer in 10 point and times font	1
No spelling errors (from spell checking)	1
Total =	

Part 2: Graphics - 5 points possible

File saved under GR#1/name on test disk	1
Banner is rectangular	1
Banner contains words: The Technology Party is Friday!	1
Balloons located on side of banner	1
Balloons are filled with a pattern	1
Total =	

Part 3: Spreadsheet 8 points possible

File called "YounameSS1"	.5
New column created for Test 2	.5
Scores entered for Test 2	.5
New rows created for new students	.5
Scores entered for new students	.5
Students' total scores correctly computed	1
Students' grade average correctly computed	2
Grade average displayed as percentage	.5
Calculated average points made on each quiz and test correctly	<u>2</u>
Total =	

Part 4: Database 5 points possible

File called "YounameDB1"	1
Database includes all 9 fields	1
Zip Code field is set data type as number	.5
All other fields have data type set as text	.5
First record is included and information is complete	1
Second record is included and information is complete	<u>1</u>
Total =	

Part 5: Mail Merge 5 points possible

File called "YounameMM1"	1
Letter is completed with appropriate fields	1
Two letters are successfully printed using mail merge	<u>3</u>
Total =	

Part 6: E-Mail - 5 points possible

Message sent successfully	3
Content of message complete and appropriate	<u>2</u>
Total =	

Part 7: WWW - 5 points possible

Web page printed successfully	3
Content of the webpage is appropriate	<u>2</u>
Total =	

Appendix H

Name _____ Section _____

Productivity Exam Grading Criteria for Transfer Exam

Part 1: Word Processing - 7 points possible

File saved under MM#1 on test disk	1
All text 12 or 14 point	1
All text in Times font	1
All paragraphs singled space	1
One blank line between each paragraph	1
Inserted date field and edited preferences	1
No spelling errors (from spell checking)	1
Total=	

Part 4: Database 5 points possible

File called "YournameDB1"	1
Database includes all 9 fields	1
Zip Code field is set data type as number	.5
All other fields have data type set as text	.5
First record is included and information is complete	1
Second record is included and information is complete	1
Total =	

Part 5: Mail Merge 5 points possible

File called "YournameMM1"	1
Letter is completed with appropriate fields	1
Two letters are successfully printed using mail merge	3
Total =	

Appendix I

EIPT 3011



Productivity Tools for Teachers

1998

Packet

EXERCISE 1: Hardware/Software Exercise

10 POINTS

Student Name _____ Section _____

Reading: Handout

Exercises: Examine the hardware and software and determine whether the two are compatible. Explain why the systems are compatible or incompatible. Give your response in the space below. If more space is needed use the back of the sheet.

Hardware

SuperMac J700

180 MHZ Power PC 604e processor

24 MB RAM

recommended)

2.1 GB hard drive

8X SCSI CD-ROM drive

recommended)

Built in 10Base-T-ethernet and AAUI standard

Four high speed PCI expansion slots for

upgradability

128 bit PCI graphics card with 2 MB VRAM

extended keyboard and mouse

Color monitor

Software

Macromedia Extreme 3-D

System Requirements

68040 processor or faster (Power PC

System 7.1 or higher

16 MB RAM required (24 MB RAM or more

Hard drive with 20 MB free disk space

8-bit color (24-bit recommended)

CD-ROM drive

Response:

Hardware

Jack's Quadra 700

4 MB RAM

80 MB Hard drive

Jack has filled 72 MB of the hard drive

2X CD-ROM drive

Built in 256 color video support

input and output jacks for sound

color monitor

Software

Mario Teaches Typing 2

System Requirements

68040 processor or faster

System 7.1 or higher

2 MB RAM required

Hard drive with 10 MB free disk space

color monitor

CD-ROM drive

Response:

Hardware

Katie's Pentium PC
Intel 200 MHz Pentium Pro processor
32 MB RAM (8 DIMM slots)
recommended)
2.1 GB hard drive
12X SCSI CD-ROM drive

Microsoft mouse and 104 keyboard
Microsoft Windows NT
SVGA monitor

Response:

Software

Macromedia Extreme 3-D
System Requirements
608040 processor or faster (Power PC
System 7.1 or higher
16 MB RAM required (24 MB RAM or more
recommended)
Hard drive with 20 MB free disk space
8-bit color (24-bit recommended)
CD-ROM drive

Hardware

Mike's Pentium PC
Intel 200 MHz Pentium Pro processor
32 MB RAM (8 DIMM slots)
MHz)
2.1 GB hard drive
12X SCSI CD-ROM drive

Microsoft mouse and 104 keyboard
Microsoft Windows 95
SVGA monitor
sound system

Response:

Software

Madden NFL 97
System Requirements
Pentium 60 MHz processor (recommended 133
MHz)
Windows 95 or MS-Dos 5.0 or higher
8 MB RAM required (16 MB RAM or more
recommended)
Hard drive with 40 MB free disk space
100% sound blaster compatibility sound card
2X CD-ROM drive
Joystick or mouse

Hardware*Jane's 486 PC*

Intel 75 MHz processor
16 MB RAM (8 DIMM slots)
800 KB hard drive
6X SCSI CD-ROM drive
Microsoft mouse and 104 keyboard
Microsoft Windows 3.1
SVGA monitor
16 bit sound card

Response:

Software*Microsoft Encarta 95*

System Requirements
386 SX or higher processor
audio board and speakers
4 MB RAM required
Hard drive with 3.5 MB free disk space
Color monitor
CD-ROM drive
Windows 3.1 or higher
Microsoft mouse

Sequentially follow the instructions in your handout to learn the information required to do these exercises. There are other exercises in the handout which can further your knowledge of the hardware/software capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. How can this computer application be used towards an instructional goal?

3. Why does this computer application lend itself towards the instructional goal?

4. How can you extend the use of this computer application to other audiences, content areas, or purposes?

EXERCISE 2: WORD PROCESSING

10 POINTS

Student Name _____ Section _____

Reading: BYMB, Chapter 2

Exercise: BYMB, Chapter 2, p. 70

- Exercise 1: Follow the instructions on p. 69
- Exercise 2: follow instructions below

This exercise requires you to create a letter to send home to parents about recent and upcoming events in your classroom. You may include a section on student birthdays, theme for the week or month, homework assignments, future field trip information, or other topics of your choosing. The minimum requirements for this assignment are listed below. Try to be creative.

Place a header at the top of your newsletter

- include a title for your newsletter in bold, large type
- include the date, class, and your name under the title in the header

Use at least five subtopics of your choosing from those above or making up your own

- center the subtitle for each topic
- use 12-14 font within the text
- fill page completely
- use Courier font

Use your spell checker and proofread for any grammatical errors

Print it

Sequentially follow the instructions in your text to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of the word processing capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. How can this computer application be used towards an instructional goal?

3. Why does this computer application lend itself towards the instructional goal?

4. How can you extend the use of this computer application to other audiences, content areas, or purposes?

EXERCISE 3: GRAPHICS

10 POINTS

Student Name _____ Section _____

Reading: BYMB, Chapter 3

Exercises: BYMB, Chapter 3, pp. 111

- Exercise 5, p. 111: follow instructions in text
- Using Drawing - recreate the attached page
- Using Painting - recreate the attached page

Sequentially follow the instructions in your text to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of the graphic capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. How can this computer application be used towards an instructional goal?

3. Why does this computer application lend itself towards the instructional goal?

4. How can you extend the use of this computer application to other audiences, content areas, or purposes?

EXERCISE 4: DATABASE

10 POINTS

Student Name _____ Section _____

Reading: BYMB, Chapter 4

Exercises: BYMB, Chapter 4, p. 126 and p. 172

- Using the file “Class Data” on your data disk, complete practice questions 1-3 on page 126. Write the answers to each question below.
 - 1.
 - 2.
 - 3.
- Using the file “Class Data” on your data disk, create a columnar report that includes the following fields: (1) Name, (2) Address, (3) City, and (4) State. Adjust the fields to make sure all the information is showing in the fields. Print the report.
- Using the file “Class Data” on your data disk, create a columnar report that includes the following fields: (1) Student, (2) Guardian, (3) birthdate, and (4) phone. Adjust the fields to make sure all the information is showing in the fields. Print the report.
- Exercise 2, page 172: follow instructions in text using all suggested fields and others if you can think of them. If you would like to create a database using a topic more relevant to your subject area, approve it with your lab instructor. Once you have created your database, fill in at least 5 records completely with appropriate information. Save the file on your disk.

Sequentially follow the instructions in your text to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of the database capabilities. If you have difficulty your instructor will assist you.

The above exercises should be completed, turned in on your disk with this lab sheet, and handed to your instructor before class on 7/25.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. How can this computer application be used towards an instructional goal?

3. Why does this computer application lend itself towards the instructional goal?

4. How can you extend the use of this computer application to other audiences, content areas, or purposes?

EXERCISE 5: SPREADSHEET

15 POINTS

Student Name _____ Section _____

Reading: BYMB, Chapter 5

Exercises: BYMB, Chapter 5

- Begin on page 180 of your text where it says “Cells”. Follow the instructions precisely through to page 191 where it says “Practice”. Complete Practice Exercise #2 & 3 on page 191.
- Begin on page 198 of your text where it says “More Practice”. Follow the instructions precisely through to page 201. Print the reading document with the spreadsheet and bar chart on the same page.

Sequentially follow the instructions in your text to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of the spreadsheet capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. How can this computer application be used towards an instructional goal?

3. Why does this computer application lend itself towards the instructional goal?

4. How can you extend the use of this computer application to other audiences, content areas, or purposes?

EXERCISE 6: Mail Merge

15 POINTS

Student Name _____ Section _____

Reading: BYMB, Chapter 6,

Exercises: BYMB, Chapter 6

Choose one of the following two exercises to complete

- Begin on page 151 of your text where it says “Mail Merge”. Follow the instructions precisely through to page 154. Print the document.

Sequentially follow the instructions in your text to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of the integrative capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. How can this computer application be used towards an instructional goal?

3. Why does this computer application lend itself towards the instructional goal?

4. How can you extend the use of this computer application to other audiences, content areas, or purposes?

EXERCISE 7: E-Mail and WWW

10 POINTS

Student Name _____ Section _____

Reading: Handout

Exercises:

- Successfully obtain your email address from the OU homepage.
- Successfully send an email to your lab instructor. The message must include your email address.
- Successfully obtain a webpage on the topic on lesson plans using the Netscape web browser. Print the web page.
- Successfully obtain a webpage on the topic on instructional technology using the Netscape web browser. Print the web page.

Sequentially follow the instructions in your handout to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of internet capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?
2. How can this computer application be used towards an instructional goal?
3. Why does this computer application lend itself towards the instructional goal?
4. How can you extend the use of this computer application to other audiences, content areas, or purposes?

Appendix J

EIPT 3011



Productivity Tools for Teachers

1998

Packet

EXERCISE 1: Hardware/Software Exercise

5 POINTS

Student Name _____ Section _____

Reading: Handout

Exercises: Examine the hardware and software and determine whether the two are compatible. Explain why the systems are compatible or incompatible. Give your response in the space below. If more space is needed use the back of the sheet.

Hardware

SuperMac J700

180 MHZ Power PC 604e processor

24 MB RAM

recommended)

2.1 GB hard drive

8X SCSI CD-ROM drive

Built in 10Base-T-ethernet and AAUI standard

Four high speed PCI expansion slots for
upgradability

128 bit PCI graphics card with 2 MB VRAM

extended keyboard and mouse

Color monitor

Software

Macromedia Extreme 3-D

System Requirements

608040 processor or faster (Power PC

System 7.1 or higher

16 MB RAM required (24 MB RAM or more
recommended)

Hard drive with 20 MB free disk space

8-bit color (24-bit recommended)

CD-ROM drive

Response:

Hardware

Jack's Quadra 700

4 MB RAM

80 MB Hard drive

Jack has filled 72 MB of the hard drive

2X CD-ROM drive

Built in 256 color video support
input and output jacks for sound
color monitor

Software

Mario Teaches Typing 2

System Requirements

68040 processor or faster

System 7.1 or higher

2 MB RAM required

Hard drive with 10 MB free disk space

color monitor

CD-ROM drive

Response:

Hardware

Katie's Pentium PC
Intel 200 MHz Pentium Pro processor
32 MB RAM (8 DIMM slots)
recommended)
2.1 GB hard drive
12X SCSI CD-ROM drive

Microsoft mouse and 104 keyboard
Microsoft Windows NT
SVGA monitor

Response:

Software

Macromedia Extreme 3-D
System Requirements
608040 processor or faster (Power PC

System 7.1 or higher
16 MB RAM required (24 MB RAM or more
recommended)
Hard drive with 20 MB free disk space
8-bit color (24-bit recommended)
CD-ROM drive

Hardware

Mike's Pentium PC
Intel 200 MHz Pentium Pro processor
32 MB RAM (8 DIMM slots)
MHz)
2.1 GB hard drive
12X SCSI CD-ROM drive

Microsoft mouse and 104 keyboard
Microsoft Windows 95
SVGA monitor
sound system

Response:

Software

Madden NFL 97
System Requirements
Pentium 60 MHz processor (recommended 133

Windows 95 or MS-Dos 5.0 or higher
8 MB RAM required (16 MB RAM or more
recommended)
Hard drive with 40 MB free disk space
100% sound blaster compatibility sound card
2X CD-ROM drive
Joystick or mouse

Hardware*Jane's 486 PC*

Intel 75 MHz processor

16 MB RAM (8 DIMM slots)

800 KB hard drive

6X SCSI CD-ROM drive

Microsoft mouse and 104 keyboard

Microsoft Windows 3.1

SVGA monitor

16 bit sound card

Software*Microsoft Encarta 95*

System Requirements

386 SX or higher processor

audio board and speakers

4 MB RAM required

Hard drive with 3.5 MB free disk space

Color monitor

CD-ROM drive

Windows 3.1 or higher

Microsoft mouse

Response:

Sequentially follow the instructions in your handout to learn the information required to do these exercises. There are other exercises in the handout which can further your knowledge of the hardware/software capabilities. If you have difficulty your instructor will assist you.

EXERCISE 2: WORD PROCESSING

5 POINTS

Student Name _____ Section _____

Reading: BYMB, Chapter 2

Exercise: BYMB, Chapter 2, p. 70

- Exercise 2: follow instructions below

This exercise requires you to create a letter to send home to parents about recent and upcoming events in your classroom. You may include a section on student birthdays, theme for the week or month, homework assignments, future field trip information, or other topics of your choosing. The minimum requirements for this assignment are listed below. Try to be creative.

Place a header at the top of your newsletter

- include a title for your newsletter in bold, large type
- include the date, class, and your name under the title in the header

Use at least five subtopics of your choosing from those above or making up your own

- center the subtitle for each topic
- use 12-14 font within the text
- fill page completely
- use Courier font

Use your spell checker and proofread for any grammatical errors

Print it

Sequentially follow the instructions in your text to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of the word processing capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. What are some the similarities between this computer application you are currently working on and previous computer application covered in the course?

3. What are some the differences between this computer application you are currently working on and previous computer application covered in the course?

4. What were some of the skills you used in this homework assignment that you used in previous homework assignments?

5. Where can you go to find information if you do not know how to do something?

Please make a list.

6. Circle any of the responses from number 5 that you actually used while completing this homework exercise.

7. How can this computer application be used towards an instructional goal?

8. Why does this computer application lend itself towards the instructional goal?

9. How can you extend the use of this computer application to other audiences, content areas, or purposes?

10. Now that you finished the homework exercises, do you feel like you have mastered this application?

EXERCISE 3: GRAPHICS

5 POINTS

Student Name _____ Section _____

Reading: BYMB, Chapter 3

Exercises: BYMB, Chapter 3, pp. 111

- Exercise 5, p. 111: follow instructions in text
- Using Drawing - recreate the attached page
- Using Painting - recreate the attached page

Sequentially follow the instructions in your text to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of the graphic capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. What are some the similarities between this computer application you are currently working on and previous computer application covered in the course?

3. What are some the differences between this computer application you are currently working on and previous computer application covered in the course?

4. What were some of the skills you used in this homework assignment that you used in previous homework assignments?

5. Where can you go to find information if you do not know how to do something?

Please make a list.

6. Circle any of the responses from number 5 that you actually used while completing this homework exercise.

7. How can this computer application be used towards an instructional goal?

8. Why does this computer application lend itself towards the instructional goal?

9. How can you extend the use of this computer application to other audiences, content areas, or purposes?

10. Now that you finished the homework exercises, do you feel like you have mastered this application?

EXERCISE 4: DATABASE

5 POINTS

Student Name _____ Section _____

Reading: BYMB, Chapter 4

Exercises: BYMB, Chapter 4, p. 126 and p. 172

- Using the file “Class Data” on your data disk, complete practice questions 1-3 on page 126. Write the answers to each question below.
 - 1.
 - 2.
 - 3.
- Using the file “Class Data” on your data disk, create a columnar report that includes the following fields: (1) Name, (2) Address, (3) City, and (4) State. Adjust the fields to make sure all the information is showing in the fields. Print the report.
- Exercise 2, page 172: follow instructions in text using all suggested fields and others if you can think of them. If you would like to create a database using a topic more relevant to your subject area, approve it with your lab instructor. Once you have created your database, fill in at least 5 records completely with appropriate information. Save the file on your disk.

Sequentially follow the instructions in your text to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of the database capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. What are some the similarities between this computer application you are currently working on and previous computer application covered in the course?

3. What are some the differences between this computer application you are currently working on and previous computer application covered in the course?

4. What were some of the skills you used in this homework assignment that you used in previous homework assignments?

5. Where can you go to find information if you do not know how to do something?

Please make a list.

6. Circle any of the responses from number 5 that you actually used while completing this homework exercise.

7. How can this computer application be used towards an instructional goal?

8. Why does this computer application lend itself towards the instructional goal?

9. How can you extend the use of this computer application to other audiences, content areas, or purposes?

10. Now that you finished the homework exercises, do you feel like you have mastered this application?

EXERCISE 5: SPREADSHEET

10 POINTS

Student Name _____ Section _____

Reading: BYMB, Chapter 5

Exercises: BYMB, Chapter 5

- Begin on page 180 of your text where it says “Cells”. Follow the instructions precisely through to page 191 where it says “Practice”. Complete Practice Exercise #2 on page 191.
- Begin on page 198 of your text where it says “More Practice”. Follow the instructions precisely through to page 201. Print the reading document with the spreadsheet and bar chart on the same page.

Sequentially follow the instructions in your text to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of the spreadsheet capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. What are some the similarities between this computer application you are currently working on and previous computer application covered in the course?

3. What are some the differences between this computer application you are currently working on and previous computer application covered in the course?

4. What were some of the skills you used in this homework assignment that you used in previous homework assignments?

5. Where can you go to find information if you do not know how to do something?

Please make a list.

6. Circle any of the responses from number 5 that you actually used while completing this homework exercise.

7. How can this computer application be used towards an instructional goal?

8. Why does this computer application lend itself towards the instructional goal?

9. How can you extend the use of this computer application to other audiences, content areas, or purposes?

10. Now that you finished the homework exercises, do you feel like you have mastered this application?

EXERCISE 6: Mail Merge

10 POINTS

Student Name _____ Section _____

Reading: BYMB, Chapter 6,

Exercises: BYMB, Chapter 6

Choose one of the following two exercises to complete

- Begin on page 151 of your text where it says “Mail Merge”. Follow the instructions precisely through to page 154. Print the document.

Sequentially follow the instructions in your text to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of the integrative capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. What are some the similarities between this computer application you are currently working on and previous computer application covered in the course?

3. What are some the differences between this computer application you are currently working on and previous computer application covered in the course?

4. What were some of the skills you used in this homework assignment that you used in previous homework assignments?

5. Where can you go to find information if you do not know how to do something?

Please make a list.

6. Circle any of the responses from number 5 that you actually used while completing this homework exercise.

7. How can this computer application be used towards an instructional goal?

8. Why does this computer application lend itself towards the instructional goal?

9. How can you extend the use of this computer application to other audiences, content areas, or purposes?

10. Now that you finished the homework exercises, do you feel like you have mastered this application?

EXERCISE 7: E-Mail and WWW

5 POINTS

Student Name _____ Section _____

Reading: Handout

Exercises:

- Successfully obtain your email address from the OU homepage.
- Successfully send an email to your lab instructor. The message must include your email address.
- Successfully obtain a webpage on the topic on lesson plans in your subject area using the Netscape web browser. Print the web page.

Sequentially follow the instructions in your handout to learn the information required to do these exercises. There are other exercises in the text which can further your knowledge of internet capabilities. If you have difficulty your instructor will assist you.

Directions: The following are questions that you will be answering as you work on your homework. These questions should be completed and turned in with each homework assignment. This is part of your homework exercises and will be worth 5 points. It is expected that you may not be able to answer all the questions at first. Your answers may change during the course, that is why it is expected to answer each question while completing each homework assignment.

1. As you begin this homework, what is your current skill level with this computer application? (i.e., beginner, intermediate, or advanced)?

2. What are some the similarities between this computer application you are currently working on and previous computer application covered in the course?

3. What are some the differences between this computer application you are currently working on and previous computer application covered in the course?

4. What were some of the skills you used in this homework assignment that you used in previous homework assignments?

5. Where can you go to find information if you do not know how to do something?

Please make a list.

6. Circle any of the responses from number 5 that you actually used while completing this homework exercise.

7. How can this computer application be used towards an instructional goal?

8. Why does this computer application lend itself towards the instructional goal?

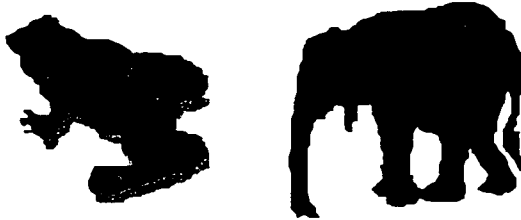
9. How can you extend the use of this computer application to other audiences, content areas, or purposes?

10. Now that you finished the homework exercises, do you feel like you have mastered this application?

APPENDIX K

Jessica's Class
September 11, 1998
EIPT 3011

FUTURE FIELD TRIP
TO ...
THE ZOO!!

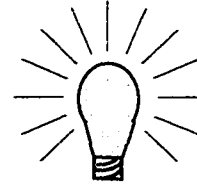
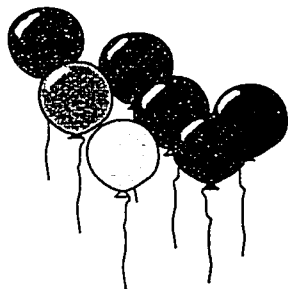


On October 8, 1998, our class will take a special field trip to the Oklahoma City Zoo. We need five to six parent volunteers so everyone ask their moms and dads to come and join in the fun!!

Everyone needs to bring \$5 and a sack lunch. We will leave the school on bus 37 at 9:30 am and return to school at 2:00pm. Let's have a safe and awesome trip!

STUDENT BIRTHDAYS

September 20 John Davis
September 24 Mary Ann
Smith
September 29 Jerry Wilson



Theme for the
Week...

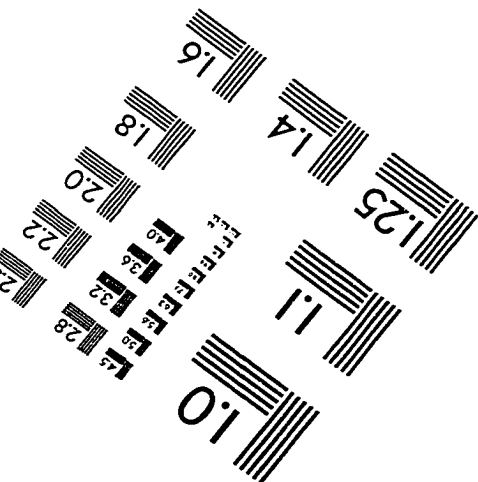
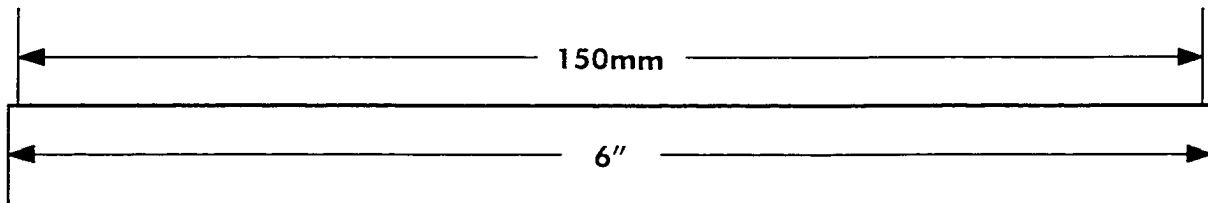
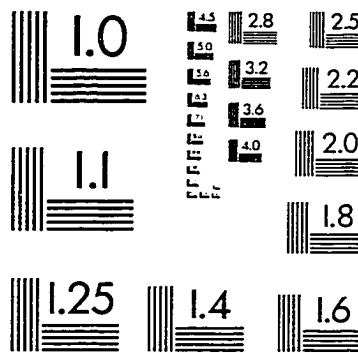
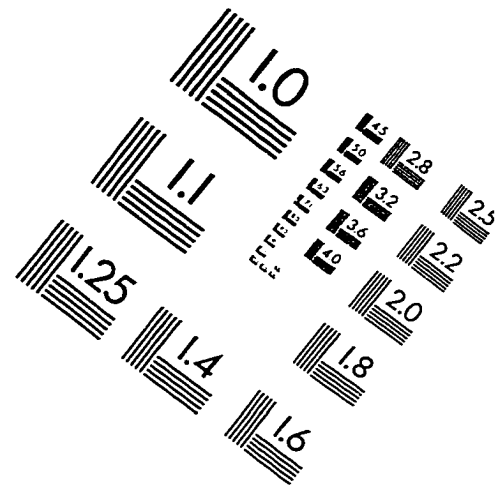
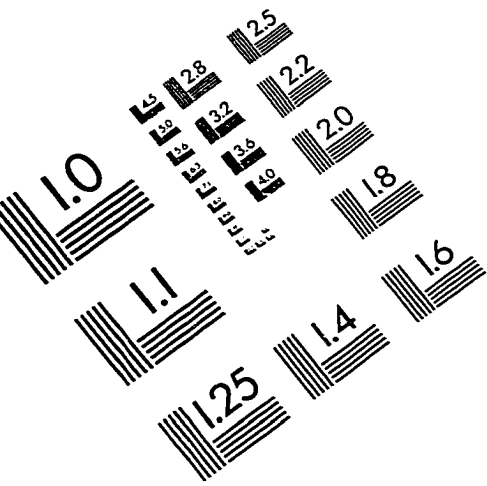
THERE IS NO "I" IN
"TEAMWORK"!

HOMEWORK
for the week:

Math: Keep a running record of how many calories you eat this week.

Science: Keep a running record of the kinds of foods you eat this week. How many fruits, vegetables, etc.

IMAGE EVALUATION TEST TARGET (QA-3)



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