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Stephen Yelon
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MINIMALIST DESIGN PRINCIPLES APPLIED TO THE PROBLEM OF COMPUTER ANXIETY

By

Christopher Branko Reznich

A DISSERTATION

Submitted to
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and Special Education

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ABSTRACT

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Computer anxiety is one possible barrier to acquisition of computer skills. To test whether an instructional intervention could decrease computer anxiety while training subjects in basic word processing skills, instruction developed according to the Minimalist Design principles of John Carroll and was compared with a commercially available instructional unit.

The design of the experiment was a repeated measures control group with random assignment of subjects. Two instructional sessions were held, separated by one month. Subjects were pre- and posttested during each instructional session with respect to computer anxiety and desire for further instruction in computer skills. Subjects worked on two similar word processing tasks, a practice and a transfer task, during the first instructional session, and on another similar word processing task during the second instructional session. Subjects' times to complete the word processing tasks were recorded, and their performances on the word processing tasks were scored according to a performance checklist. For the experimental group, there was an statistically significant decrease in computer anxiety immediately following the first instructional treatment. For the control group, there was also a decrease in computer anxiety, but which occurred over the one month time experimental time frame. Both experimental and control treatments were equally effective

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in training subjects to perform the word processing tasks. There were no significant differences between the groups with respect to desire for further computer training as a result of the treatments.

It was concluded that word processing instruction designed according to Minimalist Principles can produce an immediate reduction in computer anxiety among more computer anxious subjects.

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This dissertation is dedicated to my wife, Pornpimol June; to my parents, Paul and Eleanore; and to my brother, Brian.

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I would also like to express my gratitude to the many teachers, staff persons and colleagues who have helped me throughout my academic career at Michigan State University, but most especially to William Anderson, Ph.D., Office of Medical Education Research and Development, and Stephen Yelon, Ph.D., Department of Counseling, Educational Psychology, and Special Education.

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LIST OF T

CHAPTER

CHAPTER

CHAPTE

TABLE OF CONTENTS

LIST OF TABLES

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CHAPTER ONE

INTRODUCTION

The Broader Context: Why Don't Some People Perform?

People choose not to perform a required task for a variety of reasons. Mager and Pipe (1970) note that lack of skill is but one reason underlying performance deficiencies. Other reasons include punishment for performance instead of reward, lack of consequences for performance, and obstacles to performance. In these latter instances, training will have no effect due to the fact that the real conditions causing nonperformance are not addressed. Rossett (1992) suggests four reasons for performance problems: 1) employees' lack knowledge or skill, 2) the environment is in the way, 3) there are no, few, or proper incentives, and 4) employees are unmotivated. Rossett further suggests that different causes of performance problems will necessitate different interventions. While a lack of skill or knowledge might require training, job aids, or coaching, lack of motivation may require informing workers of the benefits of performance, or promoting early success at a task.

Mager and Pipe, and Rossett remind us that not all performance problems can be solved by training alone. Awareness of the real causes of performance problems must inform any attempt at improving human performance. This approach underlies the following study, which focuses on one case of the wider problem of people who do not want to learn how to use a new technology because of motivational difficulties:

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the case of people who do not want to learn how to use computers because they are "computer anxious."

Identification of the Problem: Computer Anxiety

Many people exhibit fear at the thought of using computers. "Computer anxiety" is defined as "the fear or apprehension felt by individuals when they use computers, or when they consider the possibility of computer utilization" (Simonson, et al., 1987, p. 238) . Rosen and Maguire (1990), in a meta-analysis of 81 research reports on computer anxiety stated that, on average, 25% of all people "feel less than completely comfortable with computers" (pg. 180). Computer anxiety has been shown to be a significant barrier to learning to use computers (Marcoulides, 1988). Research has identified computer anxiety as a significant problem of human performance.

The ability to use a personal computer is becoming a "basic skill" for students, workers and professionals in the closing decade of the 20th century. According to a report by the Office of Technology Assessment (1988), an overwhelming body of evidence suggests that new technologies for collecting, storing, manipulating, and communicating information are revolutionizing the structure and performance of the national economy. As of 1989, there were 45 million computers in use, a figure which is growing exponentially (White, 1991). David L. House, Senior Vice President of Intel, predicted that 22 million computers would be sold in 1991 (White, 1991). Skill in the use of a computer is becoming a prerequisite for success in the workplace, and there is a great need for instruction in the use of computers that enables people to take advantage of these important tools. Given the overwhelming importance of acquiring competence in the use of computers, combined with the prevalence of computer anxiety, there is a need for interventions designed specifically for individuals who are computer anxious but who, nevertheless, must acquire competence in the use of computers.

One can define the problem of computer anxiety as a performance problem according to Rossett's taxonomy as having aspects of skill deficiency and motivational deficiency. Given Marcoulides' observation that computer anxiety is a barrier to learning to use computers, we can assume that many computer anxious individuals need some form of training in order to acquire competence in using computers; even strongly motivated learners will need some form of training materials, instruction, manuals, or job aids, in order to obtain the procedural knowledge required to use a computer.

The computer anxious learner not only lacks necessary procedural knowledge, but faces a motivational barrier brought about by his or her fears. Thus, training, in whatever form, will not be enough. It will also be necessary to address the motivational problem besetting computer anxious individuals. Rossett (1992) suggests four possible interventions addressing lack of motivation: 1) informing workers of the benefits, impact, and value of performance, 2) linking performance to work challenges, 3) using role models, and 4) promoting early successes to instill confidence.

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Purpose of the Study

The purpose of this study is to determine whether instruction in word processing that is designed to address both the skill deficiency and motivation deficiency of computer anxious university undergraduate students will have a more positive effect upon 1) the levels of subjects' computer anxiety, 2) the ability of students to learn basic word processing skills, and 3) the desire of computer anxious students to learn more about computers, than would a control treatment. It is also the purpose of this study to determine whether or not treatment effects, if any, are sustained over time.

In order to introduce the research idea, methodology and instruments, it is necessary to introduce the measurement of computer anxiety, possible interventions for decreasing computer anxiety, and relevant principles of instructional design. These areas, along with the problem area of computer anxiety, will be explored more thoroughly in a review of the research literature in the next chapter.

Measurement of Computer Anxiety

Tests have been developed to measure computer anxiety, including Raub's Attitudes Toward Computers scale and Computer Usage Checklist (1981); Maurer's Computer Anxiety Index (1983), a revised version of the Educational Innovation Survey developed by Rohner and Simonson (1981); and the Computer Anxiety Scale developed by Marcoulides (1989). These instruments all use some form of paper and pencil self report us

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report using a Likert-scale format. Reliability coefficients as measured by Cronbach's alpha are generally .80 and above (Cambre and Cook, 1985).

Interventions to Decrease Computer Anxiety

Investigators have tested several methods of helping people overcome their computer anxiety (Bloom, 1985; Cambre and Cook, 1987; Howard, 1984; Howard and Thomas, 1987; Weil, 1987). Weil, et. al., (1987) developed an approach to computer anxiety reduction based upon clinical methods including individualized relaxation training, systematic desensitization, cognitive-behavioral thought-stopping and support groups. Bloom (1985) suggests an "anxiety management" approach which includes education about stress responses, skill building focusing on relaxation and altering distracting thoughts, and practice of coping skills.

Researchers have asked if computer anxiety can be diminished with instruction in computer use. Howard and Thomas (1987) segregated computer anxious students into separate classes and, with no special effort to design the course to combat computer anxiety, were able to realize reductions in computer anxiety scores of the treatment group students. Howard stressed the need for research to determine what kinds of instructional approaches are most likely to reduce computer anxiety. Cambre and Cook (1987) found that a non-threatening environment including no tests nor grades helped to reduce computer anxiety scores of students in a one-week introductory course on microcomputers. They suggest that computer anxiety can be remediated through positive computing experiences. Unfortunately, Cambre and Cook do not specify the exact nature of their instruction.

A study by Howard (1984) provides further support of the effect instruction can have on computer anxiety. Working with two groups of relatively low computer anxious students, Howard compared the effect of two instructional treatments on computer anxiety scores. The control treatment was a lecture on BASIC programming language, and the experimental treatment was a demonstration and hands-on practice session on DOS. He found that, while there was a difference in the post-instruction computer anxiety scores for the two groups, they were due more to an *increase* in the computer anxiety scores for the control group. He attributed this increase primarily to the content and delivery of the instruction; rather than being a true neutral control treatment, it had the effect of increasing anxiety scores. This gives support, negative though it may be, to the argument that instruction can have an effect on students' computer anxiety.

One problem in the research on the effect of instruction upon computer anxiety is the lack of adequate description of the instructional treatments used by the researchers. This experiment will seek to describe fully the exact nature of the instructional intervention, thus addressing a weakness of some past studies.

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Instructional Design Approach

Significant work has been done by John Carroll to develop a set of instructional design principles that directly address the domain of using computers (Carroll, 1984a, 1984b, 1990). The principles are the result of a series of qualitative studies of adults learning to use computers with typical commercial computer manuals, which included the use of introductory training materials. Carroll (1990) found that most such materials actually obstructed learning because they interfered will the learners natural learning processes. The principles that Carroll developed, called "Minimalist Principles," are intended to minimize the extent to which reference materials used as instructional materials obstruct learning and refocus the design of training materials on the goal of supporting learner-directed activity and accomplishment. This aim is consistent with current theories of cognitive psychology in which learners actively construct cognitive representations, or mental models, of the world around them (Resnick, 1989). Minimalist documentation includes mechanisms by which learners can access immediately the information they need to attain a self-directed goal, thereby efficiently constructing their own mental models of how computers function. Support for Minimalist Principles is also provided by cognitive load theory (Chandler and Sweller, 1991) which suggests that effective instructional material directs cognitive resources toward activities that are relevant to learning rather than toward preliminaries to learning. Minimalist documentation adheres to this principle by "slashing the verbiage" so that learners may access required and only required information, rather than slogging through pages of unnecessary reading. One of the intended outcomes of instru

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instruction designed according to Minimalist Principles is early success at tasks involving the use of computers, which is one way Rossett (1992) suggests for addressing the motivational needs of learners suffering from motivational deficiencies.

The sheer volume of reference material that accompanies common word processing software is daunting. Furthermore, instructional materials intended to get users started are developed to address the needs of a mass market for computer software, rather than the specific needs of any individual user or group of users. Users have goals and learning styles which software documentors cannot imagine nor address with precision. If commercial computer instructional materials cannot meet learners' needs effectively, as suggested by Carroll (1984a), it is illogical to suggest that they can meet the needs of computer anxious students. Given that instruction can be manipulated as a variable, it may be fruitful to attempt to design instruction according to Minimalist Principles and to test whether or not such instruction has an effect on computer anxiety, on computer anxious students' desire to learn computer skills, and on computer anxious students' ability to use a computer to complete a task. The Minimalist Principles form a potential framework for developing computer instruction which can then be tested with computer anxious learners to see if such instruction is effective. A thorough discussion of the Minimalist Principles is contained in the literature review in the next chapter

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The Research Idea

The proposed study is intended to test whether instruction designed according to Carroll's Minimalist Principles can meet the needs of computer anxious learners. If it can be shown 1) that a brief instructional treatment can have an effect on reducing computer anxiety and increasing the desire to learn how to use computers, and 2) if computer anxious students can actually learn useful computer skills using the instructional treatment, then the proposed study will have made a useful contribution to addressing the problem of training computer anxious learners. Computer anxious education majors who are required to take at least one course in computer applications in school settings, or computer anxious adults who must undergo compulsory job upgrading related to computers, are examples of learners who might benefit from thoughtful applications of Carroll's principles.

Definitions

computer anxiety: "the fear or apprehension felt by individuals when they used computers, or when they considered the possibility of computer utilization" (Simonson, et al., 1987, p. 238).

computer skill: ability to use computers to perform tasks, such as using word processing to write a term paper.

desire to learn: the expressed desire for instruction or continued learning in a domain. The desire to learn be expressed either verbally through self-report, through written assessment such as completion of a motivational inventory or through actions such as further study.

Minimalist Principles: a set of instructional design principles developed by Carroll and his colleagues that are intended to guide the development of instruction in the use of computers. They include using real tasks, slashing the verbiage, facilitating instant access to desired content, and coordinating the system with the instruction.

word processing task: any task which requires the use of a computer and word processing software.

practice task: a task undertaken by an individual in the process of learning a skill.

transfer task: a task which closely resembles a practice task in form, but which varies from the practice task in content.

Research Questions

1. Would a group of computer anxious students that is taught basic word-processing skills using instruction designed according to Minimalist Principles show a decrease in levels of computer anxiety as measured by the Computer Anxiety Scale than would a control group receiving commonly available commercial instruction?

2. Would a group of computer anxious students that is taught basic word-processing skills using instruction designed according to Minimalist Principles perform better on a word processing task more than would a control group receiving commonly available commercial instruction?

3. Would a group of computer anxious students that is taught basic word-processing skills using instruction designed according to Minimalist Principles express more desire to learn how to use computers than would a control group receiving commonly available commercial instruction, as measured by direct questions about their desire for further computer skills instruction?

4. Would a group of computer anxious students that is taught basic word-processing skills using instruction designed according to Minimalist Principles display more desire to learn how to use computers than would a control group receiving

commonly available commercial instruction, as measured by attendance at a follow-up instructional session?

5. If there are any differences between the control group and the experimental group with respect to computer anxiety scores or expressed desire to learn more computer skills, will these differences be evident one-month after the initial study?

Hypotheses

1. The experimental group will score lower on a measure of computer anxiety, the *Computer Anxiety Scale*, than will an equivalent control group after initial training in the use of word processing.

2 The experimental group will score lower on a measure of computer anxiety, the *Computer Anxiety Scale*, than will an equivalent control group when measured during a word processing follow-up session attended one month after initial training.

3. The experimental group will score higher on performance of a word processing task than will an equivalent control group. Differences in performance scores will be stable after a follow-up treatment.

4. The experimental group will indicate a greater desire to learn more computer skills as measured by 1) subjects' estimates of the number of hours they would be willing to devote to further word processing skills study, 2) subjects' estimates of their interest in learning other computer programs, and 3) subjects' estimates of the number of hours they would be willing to devote to developing their computer skills, than will an equivalent control group, when measured immediately after instruction.

5. The experimental group will indicate a greater desire to learn more computer skills as measured by 1) subjects' estimates of the number of hours they would be willing to devote to further word processing skills study, 2) subjects' estimates of their interest in learning other programs, 3) subjects' estimates of the number of hours they would be willing to devote to developing their computer skills, and 4) subjects' attendance at a second computer session, than will an equivalent control group, when measured during a one-month follow-up computer session.

Implications of the Study

If the hypotheses are upheld, this will be evidence for a powerful instructional and motivational effect upon computer anxious learners. Given the stakes for individuals who remain unskilled in the use of

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computers in terms of lower productivity and employability, it is important to seek such solutions.

In a wider context, the present study may have implications for future technologies that arouse anxiety in potential learners. If it can be shown that Minimalist Principles provide a useful instructional framework for addressing the problems of computer anxious learners, they may also be useful for addressing the problems of future learners who will feel anxious about as yet undeveloped technologies.

Another implication of the study is in the wider area of learner motivation and its influence on performance. The study may be able to shed light on the question of how important learner motivation really is to performance of a task.

Summary and Order of Presentation

This chapter set the broad problem area of why some people don't perform, noting that there are many reasons for nonperformance. Essential concepts of computer anxiety and its measurement, and Minimalist Principles of instructional design were introduced. The purpose of the study, research idea, definitions, research questions, hypotheses and implications of the study were also introduced.

This study seeks to compare the efficacy of computer skills instruction designed according to Minimalist Principles with that of commercially available materials in training learners to acquire basic word processing skills, in reducing computer anxiety, and in promoting learner motivation expressed as the desire to learn how to use computers.

Chapter 2 will present a review of relevant literature, chapter 3 will present the methods used in the study, chapter 4 will present the study results, and chapter 5 will present a discussion of those results and suggestions for further study.

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CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

The purpose of this study was to determine whether instruction in word processing that is designed according to Minimalist Principles to address both the skill deficiency and motivation deficiency of computer anxious university undergraduate students would have a more positive effect upon 1) the desire of computer anxious students to learn more about computers, 2) the ability of students to learn basic word processing skills, and 3) the levels of subjects' computer anxiety, than would a control treatment of commercially available materials. The research idea, questions and hypotheses were developed upon review of the literature on anxiety, computer anxiety and its measurement, human performance considerations, and Minimalist Principles. A review of that literature is presented in this chapter.

Anxiety

Anxiety has been described as a 20th century construct (Cambre, et. al., 1985). Its early history has been traced to Freud, who identified "angst" as a clinical syndrome in 1895 (Spielberger, 1966). May (1950) describes anxiety as a characteristic symptom of modern times; its

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contributors include pressure for social change produced by rapid scientific and technological advances. Epstein (1972) describes anxiety as a concept composed of three basic sources, each having a unique feeling state associated with it. The first source is *primary overstimulation*, which involves frantic feelings of being overwhelmed with stimulation to the limits of tolerance. The second source is *cognitive incongruity*, which is associated with situations involving a discrepancy between an individuals cognitive plan and reality, and the resulting failure to formulate a plan for coping with the discrepancy. The final source is *response unavailability*, a condition that occurs when the object producing the arousal is unknown, when there is a waiting period required before a response can be made, there is a conflict between opposing response tendencies, or when the required response is not in the individual's capability. Cattell and Scheier (1961) identified two types of anxiety which they referred to as "trait" and "state" anxiety. Trait anxiety is considered a relatively permanent and stable personality characteristic, while state anxiety is a transitory condition which can fluctuate over time and treatment. Spielberger (1966) refined the trait-state anxiety distinction. He defined anxiety states as "subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation or arousal of the autonomous nervous system" (p. 16). He defined anxiety traits as motives or acquired behavioral dispositions that predispose an individual to perceive a wide range of objectively nondangerous circumstances as threatening, and to respond to these with anxiety state reactions disproportionate in intensity to the magnitude of the objective danger. Spielberger (1970) developed the State-Trait Anxiety Inventory (STAI) as a measure of these

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two dimensions of anxiety. Subsequent research on the STAI has become the basis for development of measures of computer anxiety (Cambre and Cook, 1985).

The fact that state anxiety can, as Cattell and Scheier note, fluctuate over time and treatment, opens the possibility that an appropriately designed instructional treatment can be developed which reduces a person's computer anxiety while training an individual to acquire computer skills, if it can be shown that computer anxiety is primarily a "state" rather than a "trait."

Computer Anxiety and Its Measurement

Researchers have attempted to define computer anxiety (Maurer and Simonson, 1984; Raub, 1981; Simonson, et. al., 1987). Simonson, et. al. (1987) defined computer anxiety as "the fear or apprehension felt by individuals when they used computers, or when they considered the possibility of computer utilization" (p. 238). Thus, computer anxiety arises in response to a specific action or thought related to computers, or a "state" in Cattell and Scheier's view. Raub (1981) defined computer anxiety as "the complex emotional reactions that are evoked in individuals who interpret computers as personally threatening. This definition describes an anxiety state, in contrast to an anxiety trait" (p. 9, underlines in the original). Maurer and Simonson (1984) reported that a computer anxious person would exhibit avoidance of computers and the areas in which they were located; excessive caution when using computers; negative remarks toward computers and using computers;

and attempts to shorten the times when computers were being used. This view of computer anxiety reinforces the state rather than the trait characteristic.

Several researchers (Raub, 1981; Marcoulides, 1985; Simonson and Rohner, 1981; Simonson, et. al., 1987) have designed and tested instruments intended to measure computer anxiety. Raub (1981) has developed an "Attitudes Toward Computers" scale, a 25-item scale which, after factor analysis, identified one factor Raub labeled "computer anxiety." Maurer's "Computer Anxiety Index" (1984) is a revised version of an instrument called the "Educational Innovation Survey" developed by Simonson and Rohner (1981). The original instrument was thought to reflect "intent to use computer" more accurately than computer anxiety, and Maurer sought to overcome the limitations of the original survey. The resulting instrument was a 26-item survey with a reliability coefficient (Cronbach's alpha) of .94. The Computer Anxiety Scale developed by Marcoulides (1985) is a 20-item inventory developed as a measure of perceptions by students of their anxiety in different situations related to computers. Exploratory and confirmatory factor analysis revealed two factors, one Marcoulides labeled a general computer anxiety factor, the other labeled an equipment anxiety factor. Variables related to the general factor or concerned with anxiety arising from direct experiences with the computer, the role of computers in society, and from the impact of the computer on individuals at work. The equipment anxiety factor reflected anxiety over operation of a personal computer, looking at computer printers and printouts, and watching someone use a computer. The internal consistency coefficient alpha for the test was .97.

The Raub instrument was intended to investigate and measure the attitudes associated with computer anxiety, and thus was not intended as a measure of computer anxiety itself. The Maurer instrument is a commercially available product which costs approximately .50 per administration. An instrument that is reliable, measures the phenomenon of interest, and requires little or no financial outlay is the most desirable. The Computer Anxiety Scale developed by Marcoulides met all the criteria. Permission was sought from and granted by Dr. Marcoulides to use his instrument in this study.

Human Performance Considerations

It was previously noted that people do not perform for a variety of reasons, and that skill deficiency is only one reason for performance deficits. Mager and Pipe (1970) have provided a useful framework for analyzing the nature and causes of performance problems. They suggest that performance problems can be caused by skill deficiency, punishment for desired performance, reward for non-performance, desired performance making no difference, and the existence of obstacles to desired performance. Within Mager and Pipe's framework, computer anxiety may constitute an obstacle to performance insofar as computer anxiety is an interior state which prevents the learner from attempting to acquire computer skills. The negative feelings that accompany computer anxiety can also be thought of as a negative consequence of desired performance. A computer anxious person, when faced with the need to acquire computer skills, will feel uncomfortable and will seek to avoid the

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conditions that provoke the uncomfortable feelings. Mager and Pipe suggest removing obstacles to performance when they are encountered, and arranging for positive consequences when negative consequences interfere with performance. While Mager and Pipe illustrate their ideas with numerous examples, the issue of anxiety interfering with performance is not directly addressed, and we need to look elsewhere for approaches to dealing with computer anxiety.

Following Cattell and Scheier (1961), computer anxiety can be considered a transitory condition that may be alleviated via instructional intervention. Rossett's approach to analyzing human performance problems (1992) includes the category of employee motivation. She suggests that human performance professionals, while traditionally looking to phenomena external to the employee to explain performance deficits, should also consider the employee's internal state, and what is going on within the employee as he or she contemplates a new system or procedure.

The approach which underlies the present study, is to assume that the problem of computer anxiety leads to learner motivation deficits, and that motivational deficits which occur within computer anxious individuals interfere with their desire to acquire computer skills. By addressing the motivational needs of learners, one may be able to offer a learning experience that will help the computer anxious learner to "set aside" their anxiety sufficiently for computer skills learning to occur. An analogy could be made to a person suffering from a common cold. While medical science does not currently have much to offer by way of curing a cold, it offer a pharmacopoeia of medicines aimed at symptomatic relief. A worker can avail him or herself of this pharmacopoeia and feel well

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enough to continue working. The approach taken here is similar. Assuming that a motivational deficit is symptomatic of computer anxiety, then by addressing the "symptom" one may be able to overcome the effects of the "disease."

Instructional Design Considerations: Keller's ARCS Model and Carroll's Minimalist Principles

Fortunately, the field of instructional theory and design provides a number of approaches to dealing with motivational issues, and may provide a potential arsenal of treatments to address the motivational needs of computer anxious learners.

Keller (1983a, 1983b, 1987) has developed a model of motivational requirements which may be addressed in order for people to be motivated to learn. His ARCS model synthesizes the work of numerous psychological theorists into a framework for integrating strategies for increasing learner motivation. According to the ARCS model, there are four general motivational requirements: attention, relevance, confidence, and satisfaction. Keller briefly discusses the aim of each requirement, outlines requirement subcategories, and suggests strategies for meeting each requirement:

Attention. The motivational concern is getting and sustaining learners' attention. Subcategories of attention include perceptual arousal: creating curiosity by using novel approaches and injecting personal or emotional material; inquiry arousal: stimulating an attitude of inquiry by asking questions, creating paradoxes, nurturing thinking challen

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challenges; and variability: sustaining interest by variations in presentation style, concrete analogies, human interest examples and unexpected events.

Relevance. The motivational concern is responding to perceived needs. Subcategories include goal orientation: providing examples or statements of the utility of the instruction, presenting or having students present the goals of instruction; motive matching: providing learners with personal achievement opportunities, leadership responsibilities, and positive role models; and familiarity: providing concrete examples and analogies related to the learners' work.

Confidence-building. The motivational concern is promoting achievement and success, especially early on. Subcategories include learning requirements: building a positive expectation for success by establishing trust and by explaining the evaluative criteria; success opportunities: increasing belief in personal competence by providing many varied and challenging experiences which increase learning success; and personal control: tying learner success to their own efforts by providing feedback on performance.

Satisfaction-generation. The motivational concern is creating satisfaction so that there will be continued motivation to learn. Subcategories include natural consequences: providing meaningful opportunities for learners to use their new knowledge or skills by providing problems, simulations, or work samples; positive consequences: providing reinforcement of learner successes by using verbal praise, real or symbolic rewards, and student presentation of their work, and equity: assisting students in anchoring positive feelings about their accomplishments (i.e., when comparing their work with others', they rer

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they remain satisfied with their own work) by making performance requirements consistent with stated expectations and providing consistent measurement standards for all learners' tasks and accomplishments.

The ARCS model is based upon supporting studies from many areas of research on human motivation, including reinforcement theory and self-efficacy theory. It is something of an "omnibus" model - it attempts to synthesize a wide variety of approaches and perspectives into one model. Its practical utility has been supported through field-testing.

The ARCS model is intended as a foundation upon which one can plan for meeting the motivational needs of any group of students. It is particularly attractive in that it addresses the motivational needs of students throughout the educational process, rather than narrowly focusing upon how to gain students' interest.

By addressing the motivational concerns raised in the ARCS model, one may provide enough "symptomatic relief" from their anxiety states to allow computer anxious learners to acquire computer skills. Ideas within the ARCS model can be applied to the challenge of designing instruction for computer anxious learners. The attention concern can be addressed by including analogies that relate to learners' previous experience. The relevance concern of perceived need can be addressed by having learners work on tasks meaningful to them. The confidence-building concern of promoting achievement and success can be addressed by providing opportunities for successful task completion. The satisfaction-generation concern can be addressed by including meaningful tasks on which learners can work.

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The ARCS model of motivation in instruction provides an omnibus framework for approaching the challenge of making instruction which meets the motivation needs of learners. Its application can result in many ideas for designing instruction which may alleviate computer anxious learners' fears sufficiently so that they can acquire computer skills.

While the ARCS model is a framework for designing instruction that is motivating to learners, it is "content-free" in that it is not intended for guiding the development of instruction in any particular body or type of knowledge. The work of John Carroll (1984a, 1984b, 1990, 1992) provides a set of principles intended explicitly for developing instruction in the area of computer skills.

Carroll has suggested a set of what he calls "Minimalist Principles" to guide instructional developers facing the task of creating instruction in practical skills of computer use. The principles were developed out of a series of qualitative research studies conducted by Carroll and associates that investigated the behavior of adult computer learners while they tried to learn how to use their machines. He begins by describing what he calls the "training problem." Learners of computer skills begin by identifying appropriate goals such as printing a document, the means for attaining the goals (printer, keyboard, monitor), and drawing connections between goals and means. Training materials provide assistance, but they require analysis by learners as to which parts are relevant to attaining their goals, and which parts could be ignored for the time being. Learners can end up learning things and doing things that are unanticipated or unintended by the training designers. This can lead to a sense of <u>being overwhelmed</u> on the part of the learner - Epstein's notion

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notion of *primary overstimulation* is relevant in this context. Thus, in the effort to divine out of a mass of information what they need to learn in order to accomplish personal goals, learners can begin to exhibit symptoms of anxiety as defined by Epstein, a sense of being overwhelmed by new information and technology.

Another facet of the training problem is called jumping the gun. Carroll notes that training designs often respond to the problem of overwhelming learners by using overviews in the front of their manuals intended to help orient learners to the system. Often learners aren't interested in reading, they are interested in doing. Rather than obey the instruction, "Don't do anything until you've read this first," learners will plunge ahead at the first mention of a procedure that they feel will move them closer to a personal goal, frequently with troubling effects.

Skipping is another aspect of the instructional problem. According to Carroll, "People come to the learning task with a personal agenda of goals and concerns that can structure their use of training materials. They skip crucial material if it doesn't address their present concerns" (1984b, p. 125). Thus, learners will browse ahead until they find a topic that interests them, ignoring prerequisites.

Other aspects of the training problem include:

"reasoning instead of reading" - drawing defective conclusions based upon incomplete or incorrect understandings.

"ignoring the screen" - "keeping one's nose in the book" while attempting procedures, rather than attempting a step, then looking a

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at the screen to determine whether it has been effectively carried out.

"trouble recovering from errors" - Typically, instruction assumes that learners will not make errors. Learners are expected to carry out procedures exactly as they are written. The reality is that learners do make errors. The problem is that most instruction makes no adequate allowances for this fact.

"wanting to do real work" - people learn to use word processing to create documents, immediately; they are not interested in rote learning of procedures.

As a result of these studies, Carroll described his observations of how learners actually learned. He observed that people learned to use computers by exploring them, by trial and error, by setting personal goals for themselves, and by actively manipulating the machine. According to Carroll (1990), the appropriate orientation to the training problem is directing and supporting the natural learning styles and strategies of the learners. This is the essence of Minimalist Design and is embodied in the following principles:

Training on real tasks: Learners will learn better if they work on real life tasks. For example, secretaries will learn to use computers better if they begin by learning to create common office/organization documents such as business letters.

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Getting started fast: Learners will try to do things with the computer as soon as they feel they can; they will not "wait for the instruction." Most computer manuals provide far too much introductory material. Learners will get ahead of the manual, make mistakes, and become frustrated. Effective instructional materials will allow students to start as quickly as they want to by providing minimum amount of introductory material.

Reasoning and improvising: When learners actively generate elaborations of learned material, this makes the material more accessible in memory. Instructional materials can explicitly encourage learners to pose and then investigate questions that interest them. A key role of instruction is to guide learners to pose productive questions and to adopt appropriate methods to investigate them

Reading in any order: Learners tasks typically will not follow the order as prescribed in a computer manual, therefore the instructional materials need to allow the learner to access needed information as needed.

Coordinating system and training: Successful training systems incorporate linkages between the instructional materials and the action on the screen. It is not enough to expect people to follow directions alone; they must be able to coordinate directions with the feedback they receive from the system.

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Supporting error recognition and recovery: Conventional instructional materials designed according to traditional systems approaches assume error-less performance on the part of the learner (Carroll, 1990). According to Carroll, this is an untenable position. Learners, especially learners of difficult new technologies such as computers, can be expected to make mistakes. Effective instruction must include plans for this contingency. Carroll suggests an instructional module that directly addresses the most common and useful error recovery strategies.

Exploiting prior knowledge: One of the most important aspects of training design is understanding the user's prior knowledge and motivation and then finding ways to exploit it. The typewriter and desktop metaphors have been used successfully in interface design, for example.

Using the situation: The learning situation is full of meaning and experiences, the chance for discovery, and the possibility of achievement. The fine details of a real situation such as the contents of a memo to be typed, or an individual's preferences and choices in a learning situation, can guide the development of instruction.

The key to the Minimalist Principles is minimizing the extent to which instructional materials obstruct learning and of refocusing the design of training materials on the goal of supporting learner-directed activity and accomplishment. According to Carroll (1990):

> Presenting real tasks that learners already understand and are motivated to work on, helping them to get started rapidly on these tasks, allowing them to rely on their own reasoning and improvising, reducing the instructional verbiage they must passively read, organizing material to support skipping around and to facilitate the coordination of attention between the training and the system, and addressing important user errors can produce better training material than the current state of the art. (p. 183)

There are many ways in which the Minimalist Principles dovetail with Keller's ARCS model of motivation in instruction. Carroll's notion of "presenting real tasks that learners already understand and are motivated to work on" is directly related to Keller's motivational concerns of relevance and satisfaction generation. The Minimalist Principle of "getting started fast" can be very confidence-building by providing early opportunities for success, again addressing one of Keller's motivation concerns. Keller's notion of personal control is supported by Carroll's principle of reading in any order; learners can control their access to required information at any point in the learning experience. It is apparent that instruction designed according to Minimalist Principles will also in large part address the motivational concerns outlined by Keller.

Carroll (1990) reports that work has been done which confirms the efficacy of the Minimalist Principles. Olfman (Olfman, 1987; Olfman and Bostrom, 1988; Olfman and Bostrom in Carroll, 1990) designed a manual for teaching spreadsheets according to minimalist principles and found that students who were trained with the "minimalist manual" tended to use the spreadsheet longer than those in the control group. Participants evaluated the minimalist manual as better facilitating their learning. Participants in a study by Oatley, Meldrum, and Draper (in Carroll, 1990) performed twice as efficiently in both learning and testing in skills in glossary preparation with a word processor compared with a control group using a commercially developed systems-style manual. Warner (1987) at Michigan State University developed minimalist instruction in the Microsoft Disk Operating system and examined brevity and coordination of the system and training. He found that both factors enhanced achievement and learner attitudes and decreased learning time. Although he found no difference with respect to computer anxiety scores for the experimental and control groups, this could attributable to the fact that he used an instrument intended to measure general state anxiety (Spielberger's State Anxiety Inventory) rather than an instrument designed specifically for measuring computer anxiety.

Evidence is accumulating supporting the use of Minimalist Principles in designing computer skills instruction. The proposed study seeks to contribute to this literature by applying Minimalist Principles to the problem of computer anxiety.

Summary

This chapter presented a review of the literature on anxiety, computer anxiety and its measurement, human performance considerations, and the Minimalist Principles. The literature on anxiety identified two types, "trait" and "state" anxiety. Trait anxiety is a relatively enduring personality characteristic, while state anxiety can fluctuate over time and treatment. The literature on computer anxiety and its measurement defined computer anxiety as fear or apprehension when an individual uses a computer or thinks about using a computer. Many researchers consider computer anxiety as a state rather than a trait, and thus possible amenable to treatment. Several instruments used to measure computer anxiety have been developed; the present study adopted Marcoulides' Computer Anxiety Scale.

Several reasons for why individuals don't perform were noted in the literature on human performance: skill deficiency, punishment for desired performance, reward for nonperformance, desired performance making no difference, and the existence of obstacles to desired performance. It was suggested that computer anxiety could be conceived of as an obstacle to performance in this framework, and the negative feelings associated with computer anxiety operating as punishment for desire performance. Rossett suggested the need to consider lack of employee motivation as a phenomenon explaining some performance deficits. The approach taken by this study was that motivational deficits can be expected to occur within the computer anxious individual which interfere with that individual's ability and desire to acquire computer skills. It was suggested that, by dealing with the motivational deficit "symptom" of computer anxiety, one might be able to mitigate its deleterious effects. Keller's ARCS model suggested four motivational requirements - attention, relevance, confidence, and success - which need to be attended to in order to design instruction that is motivating to learners. Carroll's Minimalist Principles such as "presenting real tasks," "getting started fast," and "reading in any order" were shown to dovetail with Keller's motivational requirements. Research on application of Carroll's Minimalist Principles provide evidence for their efficacy in training individuals to use computers. This study is intended to contribute to that effort.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter presents the methodology used in the study. Separate sections present the study design, design of the instructional treatment, instrumentation, description of the subjects and subject recruitment, experimental procedures, data handling, data scoring, data analysis, and a power analysis.

Design of the Study

Campbell and Stanley (1963) suggest that randomization of experimental and control groups is the most adequate assurance of lack of initial biases, controlling for the effects of testing, history, maturation, regression, and selection by virtue of assuring group equality at the time of assignment. The study was a pre/posttest control group design with respect to computer anxiety and motivation measures, and a posttest only control group design with respect to performance at a word processing task . There was random assignment of control and experimental groups. One extension suggested by Campbell and Stanley is to include "testing for effects extended in time" (p. 31) to see if there are any enduring treatment effects. The experiment was performed two times with the same subjects, Phase I and Phase II, the second administration separated from the first by one month.

The pre/posttest design with random assignment of subjects can be depicted graphically in the following manner:

$$\begin{array}{ccccccccc} & O_1 & X_1 & O_2 & & O_3 & X_1 & O_4 \\ R & & & & & & & \\ & O_1 & X_2 & O_2 & & O_3 & X_2 & O_4 \end{array}$$

The posttest only design with random assignment of subjects can be depicted graphically in the following manner:

$$\begin{array}{cccccc} & X_1 & O_2 & & X_1 & O_4 \\ R & & & & & \\ & X_2 & O_2 & & X_2 & O_4 \end{array}$$

<u>Design of the Instructional Treatment</u>

The study is trial of a set of instructional materials. Thus a thorough discussion of the treatment is warranted.

Both the experimental and the control treatments are instructional materials designed to teach basic skills in the use of the WordPerfect© word processing software, version 5.1 (Appendices A and B).

The experimental instruction was developed to incorporate five of Carroll's Minimalist Principles: slash the verbiage, reading in any order, coordinating system and training, getting started fast, exploiting prior knowledge, and supporting error recognition and recovery. It was felt that these principles were under the control of the instructor and were thus amenable to experimental manipulation. Training on real tasks was incorporated into the word processing task set for both the experimental and the control groups. Economy of design of the study dictated that an identical word processing task be used to gauge the effectiveness of the instructional materials.

The experimental treatment was intended as a self-instructional module. It would be similar to the "let's get started" types of sections accompanying commercial word processing packages or of an introductory tutorial in a course on basic word processing skills. An expanded version of this instruction has been used as tutorial material for a program of basic computer skills instruction for academic physicians participating in the Primary Care Faculty Development Fellowship Program at Michigan State University. It was decided to investigate a variation of the "let's get started" format because it is assumed that many learners of computer packages get their instruction in this manner.

The control materials are the "Getting Started" section of the WordPerfect reference manual (1989), pages 3 - 19 (Appendix A).

The following discussion compares the experimental materials with the control materials with respect to the Minimalist Principles.

Slash the verbiage: The experimental materials contain 10 pages of text, while the control materials contain 17 pages of text. Several of the experimental material pages contain very little text. For example, the section on "deleting text" has four lines of text, one line composed of the word "or." The section in the control materials which contains information on deleting text contains 21 lines of text, and the key information regarding deleting text is imbedded within text explaining other "Keys to Know." Overall, the experimental materials contain 1309 words in 357 lines of text, while the control materials contain 4,279 words in 519 lines. The principle of slashing the verbiage is manifest throughout the experimental material by the relative brevity of the explanations.

Reading in any order: The experimental material incorporates a set of index tabs that allow the user relative "random access" to the desired section. The use of the index tabs is a variation of a technique used by Carroll (1990) in which a set of tabbed instructional cards replaced the more common instructional manual. The tabs should allow the user to access a desired topic of instruction with a minimum of searching. The control material provides a traditional table of contents.

Coordinating system and training: The experimental material includes several examples of screen information that would appear upon correct application of the instructions. An example is on the first page, which contains a mock-up of a blank screen in WordPerfect ready for text entry. This is the screen the learner should see if they have correctly followed the procedure to start up the program. Another example is in the section on "Exiting WordPerfect," where the screen prompts that appear during the process of exiting the program are represented in the material:

2. This message will appear at the bottom of the screen:

Save document? Yes (No)

The purpose of such prompts is to allow the learner to coordinate their act of reading through the instruction with the action of the system itself.

Getting started fast: The experimental instruction dispenses with customary introductory "read this first" types of material. The learner is instructed in the use of the word processing system beginning with the very first page - how to start up the word processing software. Explanatory material not directly related to use of the system is kept to a minimum or dispensed with entirely.

Exploiting prior knowledge: References are made to the typewriter and the process of typing as a means of relating text entry to readily available learner concepts. This is evident in the section "Typing Text, Moving Around" in which the metaphor of typing is exploited to highlight the differences between the act of typing, which requires a carriage return after every line, and the act of text entry and the concept of "text wrapping," which is explained without reference to the term itself.

Supporting error recognition and recovery: A section on "Undoing" is included in the experimental materials to allow the learner quick reference to two methods of error recovery, using the '"cancel" command

and the "escape" key. The control materials include only the "cancel" command, and imbed instructions for using the command within a larger section on "Keys to Know."

Subjects and Subject Recruitment

The coordinator of the Human Subjects Pool of the Department of Psychology at Michigan State University was contacted for recruitment of study subjects. The Human Subjects Pool is comprised of undergraduate introductory psychology students who, in order to fulfill course requirements, agree to participate in psychological research. Students in the pool may choose the experiments in which they participate. Subject recruitment procedures allow the researcher to specify desired subject attributes. For this experiment, it was specified that subjects should meet the following criteria: 1) no previous experience using WordPerfect for IBM and compatible computers, and 2) consider themselves afraid of computers. Standard departmental sign-up procedures for recruiting subjects from the pool were followed which involved creating and posting sign-up sheets with the title of the experiment, the time commitment required, the desired subject attributes, and the location and time to report for a brief survey. Subjects had a choice of three different times at which the could report for the screening test. A total of 200 students signed up for the study, of which 173 reported for the initial administration of the Computer Anxiety Survey.

Instrumentation

Computer anxiety was measured using Marcoulides' Computer Anxiety Scale (Appendix C), a 20-item questionnaire using a 5-point Likert scale for each question. The internal consistency of the test as measured by Cronbach's alpha is .97. The Computer Anxiety Scale was administered immediately prior to the treatment and immediately after the treatment, during both Phase I and Phase II of the study.

In order to gather demographic data and to determine pretreatment desire to learn computer skills, the Background Information form (Appendix D) was administered to all subjects. The form includes questions about subjects' class standing, age, sex, GPA, previous computer experience, previous word processing experience, typing ability, academic major, and three questions regarding subjects' desire to learn computer skills. The full Background Information questionnaire was administered to all Phase I subjects. An instrument with only the three questions pertaining to subject desire to learn computer skills was administered during Phase II (Appendix E).

In order to gather data on the desire to learn computer skills after experimental and control treatments, a Feedback questionnaire (Appendix F) containing the same three questions about subject desire to learn computer skills which appeared in the Background Information form was administered after treatments in both Phase I and Phase II of the study. The Feedback questionnaire also contained two questions that are intended to obtain qualitative data regarding subjects' perceptions of the instruction.

Experimental Procedures

Upon acceptance of the doctoral dissertation committee and successful review by the University Committee on Research Involving Human Subjects, the researcher conducted four pilot tests of the experiment, each test with one subject. The results of the pilot test were used to refine the experimental procedures.

Prior to subject recruitment, a schedule of computer laboratory times was arranged with the Microlab Services Coordinator (Appendix G). The schedule was arranged so that there would be a total of four weeks of data collection divided into two phases of two weeks duration each. Data collection extended over an eight-week period, each week of data collection followed by a week without data collection. During each week of data collection, there were five data collection periods scheduled. Recalling that the experiment was performed in two phases, a total of ten groups, five experimental and five control, were studied. The numbers of afternoon/evening sessions versus morning sessions were balanced so that there was an even distribution of experimental and control groups over the different time slots.

After subjects signed up for the study, the Computer Anxiety Survey was administered on three separate occasions, at which times informed consent to participate in the study was be obtained (Appendix H). Those students who signed up and attended one of the CAS administrations were allowed to participate in Phase I and Phase II of the study.

Two initial groups of n=86 subjects each were formed via random assignment. This was accomplished by writing the name of each subject

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on a slip of paper, putting all the slips of paper into a large manila envelope, mixing the slips of paper 5 minutes to scramble them, then withdrawing the slips of paper and assigning subjects alternatively to each group.

Subjects were contacted by phone to arrange the time at which they would participate in the study. One problem that became quickly apparent was that the time periods for Groups 1, 3, 6, and 8 conflicted with the class schedules for many of the students. This problem decreased the number of subjects participating in the study. The initial experiment group was comprised of 56 subjects, the control group of 53 subjects.

Subjects reported at their assigned times to the microcomputer lab at Room 12, Olds Hall, an MSU facility containing 22 DHK IBM-compatible microcomputers. Subjects were seated one to a computer, were each given a manila envelope containing study materials, and were instructed to wait until the entire group began. Each manila envelope contained the following materials:

- Computer Anxiety Scale and two machine-scored answer forms (Appendices C and I)

- Background Information form (Appendix D)

- Directions for Students (Appendix J)

- Time Sheet (Appendix K)

- Word Processing Tasks 1 and 2 (Appendices L and M)

- Either control or experimental Instructional Materials booklet (Appendices A and B)

Subjects were first instructed to open their envelopes and remove the Computer Anxiety Scale and one machine scored answer form. After filling in the answer form for their names, student numbers, and a section number indicating the order (pre- or posttest, Phase I or Phase II) of the CAS administration, subjects were asked to complete all twenty items of the CAS. Subjects then filled out the Background Information form.

Subjects then removed the Directions for Students, Time Sheet, Word Processing Task 1 sheet, the Instructional Materials booklet from the envelope. The researcher read the Directions for Students aloud and asked subjects if there were any questions. Subjects recorded a starting time announced by the researcher on the Time Sheet. Subjects then attempted to complete Word Processing Task 1. Upon completion of Word Processing Task 1, each subject recorded the time of completion on the Time Sheet and raised their hand as a signal to the researcher. The researcher saved the output to disk, using a file naming scheme intended to insure that each task would have a unique identifier for each subject (Appendix N).

Subjects were then instructed to remove Word Processing Task 2 from their envelopes, were told to record a second starting time on their Time Sheets, and were further told to complete Word Processing Task 2 and to record their finishing time, much as they had with Word

Processing Task 1. Again, subjects raised their hands after completing Word Processing Task 2, and the researcher save their work to disk.

As subjects completed Word Processing Task 2, they were instructed to complete the Feedback form and to retake the CAS. Subjects were then allowed to leave the microcomputer lab.

The protocol just described was followed for Phase II of the study, the only difference was the inclusion of only one Word Processing Task, rather than two (Appendix O). This task was similar in form but different in content from the Word Processing Tasks 1 and 2. The Directions for Students (Appendix P) and Time Sheet (Appendix Q) were altered to reflect this difference.

Data Handling

The first task after data collection was to check to make sure that all materials had been returned and all instruments had been completely filled in. Disk files were checked against the appropriate Word Processing Task Checklist (Appendices R, S, and T) to determine the number of criteria met on each task. Scores for the Computer Anxiety Scales and the Word Processing Checklists, as well as any data from the Background Information form and the Feedback form, were entered into a Statview SE + Graphics (Macintosh version) spreadsheet for analysis.

Data Scoring

The Computer Anxiety Scale was machine scored by staff at the Computer Center at Michigan State University. Scores could range from 20 - 100 points (1 - 5 points per question for 20 questions). Each Word Processing Checklist consisted of a total of 9 items. Time to perform the word processing tasks was measured in minutes and decimal equivalents of minutes. The background and feedback questions pertaining to desired time to learn computer skills and word processing were scored using 5-point scales ranging from 1="none" to 5="> five hours." The background and feedback question about interest in learning computer skills was scored on a 4-point scale ranging from 1="not at all" to 4="a lot."

Data Analysis

Data analysis in support of hypothesis testing focused on comparing the experimental and control groups for differences in Computer Anxiety Scores, number of Word Processing Checklist criteria met, and differences in reported measures of motivation to learn computer skills.

Repeated measures ANOVA is used to test for statistical significance of mean difference scores for multiple outcome measures in a one factor experimental design (Glass and Hopkins, 1984). This statistical procedure maintains the alpha-level, or probability of rejecting a true null hypothesis of no difference between group means (type I), at the desired level. F-tests of mean difference scores were performed to test for significant differences between the experimental and control groups with respect to computer anxiety.

Performance on the word processing tasks was compared using repeated measures ANOVAs of mean group checklist scores to detect any significant difference in performance on the word processing task. Alpha-level for all tests of statistical significance will be .05, which is conventional for behavioral research (Cohen, 1977).

Further analysis of the effect of the two treatments on computer anxiety scores and on performance scores was undertaken by dividing the experimental and control groups into high and low computer anxious subgroups, and then testing to see if there are any differences attributable to treatment for the subgroups. The splitting of the groups was based upon Phase I pretest CAS scores, the upper half of CAS scores being the "high anxiety" group, and the lower half of CAS scores being the "low anxiety" group.

The Background and Feedback Questionnaires contained 3 questions that were intended as estimates of subjects' desire to learn how to use computers. Assuming that the underlying variable - intention to invest time in an activity - was continuous, ANOVA was chosen as the analytical technique (Borg and Gall, 1983).

A secondary data analysis using the ANCOVA procedure was performed to determine the effect of confounding variables on the outcome CAS measures.

Data analysis was performed on a Macintosh IIci using Statview SE + Graphics and Super ANOVA software. Scoring of subjects' word processing tasks was performed using an IBM AT computer with

WordPerfect version 5.1, the same software used by subjects during the study.

Power Analysis

According to Glass and Hopkins(1984), the "power" of a statistical test is the probability of rejecting a false null hypothesis. The greater the power of a test, the less likely one is to commit a type II error, or retaining a null hypothesis when it is actually false. Ideally, a test would have sufficient power to minimize the probability of type II error.

One can increase the power of a test of a hypothesis testing procedure by increasing sample size, increasing the alpha-level, and by maximizing the effect size of the experimental treatment. Glass and Hopkins note that increasing sample size and increasing the alpha level of a test are within the control of the researcher. They advise taking the largest sample that is practical, and then determine if the sample size has sufficient power for detecting a difference large enough to be of interest. Cohen (1977) suggests a minimum power value of .80, (a beta-level of .20) on the assumptions that a) researchers most commonly specify an alpha level of .05, and b) the relative seriousness of a type I error (i.e., rejecting a true null hypothesis) is four times as grave as that of a type II error. Cohen assumes that behavioral scientists are more concerned with type I than type II error: it is better to risk "failure to find" than ""finding something that is not there" (pg. 56). This concern is reflected in the .05/.20, alpha/beta level specifications.

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The most common method of determining the power of a statistical test such as an F-test is to calculate a "centrality parameter," ϕ, and use this parameter to locate the associated power of the test for a given alpha level in the appropriate Pearson-Hartley power chart (Glass and Hopkins, 1984). Subkoviak and Levin (1977) note that the power of a test is affected by the reliability of the instruments used to measure the dependent variables: measurement error will decrease the power of a test to reject a false null hypothesis. Subkoviak and Levin suggest a procedure for adjusting the calculation of the centrality parameter, given an estimate of the reliability of a dependent measure, which will result in a more realistic power estimate. They suggest using the following formula:

$$\phi = \sqrt{\frac{\rho_{yy'} n \psi_\sigma^2}{(\nu + 1)\sum_{k=1}^{K} a_k^2}}$$

where:

ϕ = Pearson-Hartley centrality parameter

$\rho_{yy'}$ = estimate of within-treatment reliability

n = number of subjects per treatment group

ψ_σ = linear contrast expressed in within-treatment standard deviation units, or "effect size" (Subkoviak and Levin, 1977; Cohen, 1977)

$(\nu + 1)$ = number of treatment groups

and,

$\sum_{k=1}^{K} a_k^2$ = sum of squares of the contrast coefficients as a means for correcting the power estimate to account for the imperfect reliability of measurement of the dependent variable.

Previous studies using the CAS have estimated the test-retest reliability of the instrument at .77. This study had approximately 50 subjects per group, with two treatment groups. For comparisons of two groups, the linear contrast coefficients are "1" and "-1" (Subkoviak and Levin, 1977). The desired effect size is .80 of a standard deviation.

Summarizing the values for the above variables:

$$\rho_{yy'} = .78$$

$$n = 50$$

$$\psi_\sigma = .80$$

$$(\nu + 1) = 2$$

and,

$$\sum_{k=1}^{K} a_k^2 = (1)^2 + (-1)^2 = 2$$

and substituting these values into the Subkoviak and Levin equation:

$$\sqrt{\frac{(.77)(50)(.80)^2}{(2)(2)}} = 2.48$$

one obtains a centrality parameter of 2.48. Locating this parameter on the Pearson-Hartley power charts for alpha = .05, the power of an F-test or t-test to detect a .80 standard deviation difference in the means of two groups is approximately .93. This compares favorably with assertions by

Cohen (1977) and Brewer (1972) of a minimum level of .80 as sufficient power to reject a false null hypothesis.

It is interesting to note how much power is lost when a smaller effect size is posited. Assuming an effect size of .50 standard deviation rather than .80, and again substituting the values in the Subkoviak and Levin equation:

$$\sqrt{\frac{(.77)(50)(.50)^2}{(2)(2)}} = 1.55$$

a centrality parameter of 1.55 is obtained. Referring to the Pearson and Hartley power charts, and again assuming an alpha-level of .05, this value for the centrality parameter yields a power of only .49.

The power analysis reveals that this experiment was able to reliably detect differences of .80 standard deviations between group means if they indeed existed.

Summary

The study was a pretest and posttest control group design with random assignment of subjects with respect to measures of computer anxiety and desire to learn computer skills, and a posttest control group design with random assignment of subjects with respect to the measure of computer performance. The experiment was repeated to see of there are any effects which endure over time.

The experimental treatment was word processing instruction for teaching the WordPerfect application designed according to Carroll's Minimalist Principles. The control treatment was the "Getting Started" section from the WordPerfect documentation. Computer anxiety was measured Marcoulides' Computer Anxiety Scale, desire to learn computers was measured using three questions on Background Information and Feedback forms, and performance of a word processing task was measured using a task checklist.

Subjects were recruited from the Human Subjects Pool of the Department of Psychology at Michigan State University. Desired attributes included on subject sign-up sheets for the study were no previous experience using WordPerfect, and fear of using computers. After testing subjects using the CAS, subjects reported approximately two weeks later to a microcomputer laboratory for the study proper.

Data analysis involved analysis of descriptive statistics, significance testing of the hypotheses using one-factor and repeated measures ANOVA, and secondary analysis of the data to determine the presence and possible effect of confounding variables using ANCOVA.

A power analysis revealed that, given an n of 50 subjects, an effect size of .80 standard deviations would yield a power of .93 to detect a false null hypothesis. Thus, there was sufficient power to detect significant differences between control and experimental groups if they indeed existed.

CHAPTER FOUR

RESULTS

Introduction

In this chapter the results of the data analysis are presented. First the sample will be described. This will be followed by an analysis of the data to test the hypotheses. The chapter will conclude with an analysis to check for the possible presence and effects of confounding variables.

Description of the Sample

Of the original n=109 group, four subjects were removed from the study due to incomplete data sets. Two subjects from the control group were missing complete sets of CAS scores, and two subjects from the experimental group were missing the word processing task document files. The resulting group consisted of n=105 subjects, with a control group of n=51 subjects, or 48.6% of the total, and an experimental group of n=54 subjects, or 51.4 of the total.

Table 1 presents the means and standard deviations of the age and grade point average (GPA) of the control and experimental groups. The mean age for the experimental and control groups was 18.55 years, and the mean GPA for both groups was 2.68. An F-test comparison of group mean differences showed that they were not significantly different at the

.05 level with respect to age (mean difference=-.083, $F_{Scheffe}$=.281, but were significantly different at the .05 level with respect to GPA (mean difference=-.319, $F_{Scheffe}$=6.157). GPA was not found to correlate significantly with the Phase I pretest CAS score (r=-.114), thus it was not considered as a potential confounding variable.

Table 1
Means and Standard Deviations of Subjects' Age and GPA

	Control		Experimental		Totals	
	mean	sd	mean	sd	mean	sd
Age	18.51	.903	18.59	.687	18.55	.796
GPA	2.52	.685	2.84	.627	2.68	.673

Table 2 presents the distribution of gender for the two groups. Subjects were female by a significant majority (Chi-square=12.34, p=.0004). A one factor ANOVA revealed that females had significantly higher Phase I pretest CAS scores than did males (Table 3). Other comparisons were performed to see if there were any other significant differences between gender groups. Specifically, males and females in the sample were compared with respect to their GPA, current word processing skills, and number of semesters or terms of previous computer courses. A one-factor ANOVA revealed no significant differences between male and female subjects with respect to GPA ($F_{Scheffe}$=.049, p=.826), nor with respect to current word processing skills (Chi-square=6.739, p=.1503). Males and females differed significantly with respect to the number of semesters or terms of previous computer courses (Chi-square=14.789, p=.0113). Table 4 presents the number of previous terms or semesters of computer study by gender. While there are differences between males and females according to the contingency table analysis, it is difficult to perceive any pattern to these differences, thus, the number of previous semesters or terms of computer study will not be considered as a potential confounding variable related to gender.

Table 2
Counts and Percentages of Gender of Subjects

	Control		Experimental		Totals	
	count	percent	count	percent	count	percent
female	37	72.5	34	62.9	71	67.6
male	14	27.5	20	37.1	34	32.4

Table 3
ANOVA Table: Comparison of Phase I CAS Pretest Scores Based Upon Gender

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	1118.016	1118.016	5.108	.0259
Within Groups	103	22544.974	218.883		
Total	104	23662.99			

Table 4
Number of Semesters/Terms of Subjects' Previous Computer Study by Gender

	Female		Male		Totals	
	count	percent	count	percent	count	percent
none	12	16.9	3	8.82	15	14.3
< one	3	4.23	4	11.76	7	6.7
one	35	49.3	14	41.18	49	46.7
two	17	23.94	4	11.76	21	20
three	4	5.63	6	17.65	10	9.5
four	0	0.0	0	0.0	0	0.0
> four	0	0.0	3	5.6	3	2.8

Table 5 describes subjects' academic majors. The most prevalent major was some form of social science. This category included psychology, communications, and business administration. This category was followed by engineering and "hard" science, including premedical matriculation. The "not decided" category accounted for almost one-third of the sample. In Table 5, within-group percentages reflect within-group subtotals, and the percentages in the "Totals" column reflect subtotals for all subjects. A Chi-square analysis found the experimental and control groups to be significantly different with respect to academic major (Chi-square=10.372, p=.0346).

Table 5
Counts and Percentages of Academic Majors of Subjects

	Control		Experimental		Totals	
	count	percent	count	percent	count	percent
social science	19	37.3	16	29.6	35	33.3
engineer/ science	8	15.7	16	29.6	24	22.9
education	9	17.6	1	1.9	10	9.5
liberal arts	2	3.9	2	3.7	4	3.8
not decided	13	25.5	19	35.2	32	30.5

A review of Table 5 reveals that two categories of academic major, education and liberal arts, had very few subjects, thus, it would be unreasonable to use the five categories of academic major to determine whether there were any significant differences between the experimental and control groups on the Phase I CAS pretest that were attributable to academic major. In order to determine whether there were any significant differences between the experimental and control groups on the Phase I CAS pretest that were attributable to academic major, the five categories of this variable were therefore recoded into two levels. This was done so that there would be sufficient numbers of subjects in each category to provide for a reasonable analysis. The categories "social science" and "engineer/science" were combined into one category of academic major, and the categories "liberal arts," "education," and "undecided" were combined into the other category. It should be noted that subjects who listed "education" as their academic major indicated that they were in the liberal arts domain. Table 6 presents the results of a one-way ANOVA comparing subjects' Phase I CAS pretest scores based upon the recoded academic majors. There was no significant difference in the scores based upon recoded academic major.

Table 6
ANOVA Table: Comparison of Phase I CAS Pretest Scores Based Upon Recoded Academic Major

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	2098.356	209.356	.919	.3399
Within Groups	103	23453.634	227.705		
Total	104	23662.99			

Table 7 summarizes the data for subjects' class year. Over 80% of the total group reported being in their first year of undergraduate studies. A contingency table analysis revealed no significant differences between the experimental and control groups with respect to class standing (Chi-square=3.49, p=.1747).

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Table 7
Counts and Percentages of Class Year of Subjects

	Control		Experimental		Totals	
	count	percent	count	percent	count	percent
first	44	86.3	41	75.9	85	81
second	4	7.8	11	20.4	15	14.3
third	3	5.9	2	3.7	5	4.7

Table 8 is a summary of the number of previous semesters or terms subjects had undertaken computer-related study. The question for this item asked subjects to record whether or not they had had any kind of course related to computers, including computer literacy, usage, and programming, and including any high school work. Two-thirds (66.7%) reported having taken one or two semesters or terms of previous computer work. Almost 15% of the total sample reported having had no previous computer instruction. Contingency table analysis revealed no significant differences between experimental and control group with respect to the number of previous semesters or terms subjects had undertaken computer-related study (Chi-square=3.892, p=.5651).

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Table 8
Number of Semesters/Terms of Subjects' Previous Computer Study

	Control		Experimental		Totals	
	count	percent	count	percent	count	percent
none	9	17.6	6	11.1	15	14.3
< one	3	5.9	4	7.4	7	6.7
one	23	45.1	26	48.1	49	46.7
two	11	21.6	10	18.5	21	20
three	5	9.8	5	9.3	10	9.5
four	0	0.0	0	0.0	0	0.0
> four	0	0.0	3	5.6	3	2.8

Table 9
Counts and Percentages of Subjects' Current Word Processing Skills

	Control		Experimental		Totals	
	count	percent	count	percent	count	percent
none	0	0.0	3	5.6	3	2.9
poor	15	29.4	14	25.9	29	27.7
average	30	58.8	24	44.4	54	51.4
good	5	9.8	12	22.2	17	16.2
excellent	1	2.0	1	1.9	2	1.9

Table 9 summarizes subjects' self-evaluations of their current word processing skills, irrespective of platform or software. Just over 51% of all subjects reported their current word processing skills as "average." Approximately 30% reported their word processing skills as either non-existent or "poor." Given the fact that the criteria for students to sign up for the study included an aversion to computers, it is interesting to note that 19 subjects, or approximately 18% of the total sample, rated their word processing skills as "good" or "excellent." Contingency table analysis revealed no significant differences between the experimental and control groups with respect to subjects' self-evaluations of their current word processing skills (Chi-square=6.503, p=.1646).

Table 10
Counts and Percentages of Subjects' Typing Skills Self-Ratings

	Control		Experimental		Totals	
	count	percent	count	percent	count	percent
poor	13	25.5	6	11.1	19	18.1
average	31	60.8	34	63.0	65	61.9
good	7	13.7	14	25.9	21	20.0

Table 10 presents a summary of subjects' self-ratings of their typing ability. Nearly two-thirds of the total sample reported their typing ability as "good." Contingency table analysis revealed no significant differences between the experimental and control groups with respect to the subjects' self-ratings of their typing ability (Chi-square=4.969, p=.0834).

Some subject attrition occurred between Phase I and Phase II of the experiment. Table 11 presents the frequency counts for those subjects who attended only Phase I and for those subjects who attended both Phase I and Phase II. Just under 30% of the total number of subjects dropped out of the experiment. A Chi-square test revealed no significant statistical differences in the dropout rates between the experimental and the control groups (Chi-square=.239, p=.625).

Table 11
Subject Attendance at Phase I Only and Phases I and II

	Control		Experimental		Totals	
	count	percent	count	percent	count	percent
Phase I only	16	31.4	15	27.8	31	29.5
Phases I and II	35	68.3	39	72.2	74	70.5

The Computer Anxiety Scale was checked for reliability using the test-retest method. Subkoviak and Levin (1977) suggest calculating the Pearson product-moment correlation coefficient, *r*, as the appropriate statistical procedure for checking test-retest reliability. The subjects' first CAS scores obtained during their initial testing were correlated with the CAS scores obtained during the Phase I pretest, yielding a Pearson *r* of .82.

Table 12
Subjects' Mean Computer Anxiety Scale Scores: Phase I

	Control		Experimental		Totals	
	mean	sd	mean	sd	mean	sd
	n=51		n=54		n=105	
CAS 1	46.05	14.87	40.13	14.84	43.01	15.08
CAS 2	44.86	14.84	37.92	14.08	41.29	14.08

Table 12 summarizes data for CAS total scores for the Phase I pretest (CAS 1) and posttest (CAS 2) administrations. Significance testing of mean differences (CAS 1 - CAS 2) comparing experimental and control groups will be presented in the next section on hypothesis testing. Overall, there appears to be a small decrement in CAS 2 scores when compared to CAS 1 scores. A one-factor ANOVA comparing CAS 1 scores for the control and experimental groups revealed a significant difference at the .05 level between the two groups on the Phase I pretest ($F_{Scheffe}$=4.176, p=.043).

Table 13 summarizes the data for CAS total scores for the Phase II pretest (CAS 3) and posttest (CAS 4). Again, significance testing of mean differences comparing experimental and control groups will be presented in the next section. Overall, there appears to be no decrement in CAS 4 scores when compared to CAS 3 scores.

Table 13
Subjects' Mean Computer Anxiety Scale Scores: Phase II

	Control (n=35)		Experimental (n=39)		Totals (n=74)	
	mean	sd	mean	sd	mean	sd
CAS 3	41.97	12.81	38.00	14.59	39.87	13.83
CAS 4	41.42	14.32	38.23	14.25	39.74	14.28

Table 14
Means and Standard Deviations of Subjects' Desired Time to Learn Word Processing

	Control		Experimental		Totals	
	mean	sd	mean	sd	mean	sd
Phase I Pretest	3.25	.97	3.07	1.14	3.16	1.06
Phase I Posttest	3.17	.97	3.13	1.02	3.15	.99
Phase II Pretest	3.20	1.02	3.00	1.10	3.09	1.06
Phase II Posttest	3.20	.96	3.02	1.08	3.10	1.02

Table 14 presents mean values and standard deviations of subjects' responses to the pretest and posttest question: "If an opportunity were to arise, how much time would you be willing to devote to learning word processing skills?" This item was answered on a 5-point scale from "none" to "> five hours." In general, it appears that subjects desired spending approximately 2 - 3 hours on learning word processing. There appears to be a weak increase in mean scores for the Phase I experimental group and a weak decrease in mean scores for the Phase I control group. Within group Phase II mean scores appear to be unchanged for both the control and the experimental groups.

Table 15
Means and Standard Deviations of Subjects' Interest in Learning Computer Skills

	Control		Experimental		Totals	
	mean	sd	mean	sd	mean	sd
Phase I Pretest	3.09	.80	2.83	.90	2.96	.86
Phase I Posttest	3.04	.87	2.83	.88	2.93	.88
Phase II Pretest	3.08	.74	2.87	.76	2.97	.76
Phase II Posttest	3.17	.75	2.76	.71	2.96	.75

Table 15 presents means and standard deviations of subjects' responses to the pretest and posttest question: "How interested are you in learning computer skills, whatever they may be?" This item was answered on a 4-point scale from "not at all" to " a lot," with lower values indicating lower interest. Mean scores seemed to fall about the "somewhat" value.

Table 16
Means and Standard Deviations of Subjects' Desired Time to Learn Computer Skills

	Control		Experimental		Totals	
	mean	sd	mean	sd	mean	sd
Phase I Pretest	3.39	1.06	3.09	1.14	3.23	1.10
Phase I Posttest	3.29	1.08	3.15	1.02	3.21	1.04
Phase II Pretest	3.43	1.06	3.03	1.04	3.22	1.06
Phase II Posttest	3.46	1.07	3.05	1.02	3.24	1.05

Table 16 presents mean values and standard deviations of subjects' responses to the pretest and posttest question: "How much time would you be willing to devote to learning computer skills, whatever they may be?" Subjects responded to this question by choosing from a 5-point scale with items ranging from "none" to "> five hours." Subjects appeared willing to devote from 2-3 to 4-5 hours to learning computer skills. The mean values for the control group appear to be slightly higher that those for the experimental group.

Table 17
Means and Standard Deviations of Subjects' Word Processing Task Performance Measured by Checklist

	Control		Experimental		Totals	
	mean	sd	mean	sd	mean	sd
WP 1 Phase I	7.67	1.32	7.68	1.51	7.68	1.42
WP 2 Phase I	8.16	1.30	8.46	1.14	8.31	1.23
WP 3 Phase II	8.37	1.09	8.26	1.09	8.31	1.08

A summary of subjects' performance on the word processing tasks is presented in Table 17. Subjects' word processing performance was measured according to a 9-point checklist. There appears to be an increase in subjects' performance during Phase I when comparing the practice task (WP 1) with the transfer task (WP 2). There also appears to be a slight performance decrement with the second transfer task (WP 3) which subjects performed one month after the first two tasks.

Table 18
Means and Standard Deviations of Subjects' Word Processing Task Time in Minutes

	Control		Experimental		Totals	
	mean	sd	mean	sd	mean	sd
WP 1 (Phase I)	14.68	8.23	13.37	4.52	14.01	6.59
WP 2 (Phase I)	7.02	2.78	7.49	2.88	7.26	2.83
WP 3 (Phase II)	9.75	3.53	10.60	5.03	10.19	4.38

Table 18 presents the means and standard deviations of time subjects spent on their word processing tasks. The time is reported in minutes and decimal equivalents of a minute. It is obvious that subjects took significantly less time to complete the second word processing task; time for the second task was roughly half of the first for both the experimental and the control groups. Subjects also took less to perform a similar task after one month when compared with the first word processing task; however, there appeared to be a "rebound effect" in that Phase II task time was generally longer than that for the second task of Phase I.

Summary of the Descriptive Statistics

The total group consisted of n=105 subjects, with a control group of n=51 and experimental group of n=54 subjects. The subjects were mostly female. Female subjects were found to have significantly higher Phase I pretest CAS scores than the male subjects. Experimental and control groups differed significantly with respect to their GPA; GPA did not correlate significantly with the Phase I pretest CAS, so it was not treated as a confounding variable. The most prevalent academic major for all subjects was some form of social science. Over 80% of all subjects reported being in the first year of their undergraduate studies. Sixty-six percent of all subjects reported having taken 1 or 2 semesters or terms of previous computer instruction.

Just under 30% of subjects dropped out of the study after Phase I. There was no significant difference between the experimental and the control groups with respect to subject dropout rates.

A test-retest check of instrument reliability of the CAS yielded a correlation coefficient of r=.82. The control and experimental groups differed significantly on their pretest CAS score means.

Initially, subjects appeared to desire approximately 2-3 hours for learning word processing skills. Subjects initially reported, on average, being "somewhat" interested in learning computer skills, and willing to spend approximately 2-3 to 4-5 hours learning computer skills.

Experimental and control group subjects averaged 7.6 checklist points on the first word processing task. On the second word processing task, experimental group subjects averaged 8.4 points, and control group subjects averaged 8.16 points. On the third word processing task, experimental group subjects averaged 8.26 points, and control group subjects averaged 8.37 points.

Subjects' average time to complete the word processing tasks decreased on WP 2 relative to WP 1, and increased slightly on WP 3 relative to WP 2.

Hypothesis Testing

In this section, the experimental hypotheses presented in Chapter One will be tested statistically. The following are the hypotheses of the study:

1. The experimental group will score lower on a measure of computer anxiety, the *Computer Anxiety Scale*, than will an equivalent control group after initial training in the use of word processing.

2 The experimental group will score lower on a measure of computer anxiety, the *Computer Anxiety Scale*, than will an equivalent control group when measured during a word processing follow-up session attended one month after initial training.

3. The experimental group will score higher on performance of a word processing task than will an equivalent control group.

Differences in performance scores will be stable after a follow-up treatment.

4. The experimental group will indicate a greater desire to learn more computer skills as measured by 1) subjects' estimates of the number of hours they would be willing to devote to further word processing skills study, 2) subjects' estimates of their interest in learning other computer programs, and 3) subjects' estimates of the number of hours they would be willing to devote to developing their computer skills, than will an equivalent control group, when measured immediately after instruction.

5. The experimental group will indicate a greater desire to learn more computer skills as measured by 1) subjects' estimates of the number of hours they would be willing to devote to further word processing skills study, 2) subjects' estimates of their interest in learning other programs, 3) subjects' estimates of the number of hours they would be willing to devote to developing their computer skills, and 4) subjects' attendance at a second computer session, than will an equivalent control group, when measured during a one-month follow-up computer session.

Computer Anxiety

The first experimental hypothesis holds that subjects in the experimental group will experience more reduction in their CAS scores than will subjects in the control group after an initial (Phase I) learning experience. In other words, mean difference scores (pretest: CAS 1 - posttest: CAS 2) will be higher for the experimental group than for the control group. The second experimental hypothesis was that the experimental group subjects would score lower on the CAS than would the control group subjects when measured during a word processing follow-up session attended one month after initial training. In order to test this second hypothesis, several comparisons will be made. The first will compare Phase II pretest CAS scores with Phase I pretest scores (CAS 1 - CAS 3) for significant differences in means. This comparison will determine whether subjects' computer anxiety as measured by the CAS was different one month after their pretest measurement, and thus determine the presence of any long-term effect on CAS scores after the initial training. The second comparison will compare students' Phase II pretest CAS scores with their Phase I posttest scores (CAS 2 - CAS 3), to see if there was any change in subjects' post-treatment computer anxiety as measured by the CAS which occurred over time and prior to the second (Phase II) word processing session. A third comparison would compare subjects' pre- and posttest Phase II scores (CAS 3 - CAS 4) to determine if there was any additional effect on CAS scores attributable to the second word processing training experience. A fourth comparison involving Phase I CAS pretest scores with Phase II CAS posttest scores will determine the presence of effects on Phase I pretreatment scores based upon two training sessions separated by one month, or as a result of the entire experimental program.

A repeated measures ANOVA is used to test the statistical significance of mean difference scores for multiple outcome measures in a one factor experimental design (Glass and Hopkins, 1984). The Scheffe method for multiple comparisons was employed, as it maintains the alpha level at .05, for all comparisons and is the most flexible of the multiple comparison methods in its ability to determine significant contrasts (Hopkins and Glass, 1984). Tables 19 - 22 present repeated measures ANOVAs for the CAS scores over time and within group.

According to the results of the repeated measures analyses performed on the CAS 1, 2, 3, and 4 scores for the control group, their were no significant differences found for any one pairwise comparison (Table 20). However, there was a significant difference at the .05 level in CAS scores for all administrations of CAS to the control group taken as a whole (Table 19). This suggests that there was an effect on the CAS scores of the control group, but that the effect was spread out over the 4 administrations. A review of Table 20 indicates that most of the decrement occurred in the one-month interim period between Phase I (CAS 1 and 2) and Phase II (CAS 3 and 4).

Table 19
ANOVA Table for Computer Anxiety Scores Repeated Measures, Control Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	34	21256.186	625.182	19.463	.0001
Within Subjects	105	3372.75	32.121		
treatment	3	308.65	102.883	3.425	.02
residuals	102	3064.1	30.04		
Total	139	24628.936			

Table 20
Computer Anxiety Score Mean Comparisons, Control Group

Comparison	Mean Difference	Scheffe F-test
CAS 1 - CAS 2	1.086	0.229
CAS 1 - CAS 3	3.114	1.883
CAS 1 - CAS 4	3.657	2.597
CAS 2 - CAS 3	2.029	0.799
CAS 2 - CAS 4	2.571	1.284
CAS 3 - CAS 4	0.543	0.057

Within the experimental group, the pairwise comparisons involving the Phase I pretest (CAS 1) and all subsequent administrations of the CAS were significant at the .05 level (Tables 21 - 22). The first experimental hypothesis is upheld: subjects in the experimental group rated their posttest computer anxiety lower than their initial pretest computer anxiety as measured by the CAS. Furthermore, this difference remained significant for all subsequent administrations of the CAS, suggesting that the initial treatment effect was durable over time. All other pairwise comparisons were not statistically significant, therefore the second experimental hypothesis, that the experimental group subjects would score lower on the CAS than would the control group subjects when measured during a word processing follow-up session attended one month after initial training, is rejected.

Table 21
ANOVA Table for Computer Anxiety Scores Repeated Measures
Experimental Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	38	31692.474	834.012	52.96	.0001
Within Subjects	117	1842.5	15.748		
treatment	3	341.385	113.795	8.642	.0001
residuals	114	1501.115	13.168		
Total	155	33534.974			

Table 22
Computer Anxiety Score Mean Comparisons, Experimental Group

Comparison	Mean Difference	Scheffe F-test
CAS 1 - CAS 2	2.897	4.144*
CAS 1 - CAS 3	3.692	6.730*
CAS 1 - CAS 4	3.462	5.915*
CAS 2 - CAS 3	0.795	0.312
CAS 2 - CAS 4	0.564	.157
CAS 3 - CAS 4	-.231	.026

*=significant at .05

A second analysis was conducted to further determine which subjects experienced a possible treatment effect. Subjects' scores were divided at the 50th percentile and F-tests of CAS mean difference scores were conducted for the experimental and control groups for both the upper and lower percentile ranges. It should be noted that by dividing the experimental and control groups into subgroups for analysis, the power to detect significant differences is significantly diminished (Glass and Hopkins, 1984). Nevertheless, subjects' mean difference scores comparing their Phase I pretest CAS scores with all subsequent administrations of the CAS in the upper 50% of the experimental group were significantly different at the .05 level (Table 23). Mean differences for any comparison of CAS scores in the upper 50% of the control group were not statistically significant at the .05 level (Table 24). For the lower 50% range, there were no significant differences at the .05 level for the experimental group (Table 25). Interestingly, there was one significant mean difference at the .05 level in the lower 50% of the control group (Table 26). A review of the mean difference scores of the upper and lower halves of the control group again reveals the "distributed" effect on the control group CAS scores described earlier; CAS scores appear to be lower for all control group subjects irrespective of percentile grouping. Overall, the desired treatment effect of lowered computer anxiety appeared to be experienced by the more computer anxious students, as measured by the CAS, in the experimental group, and possibly by all students, although to a lesser extent, in the control group.

Table 23
CAS Mean Score Comparisons, Experimental Group, Upper 50%

Comparison	Mean Difference	Scheffe F-test
CAS 1 - CAS 2	4.227	4.101*
CAS 1 - CAS 3	6.091	8.514*
CAS 1 - CAS 4	5.955	8.137*
CAS 2 - CAS 3	1.864	.797
CAS 2 - CAS 4	1.727	.685
CAS 3 - CAS 4	-.136	.004

*=significant at .05

Table 24
CAS Mean Score Comparisons, Control Group, Upper 50%

Comparison	Mean Difference	Scheffe F-test
CAS 1 - CAS 2	.812	.033
CAS 1 - CAS 3	4.25	.911
CAS 1 - CAS 4	3.375	.575
CAS 2 - CAS 3	3.438	.596
CAS 2 - CAS 4	2.562	.331
CAS 3 - CAS 4	-.875	.039

Table 25
CAS Mean Score Comparisons, Experimental Group, Lower 50%

Comparison	Mean Difference	Scheffe F-test
CAS 1 - CAS 2	1.176	.65
CAS 1 - CAS 3	.588	.162
CAS 1 - CAS 4	.235	.026
CAS 2 - CAS 3	-.588	.162
CAS 2 - CAS 4	-.941	.416
CAS 3 - CAS 4	-.353	.058

Table 26
CAS Mean Score Comparisons, Control Group, Lower 50%

Comparison	Mean Difference	Scheffe F-test
CAS 1 - CAS 2	1.316	.458
CAS 1 - CAS 3	2.158	1.233
CAS 1 - CAS 4	3.895	4.016*
CAS 2 - CAS 3	.842	.188
CAS 2 - CAS 4	2.579	1.761
CAS 3 - CAS 4	1.737	.799

*=significant at .05

Recalling that approximately 30 subjects did not continue with Phase II of the experiment, a comparison was made of Phase I pretest CAS scores between subjects who attended only Phase I and subject who attended both Phase and Phase II. Table 27 presents Phase I pretest CAS scores for subjects who attended the Phase I session only and the Phases I and II sessions, control and experimental groups.

Table 27
Phase I Pretest CAS Scores: Phase I Only and Phases I and II

	Control		Experimental		Totals	
	mean	sd	mean	sd	mean	sd
Phase I only (n=31)	48.18 (n=16)	19.09	36.06 (n=15)	12.30	42.32	17.05
Phase I & Phase II (n=74)	45.08 (n=35)	12.71	41.69 (n=39)	15.56	43.29	14.29

A two-factor ANOVA comparing pretest CAS means of subjects attending Phase I only with subjects attending both Phases, for both the control and experimental groups, revealed no statistically significant differences at the .05 level attributable to attendance (Table 28). Thus, there appeared to be no differential dropout phenomenon among subjects with respect to Phase I pretest CAS scores.

Table 28
ANOVA Table Comparing CAS 1 Score, Group by Attendance

Source:	df:	SS:	MS:	F-test:	p:
Group (A)	1	1312.536	1312.536	5.947	.0165
Attendance (B)	1	34.736	34.736	.157	.6924
A x B	1	415.358	415.358	1.882	
Error	101	22292.421	220.717		

It is interesting to note that there was a significant mean difference between Phase I pretest and posttest CAS scores among the subjects when considering attrition. In the control group, i.e., those who dropped out and those who did not drop out did not have statistically significant mean difference scores at the .05 level when the Phase I CAS pretest was compared with the Phase I CAS posttest (non-dropout control group mean difference=1.086, $F_{Scheffe}$=.864; dropout control group mean difference=1.438, $F_{Scheffe}$=.623). In the experimental group, the subjects who dropped out, when taken as a group, did not have statistically significant mean difference Phase I pretest/posttest CAS scores at the .05 level (dropout experimental group mean difference=.4, $F_{Scheffe}$=.04).

Experimental group subjects who continued on to Phase II, however, did have statistically significant mean difference scores at the .05 level (non-dropout experimental group mean difference=2.897, $F_{Scheffe}$=21.319). Thus, experimental group subjects who experienced an immediate reduction in CAS scores stayed with the experiment; all other subjects, whether they stayed with the experiment or not, did not experience an immediate reduction in CAS scores.

Word Processing Task Performance

The third hypothesis was that the experimental group would score higher on performance of a word processing task than would an equivalent control group. Furthermore, differences in performance scores would be stable after a follow-up treatment. A comparison of two variables, word processing performance as measured by a performance checklist, and time spent on word processing tasks measured in minutes, was used to test the hypotheses. In order for the experimental hypothesis to be upheld, one would expect a significant difference in performance means in favor of the experimental group: experimental subjects would be expected to score higher on the checklist measure, and would also be expected to score lower on the time measure. The former assumes that students who score higher on the checklist measure are more effective word processing learners; the latter assumes that students who take less time to complete the word processing task are more efficient word processing learners.

It is useful to recall that there was a total of three word processing tasks, a practice task and a transfer task during Phase I, and another transfer task during Phase II. In order to test the hypothesis that the experimental group would score higher on performance of a word processing task than would an equivalent control group, a one-way ANOVA was performed comparing mean performance checklist scores of the experimental and control groups for each word processing task. In addition, a repeated measures ANOVA of average amounts of time to complete the word processing tasks measured in minutes were performed.

One-way ANOVAs of the experimental and control groups performance checklist mean scores on the three word processing tasks revealed no significant differences (Tables 29-31). A review of the mean scores (Table 17) shows that they are very similar for the control and experimental groups. It appears that neither treatment was more effective than the other in teaching word processing.

Table 29
ANOVA Table: Word Processing Task One Performance as Measured by Checklist

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	.009	.009	.004	.947
Within Groups	103	208.981	2.029		
Total	104	208.99			

Table 30
ANOVA Table: Word Processing Task Two Performance as Measured by Checklist

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	2.458	2.458	1.642	.2029
Within Groups	103	154.171	1.497		
Total	104	156.629			

Table 31
ANOVA Table: Word Processing Task Three Performance as Measured by Checklist

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	.244	.244	.205	.6519
Within Groups	72	85.607	1.189		
Total	73	85.851			

It is interesting to note that the checklist means were relatively elevated. Even the "practice" task scores averaged 7.6 out of 9, the highest possible score, for both groups, indicating that both treatments were effective in teaching subjects how to use word processing to complete the assigned task. The high mean scores for all three word processing tasks also indicate the possible presence of a "ceiling effect" - so many students were able to attain the highest possible score that there was insufficient variance available to determine the presence, if any, of a differential treatment effect. Table 32 presents the percentages of subjects in the experimental and control groups scoring 9 on the performance checklist for each of the three word processing tasks, and supports the notion of a ceiling effect at work in the study.

Table 32
Percentages of Subjects Scoring "9" on the Performance Checklist

	control	exp
WP Task 1	39.21	40.74
WP Task 2	60.78	66.67
WP Task 3	65.71	56.41

A repeated measures comparison of the word processing performance checklist means of the practice task (WP 1) with the transfer task (WP 2) provides a possible measure of training effectiveness, i.e., if there is an increment in mean performance scores between the practice and the transfer task, then the training can be said to be effective. For both the control group and the experimental group subjects, performance on the transfer task (WP 2) was statistically better than it was on the practice task (WP 1) at the .05 level, indicating that both treatments were effective in training subjects to perform the word processing tasks (Tables 33-36). There was no statistically significant difference in the control or experimental group task performance means when comparing word processing task 2 with task 3.

Table 33
ANOVA Table for Word Processing Scores Repeated Measures, Experimental Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	38	77.231	2.032	2.202	.0017
Within Subjects	78	72	.923		
treatment	2	14.308	7.154	9.424	.0002
residuals	76	57.692	.759		
Total	116	149.231			

Table 34
Word Processing Performance Mean Comparisons, Experimental Group

Comparison	Mean Difference	Scheffe F-test
WP 1 - WP 2	-.846	9.196*
WP 1 - WP 3	-.538	3.729*
WP 2 - WP 3	.308	1.216

*=significant at .05

Table 35
ANOVA Table for Word Processing Scores Repeated Measures, Control Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	34	116.99	3.441	4.014	.0001
Within Subjects	70	60	.857		
treatment	2	12.248	6.124	8.72	.0004
residuals	68	47.752	.702		
Total	104	176.99			

Table 36
Word Processing Performance Mean Comparisons, Control Group

Comparison	Mean Difference	Scheffe F-test
WP 1 - WP 2	-.514	3.296*
WP 1 - WP 3	-.829	8.554*
WP 2 - WP 3	-.314	1.231

*=significant at .05

Tables 37-40 present comparisons of word processing performance for both the experimental and control groups based upon subjects percentile rank in either the upper or lower 50% with respect to Phase I pretest CAS scores. It is interesting to note that in the experimental group, subjects in both the upper and lower computer anxious subgroups experienced their greatest performance increase on the Phase I transfer task, while in the control group subjects in both the upper and

lower computer anxious subgroups experienced their greatest performance increase on the Phase II task. These phenomena partially mirror that of subjects' CAS scores, in which the higher anxiety experimental group showed the treatment effect of lower anxiety immediately after Phase I treatment, while the control group as a whole showed lower anxiety after the Phase II treatment.

Table 37
Word Processing Task Performance Comparisons,
Experimental Group, Upper 50% CAS

Comparison	Mean Difference	Scheffe F-test
WP 1 - WP 2	-.864	5.856*
WP 1 - WP 3	-.591	2.741
WP 2 - WP 3	.273	.584

*=significant at .05

Table 38
Word Processing Task Performance Comparisons,
Experimental Group, Lower 50% CAS

Comparison	Mean Difference	Scheffe F-test
WP 1 - WP 2	-.824	3.271*
WP 1 - WP 3	-.471	1.068
WP 2 - WP 3	.273	.584

*=significant at .05

Table 39
Word Processing Task Performance Comparisons, Control Group, Upper 50% CAS

Comparison	Mean Difference	Scheffe F-test
WP 1 - WP 2	-.562	2.066
WP 1 - WP 3	-.875	5.000*
WP 2 - WP 3	-.312	.638

*=significant at .05

Table 40
Word Processing Task Performance Comparisons, Control Group, Lower 50% CAS

Comparison	Mean Difference	Scheffe F-test
WP 1 - WP 2	-.474	1.308
WP 1 - WP 3	-.789	3.633*
WP 2 - WP 3	-.316	.581

*=significant at .05

One-way ANOVA comparisons of the control and experimental groups of the average amounts of time to complete the word processing tasks measured in minutes were performed, and the results were similar to those for task performance as measured by the checklists. Tables 41-43 present the results of ANOVAs comparing average time to complete the word processing tasks expressed in minutes and decimal equivalents of minutes. None of the comparisons was significant at the .05 level.

Table 41
ANOVA Table: Word Processing Task One Time in Minutes

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	45.512	45.512	1.049	.3082
Within Groups	103	4470.294	43.401		
Total	104	4515.806			

Table 42
ANOVA Table: Word Processing Task Two Time in Minutes

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	6.078	6.078	.756	.3865
Within Groups	103	827.811	8.037		
Total	104	833.889			

Table 43
ANOVA Table: Word Processing Task Three Time in Minutes

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	13.38	13.38	.694	.4076
Within Groups	72	1388.581	19.286		
Total	73	1401.961			

There were significant practice effects with respect to time for both control and experimental groups. Subjects in both groups took significantly less time to perform the transfer task (Time 2) than they did the practice task (Time 1) (Tables 44-47). On the basis of checklist scores and time measures, both the control and experimental treatments could be said to be successful in training subjects to perform word processing tasks.

Table 44
ANOVA Table for Word Processing Time Repeated Measures, Control Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	34	1311.241	38.566	1.124	.3332
Within Subjects	70	2401.185	34.303		
treatment	2	955.126	477.563	22.457	.0004
residuals	68	1446.059	21.266		
Total	104	3712.426			

Table 45
Word Processing Time Mean Comparisons, Control Group

Comparison	Mean Difference	Scheffe F-test
Time 1 - Time 2	7.234	21.532*
Time 1 - Time 3	4.915	9.942*
Time 2 - Time 3	-2.319	2.212

*=significant at .05

The experimental group experienced a significant increase in task time for the Phase II word processing task (Time 3) when compared with the Phase I transfer task (Time 2), indicating some performance loss during the one-month interim period. The control experienced some apparent loss, but it was not statistically significant. This loss was only partial: comparisons of the Phase II word processing task time (Time 3) with the Phase I practice task time (Time 1) revealed significant differences for both the control and experimental groups, indicating that the effects of task practice were still significant when subjects were given the opportunity to practice one month after the initial training session.

Table 46
ANOVA Table for Word Processing Time Repeated Measures, Experimental Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	38	1029.685	27.097	1.352	.1309
Within Subjects	78	1563.415	20.044		
treatment	2	495.378	247.689	17.625	.0001
residuals	76	1068.037	14.053		
Total	116	2593.1			

Table 47
Word Processing Time Mean Comparisons, Experimental Group

Comparison	Mean Difference	Scheffe F-test
Time 1/Time 2	5.038	17.613*
Time 1/Time 3	2.635	4.818*
Time 2/Time 3	-2.403	4.007*

*=significant at .05

Comparison of time to complete task for the first, second, and third tasks for the upper and lower halves of the experimental and control groups revealed that all subgroups showed significant practice effects during Phase I (Tables 48 - 51). Both upper and lower CAS percentile subgroups for both the experimental and control groups took significantly less time to perform the transfer task (Time 2) than to perform the practice task (Time 1) during Phase I. Within the control group, there were two other significant comparisons. First, the higher anxiety half of the control group took significantly longer to perform the Phase II task (Time 3) when compared with the Phase I transfer task (Time 2). The lower anxiety half of the control group took significantly less time to perform the Phase II task than they did the Phase I practice task.

Table 48
Word Processing Time Comparisons,
Experimental Group, Upper 50% CAS

Comparison	Mean Difference	Scheffe F-test
Time 1/Time 2	5.101	10.734*
Time 1/Time 3	2.707	3.023
Time 2/Time 3	-2.394	2.364

*=significant at .05

Table 49
Word Processing Time Comparisons,
Experimental Group, Lower 50% CAS

Comparison	Mean Difference	Scheffe F-test
Time 1/Time 2	4.957	6.59*
Time 1/Time 3	2.542	1.73
Time 2/Time 3	-2.415	1.562

*=significant at .05

Table 50
Word Processing Time Comparisons,
Control Group, Upper 50% CAS

Comparison	Mean Difference	Scheffe F-test
Time 1/Time 2	6.241	12.298*
Time 1/Time 3	2.702	2.306
Time 2/Time 3	-3.538	3.953*

*=significant at .05

Table 51
Word Processing Time Comparisons,
Control Group, Lower 50% CAS

Comparison	Mean Difference	Scheffe F-test
Time 1/Time 2	8.071	11.209*
Time 1/Time 3	6.779	7.909*
Time 2/Time 3	-1.292	.287

*=significant at .05

Desire to Learn More Computer Skills

The hypotheses that the experimental group subjects would indicate greater desire to learn more computer skills as measured by 1) subjects' estimates of the number of hours they would be willing to devote to further word processing skills study, 2) subjects' estimates of their interest in learning other computer programs, and 3) subjects' estimates of the number of hours they would be willing to devote to developing their computer skills, than would an equivalent control group, when measured immediately after instruction and when measured during a one-month follow-up computer session was tested by comparing subjects' mean responses to questions on the background and feedback study instruments (Appendices D and F). The first question asked: "If an opportunity were to arise, how much time would you be willing to devote to learning word processing skills?" Subjects responded by choosing one of five responses ranging from "none" to "> five hours." The second question asked: "How interested are you in learning computer skills, whatever they may be?" Subjects responded by choosing one of four responses ranging from "not at all" to "a lot." The third question asked: "How much time would you be willing to devote to learning computer skills, whatever they may be?" Subjects responded by choosing one of five responses ranging from "none" to "> five hours." One factor ANOVA group comparisons were used to determine if there were any differences between experimental and control groups with respect to any of the measures; repeated measures ANOVA comparisons were used to see if there were any differences within experimental and control groups over time with respect to any of the measures.

The one factor ANOVA comparisons (Tables 52-63) revealed only one significant control group/experimental group comparison, that of the Phase II Feedback question regarding "interest in learning computer skills," the second question listed above (Table 59). The control group rated their interest in learning computer skills, whatever they may be, higher than did the experimental group, when asked immediately after the second word processing training session. All other experimental/control group comparisons were not significant at the .05 level.

Table 52
ANOVA Table: Desired Time to Learn Word Processing, Phase I Pretest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	.858	.858	.753	.3877
Within Groups	103	117.39	1.14		
Total	104	118.248			

Table 53
ANOVA Table: Desired Time to Learn Word Processing, Phase I Posttest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	.058	.058	.057	.8113
Within Groups	103	103.504	1.005		
Total	104	103.562			

Table 54
ANOVA Table: Desired Time to Learn Word Processing,
Phase II Pretest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	.738	.738	.651	.4224
Within Groups	72	81.6	1.133		
Total	73	82.338			

Table 55
ANOVA Table: Desired Time to Learn Word Processing,
Phase II Posttest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	.561	.561	.527	.4701
Within Groups	72	76.574	1.064		
Total	73	77.135			

Table 56
ANOVA Table: Interest in Learning Computer Skills, Phase I Pretest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	1.838	1.838	2.49	.1176
Within Groups	103	76.01	.738		
Total	104	77.848			

Table 57
ANOVA Table: Interest in Learning Computer Skills, Phase I Posttest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	1.112	1.112	1.442	.2326
Within Groups	103	79.422	.771		
Total	104	80.533			

Table 58
ANOVA Table: Interest in Learning Computer Skills, Phase II Pretest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	.844	.844	1.479	.228
Within Groups	72	41.102	.571		
Total	73	41.946			

Table 59
ANOVA Table: Interest in Learning Computer Skills, Phase II Posttest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	2.984	2.984	5.669	.0199
Within Groups	72	37.895	.526		
Total	73	40.878			

Table 60
ANOVA Table: Desired Time to Learn Computer Skills, Phase I Pretest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	2.354	2.354	1.944	.1662
Within Groups	103	124.694	1.211		
Total	104	127.048			

Table 61
ANOVA Table: Desired Time to Learn Computer Skills, Phase I Posttest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	.559	.559	.508	.4778
Within Groups	103	113.403	1.101		
Total	104	113.962			

Table 62
ANOVA Table: Desired Time to Learn Computer Skills, Phase II Pretest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	2.995	2.995	2.711	.104
Within Groups	72	79.546	1.105		
Total	73	82.541			

Table 63
ANOVA Table: Desired Time to Learn Computer Skills, Phase II Posttest

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	3.038	3.038	2.784	.0996
Within Groups	72	78.583	1.091		
Total	73	81.622			

The repeated measures comparisons (Tables 64-75) revealed no significant mean differences at the .05 level for any pairs of measures for any single question within either the control or the experimental group.

Table 64
ANOVA Table: Desired Time to Learn Word Processing
Repeated Measures, Control Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	34	115.386	3.394	17.173	.0001
Within Subjects	105	20.75	.198		
treatment	3	.193	.064	.319	.8116
residuals	102	20.557	.202		
Total	139	136.136			

Table 65
Desired Time to Learn Word Processing Mean Comparisons,
Control Group

Comparison	Mean Difference	Scheffe F-test
Ph I Pretest - Ph I Posttest	.086	.213
Ph I Pretest - Ph II Pretest	.086	.213
Ph I Pretest - Ph II Posttest	.086	.213
Ph I Posttest - Ph II Pretest	0	0
Ph I Posttest - Ph II Posttest	0	0
Ph II Pretest - Ph II Posttest	0	0

Table 66
ANOVA Table: Desired Time to Learn Word Processing
Repeated Measures, Experimental Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	38	156.09	4.108	22.353	.0001
Within Subjects	117	21.5	.184		
treatment	3	.256	.085	.459	.7117
residuals	114	21.244	.186		
Total	155	177.59			

Table 67
Desired Time to Learn Word Processing Mean Comparisons,
Experimental Group

Comparison	Mean Difference	Scheffe F-test
Ph I Pretest - Ph I Posttest	.026	.023
Ph I Pretest - Ph II Pretest	.103	.367
Ph I Pretest - Ph II Posttest	.077	.206
Ph I Posttest - Ph II Pretest	.077	.206
Ph I Posttest - Ph II Posttest	.051	.092
Ph II Pretest - Ph II Posttest	-.026	.023

Table 68
ANOVA Table: Interest in Learning Computer Skills
Repeated Measures, Control Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	34	71.171	2.093	14.653	.0001
Within Subjects	105	15	.143		
treatment	3	.171	.057	.393	.7583
residuals	102	14.829	.145		
Total	139	86.171			

Table 69
Interest in Learning Computer Skills Mean Comparisons,
Control Group

Comparison	Mean Difference	Scheffe F-test
Ph I Pretest - Ph I Posttest	-.029	.033
Ph I Pretest - Ph II Pretest	.000	.000
Ph I Pretest - Ph II Posttest	-.086	.295
Ph I Posttest - Ph II Pretest	.029	.033
Ph I Posttest - Ph II Posttest	.057	.131
Ph II Pretest - Ph II Posttest	-.086	.295

Table 70
ANOVA Table: Interest in Learning Computer Skills
Repeated Measures, Experimental Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	38	84.577	2.226	16.534	.0001
Within Subjects	117	15.75	.135		
treatment	3	.224	.075	.549	.6497
residuals	114	15.526	.136		
Total	155	100.327			

Table 71
Interest in Learning Computer Skills Mean Comparisons,
Experimental Group

Comparison	Mean Difference	Scheffe F-test
Ph I Pretest - Ph I Posttest	-.026	.031
Ph I Pretest - Ph II Pretest	-.051	.126
Ph I Pretest - Ph II Posttest	.051	.126
Ph I Posttest - Ph II Pretest	-.026	.031
Ph I Posttest - Ph II Posttest	.077	.282
Ph II Pretest - Ph II Posttest	.103	.502

Table 72
ANOVA Table: Desired Time to Learn Computer Skills
Repeated Measures, Control Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	34	136.171	4.005	23.043	.0001
Within Subjects	105	18.25	.174		
treatment	3	.079	.026	.147	.9314
residuals	102	18.171	.178		
Total	139	154.421			

Table 73
Desired Time to Learn Computer Skills Mean Comparisons,
Control Group

Comparison	Mean Difference	Scheffe F-test
Ph I Pretest - Ph I Posttest	.057	.107
Ph I Pretest - Ph II Pretest	.029	.027
Ph I Pretest - Ph II Posttest	.000	.000
Ph I Posttest - Ph II Pretest	-.029	.027
Ph I Posttest - Ph II Posttest	-.057	.107
Ph II Pretest - Ph II Posttest	-.029	.027

Table 74
ANOVA Table: Desired Time to Learn Computer Skills
Repeated Measures, Experimental Group

Source:	df:	SS:	MS:	F-test:	p:
Between Subjects	38	142.09	3.739	28.225	.0001
Within Subjects	117	15.5	.132		
treatment	3	.051	.017	.126	.9445
residuals	114	15.449	.136		
Total	155	157.59			

Table 75
Desired Time to Learn Computer Skills Mean Comparisons,
Experimental Group

Comparison	Mean Difference	Scheffe F-test
Ph I Pretest - Ph I Posttest	.026	.032
Ph I Pretest - Ph II Pretest	.051	.126
Ph I Pretest - Ph II Posttest	.026	.032
Ph I Posttest - Ph II Pretest	.026	.032
Ph I Posttest - Ph II Posttest	.000	.000
Ph II Pretest - Ph II Posttest	-.026	.032

Summary of the Hypothesis Tests

This section summarizes the results according to each hypothesis.

Hypothesis #1: *The experimental group will score lower on a measure of computer anxiety, the Computer Anxiety Scale, than will an equivalent control group after initial training in the use of word processing.*

Subjects in the Phase I experimental group rated their posttest computer anxiety significantly lower than their pretest computer anxiety. Moreover, this effect was found in the upper 50% of subjects as determined by their Phase I pretest CAS scores. In other words, experimental group subjects who were initially more computer anxious reported feeling significantly less anxious when they took the Phase I CAS posttest. This treatment effect endured with all subsequent administrations of the CAS, indicating that the initial drop in CAS scores was durable over time. Pretest/posttest mean differences for subjects in the Phase I control group were not significantly different. The first experimental hypothesis is therefore supported by the data.

Hypothesis #2: *The experimental group will score lower on a measure of computer anxiety, the Computer Anxiety Scale, than will an equivalent control group when measured during a word processing follow-up session attended one month after initial training.*

Neither the experimental group nor the control group Phase II pretest and posttest CAS scores were significantly different. The second experimental hypothesis is therefore rejected. One phenomenon of interest is the overall reduction of the control group's CAS scores. A comparison of the Phase I pretest and Phase II posttest for the control group was significant, while no other pairwise control group comparison was significant.

Hypothesis #3: *The experimental group will score higher on performance of a word processing task than will an equivalent control group. Differences in performance scores will be stable after a follow-up treatment.*

There were no significant differences between the experimental and control groups with respect to their scores on the three word processing tasks as measured by the performance checklists. Within group comparisons of checklist scores revealed that both experimental and control treatments were effective in training subjects to perform the word processing tasks, as the checklist scores for word processing task 2 were significantly higher than for word processing task 1 for both groups. Subjects in the experimental group, irrespective of their percentile grouping into upper and lower halves with respect to computer anxiety, experienced their greatest performance increase on the Phase I transfer task, which was the task immediately following their first instructional treatment. Subjects in the control group in both the upper and lower computer anxiety halves performance increase on the Phase II task compared with the Phase I practice task. These results somewhat parallel the results for subjects computer anxiety scores, in which the higher anxiety showed the treatment effect of lower anxiety immediately after Phase I treatment, while the control group as a whole showed lower anxiety after the Phase II treatment. There appeared to be a "ceiling effect' as indicated by the high numbers of subjects who were able to score "perfect 9's" for the word processing tasks.

There were no significant differences between the experimental and control groups with respect to the time taken to complete any of the word processing tasks. There were significant differences within groups when comparing time taken to complete the first word processing task and time taken to complete the two subsequent word processing tasks. Subjects in both groups took significantly less time to complete the transfer tasks (WP 2) when compared to the practice task (WP 1). Comparison of the Phase II word processing task (WP 3) with the Phase I practice task was significant for both the experimental and control groups, indicating that at least some of the benefits of task practice endured over time. Comparisons of upper and lower pretest CAS half groupings for both the experimental and control groups revealed that all subgroups based upon treatment and computer anxiety took significantly less time to complete the Phase I transfer task than to complete the Phase I practice task. Within the control group, the Higher anxiety half of the group took significantly longer to complete the Phase II task when compared with the Phase I transfer task, and the lower anxiety half of the control group took significantly less time to complete the Phase II task than they did the Phase I practice task.

Given the observation that there were no significant differences between the experimental and the control groups with respect to task performance and time to complete the task for any of the word processing tasks, the third experimental hypothesis is not upheld.

Hypothesis #4: *The experimental group will indicate a greater desire to learn more computer skills as measured by 1) subjects' estimates of the number of hours they would be willing to devote to further word processing skills study, 2) subjects' estimates of their interest in learning other computer programs, and 3) subjects' estimates of the number of hours they would be willing to devote to developing their computer skills, than will an equivalent control group, when measured immediately after instruction.*

There were no significant differences between the experimental and control groups with respect to any of the questions pertaining to subjects' desire to learn computer skills or word processing when measured immediately following the Phase I treatment. The fourth experimental hypothesis is therefore rejected.

Hypothesis #5: *The experimental group will indicate a greater desire to learn more computer skills as measured by 1) subjects' estimates of the number of hours they would be willing to devote to further word processing skills study, 2) subjects' estimates of their interest in learning other programs, 3) subjects' estimates of the number of hours they would be willing to devote to developing their computer skills, and 4) subjects' attendance at a second computer session, than will an equivalent control group, when measured during a one-month follow-up computer session.*

There was only one significant difference between the control group and the experimental group with respect to the questions pertaining to desire to learn computer skills or word processing when measured before and after the Phase II treatment. The control group rated their interest in learning computer skills, whatever they may be, higher that than did the experimental group, when asked immediately after the Phase II word processing training session. There were no significant differences between the experimental and control groups in the numbers of subjects who dropped out of the study between Phase I and Phase II. Based upon both questionnaire and attendance data, the fifth experimental hypothesis is rejected.

Controlling for Pretest Group Differences: Analysis of Covariance

The hypothesis testing performed thus far has examined within group differences on repeated measures of the CAS to determine the effect of the two treatments on subsequent CAS scores. In order to make reliable tests of between group differences with respect to the computer anxiety measure, it is necessary to control for pretest group differences on the Computer Anxiety Scale measure. Recalling the data summarized in Table 12, pg. 62, a one-factor ANOVA comparison of the experimental and control group revealed that there was a difference significant at the .05 level with respect to their Phase I pretest CAS scores ($F_{Scheffe}$=4.176, p=.043). Thus, any attempt at between groups comparisons to determine if one group scored significantly more or less on a posttest CAS measure that the other group would have to account for this pretest difference between the groups. The analytical technique that allows for this statistical control is the analysis of covariance, or ANCOVA (Glass and Hopkins, 1984).

In order to apply the ANCOVA technique, the regression lines of the covariate (CAS 1, the Phase I pretest), and those of the outcome measures (CAS 2, 3, 4) must have the same slope The first step in the test of this "colinearity assumption" is to regress each outcome measure (CAS 2, 3, and 4) over the covariate (CAS 1) for the experimental and control groups separately, yielding a total of six regression beta-coefficients. The next step is to calculate a *Z*-score for each pair of experimental and control group beta-coefficients according to the following equation:

$$\sqrt{\frac{b_e - b_c}{\sqrt{se_e^2 + se_c^2}}}$$

where:

b_e and b_c	=	beta coefficients for the experimental and control groups
se_e and se_c	=	standard error of the experimental and control group beta coefficients.

and check to see of the *Z*-score is significant at the desired alpha level, which in this case is set at .05.

The following example will clarify the test of the colinearity assumption. Regressing CAS 2 over CAS 1 for the experimental group yields the results in the first beta-coefficient table (Table 76). Regressing CAS 2 over CAS 1 for the experimental group yields the results in the second beta-coefficient table (Table 77). Substituting the values for b_e, b_c, se_e, and se_c in the above equation:

$$\sqrt{\frac{.886-.889}{\sqrt{(.047)^2+(.065)^2}}}$$

Table 76
Beta-Coefficient for the Regression $Y_{CAS\ 2}$ over $X_{CAS\ 1}$, Experimental Group

variable:	beta:	SE:	t:	p:
Intercept	2.353			
Slope	.886	.047	18.894	.0001

Table 77
Beta-Coefficient for the Regression $Y_{CAS\ 2}$ over $X_{CAS\ 1}$, Control Group

variable:	beta:	SE:	t:	p:
Intercept	3.933			
Slope	.889	.065	13.696	.0001

we obtain a Z-score of -.0388 (p-.515), which is not significant at the .05 level. Tests of the colinearity assumption for all relevant beta coefficient pairs were not significant, thus the colinearity assumption is upheld and the ANCOVA can be continued.

ANCOVA analysis was performed adjusting the experimental and control group CAS outcome means to account for pretest CAS differences between the two groups. Table 78 presents the sources of variance and Table 79 the adjusted mean difference (control group mean minus the experimental group mean) resulting from ANCOVA analysis adjusting the Phase I posttest (CAS 2) group means.

Table 78
ANCOVA Table for Adjusting CAS 2 Means

Source:	df:	SS:	MS:	F-test:	p:
Group (A)	1	6.789	6.789	.189	.6643
CAS 1 (B)	1	17901.081	17901.081	499.583	.0001
A x B	1	.027	.027	.001	.9781
Error	101	3619.039	35.832		

Table 79
Adjusted Mean Difference: CAS 2

Mean Difference (exp - ctrl)	SE	t:	p:
1.674	1.192	1.404	.1634

The results of the ANCOVA analysis show that there were no significant differences between the experimental and control group CAS Phase I posttest means when they were adjusted for the pretest CAS differences between the two groups. Tables 80 and 81 present the ANCOVA analysis adjusting the CAS 3 (Phase II pretest) means, and Tables 82 and 83 present the ANCOVA analysis adjusting the CAS 4 (Phase II posttest) means.

Table 80
ANCOVA Table for Adjusting CAS 3 Means

Source:	df:	SS:	MS:	F-test:	p:
Group (A)	1	11.928	11.928	.252	.6171
CAS 1 (B)	1	9593.694	9593.694	202.802	.0001
A x B	1	4.476	4.476	.095	.7593
Error	70	3311.398	47.306		

Table 81
Adjusted Mean Difference: CAS 3

Mean Difference (exp - ctrl)	SE	t:	p:
1.142	1.614	.708	.4815

The results of the ANCOVA analyses revealed that, when controlling for pretest differences in CAS scores, there were no significant differences between the experimental and control groups in the outcome CAS scores measures either immediately after the Phase I treatment (CAS 2), immediately before the Phase II treatment (CAS 3), or immediately after the Phase II treatment (CAS 4). Therefore, when making between group comparisons, it is clear that one cannot hold that either the experimental or the control group treatments are better at reducing computer anxiety. This clearly differs from the results obtained via the repeated measures analyses of the within group comparisons, in which different patterns of treatment effects on computer anxiety scores were noted for the two groups.

Table 82
ANCOVA Table for Adjusting CAS 4 Means

Source:	df:	SS:	MS:	F-test:	p:
Group (A)	1	4.284	4.284	.077	.7819
CAS 1 (B)	1	10252.045	10252.045	184.870	.0001
A x B	1	6.531	6.531	.118	.7325
Error	70	3881.886	55.456		

Table 83
Adjusted Mean Difference: CAS 4

Mean Difference (exp - ctrl)	SE	t:	p:
.266	1.748	.152	.8796

It is interesting to note the amount of adjustment of the experimental and control group means which results from the ANCOVA. Table 84 and 85 present a one-factor analysis of variance of the experimental and control group CAS 2 means which would be the preferred analytical technique for a between groups comparison had the pretest CAS means for the experimental and control groups not been significantly different.

Table 84
ANOVA Table: Experimental vs. Control Group, CAS 2

Source:	df:	SS:	MS:	F-test:	p:
Between Groups	1	1262.105	1262.105	6.037	.0157
Within Groups	103	21531.743	209.046		
Error	104	22793.848	35.832		

Table 85
Means, Standard Deviations, Standard Errors, Experimental and Control Group, CAS 2

Group	Means	SD	SE
experimental	37.926	14.082	1.916
control	44.863	14.847	2.074

A comparison of the mean difference of 6.937 represented in Table 85 with the mean difference of 1.674 presented in Table 79 reveals the extent of the adjustment of the CAS 2 group means resulting from the ANCOVA.

Summary of the ANCOVA Analysis

There were no significant differences between the experimental and the control groups with respect to their Phase I posttest scores or their Phase II pretest and posttest scores when one controlled for pretreatment differences in the two groups with respect to computer anxiety. Thus, the first and second experimental hypotheses are not supported by the between groups comparisons, while there is empirical support for the first hypothesis provided by the within groups, repeated measures comparisons.

Exploring Gender Differences

It has been noted that there were significantly more female subjects in the study (Table 2). It was further noted that females scored higher on the initial computer anxiety measure than did males. (Table 3). By analyzing the CAS scores while attempting to account for the effects of both group and gender, it may be possible to determine if changes in computer anxiety scores are attributable to gender, to treatment, or to an interaction of gender and treatment. While such an analysis was not of primary interest in this study, a brief exploration of possible gender effects is warranted.

Tables 86 - 87 present the results of two-factor analyses of variance comparing the experimental and control group CAS 1 and CAS 2 (Phase I) scores while accounting for the effects of gender. In order to perform this analysis, it was necessary to delete six male subjects from the experimental group and three female subjects from the control group so that cell counts could be equalized with respect to gender. As a result, there were 34 female subjects each in the experimental and control group cells, and 14 male subjects each in the experimental and control group cells.

Table 86
Two Factor ANOVA Table for Gender and Group: CAS 1

Source:	df:	SS:	MS:	F-test:	p:
Gender (A)	1	943.46	943.46	4.219	.0428
Group (B)	1	914.941	914.941	4.091	.046
A x B	1	67.941	67.941	.304	.5828
Error	92	20574.828	223.639		

Table 87
Two Factor ANOVA Table for Gender and Group: CAS 2

Source:	df:	SS:	MS:	F-test:	p:
Gender (A)	1	863.61	863.61	4.038	.0474
Group (B)	1	1242.147	1242.147	5.809	.0179
A x B	1	41.314	41.314	.193	.6613
Error	92	19674.139	213.849		

It would appear that both gender and treatment have an effect on CAS scores. There were, however, no interaction effects between gender and treatment; the effects of treatment do not vary with gender. Thus, any differences in CAS scores with respect to gender appear to be attributable to the fact that female subjects started with higher CAS scores than did males, and this difference appeared to persist after the first treatment.

Several limitations are readily apparent even from this cursory analysis. First, given the prevalence of female subjects compared to male subjects, the resulting imbalance in cell frequencies with respect to gender renders this analysis suspect. Were we to attempt a two-way analysis of variance that would use CAS 3 and CAS 4 as dependent measures, then the male experimental and control group cells would diminish in size to 8 per cell. It is obvious that this would result in inadequate statistical power for any realistic analysis. In order to conduct a more reasonable analysis that can account for possible gender effects, then a balanced two-factor design is required (Glass and Hopkins, 1984), and one would have to markedly increase the number of male subjects.

CHAPTER FIVE
DISCUSSION

Introduction

In this final chapter, the significance of the study results is discussed, followed by review of the limitations of the study, possible directions for future study, and the final conclusions.

Significance of the Study Results

The research idea presented at the beginning of this study was that if brief instructional interventions designed according to Minimalist Principles had positive effects on computer anxiety, learners' abilities to use computers, and learners' desire to acquire computer skills, and that those effects could be shown to endure over time, then this would provide strong evidence for the efficacy of using Minimalist Principles to design computer skills training to teach computer anxious learners. An implication of this line of reasoning was that if such instruction were indeed efficacious in the case of computer skills training, then it might also hold promise in developing training not only for computer skills, but also for technologies other than computers.

The evidence supplied by the results presented in the previous chapter provides some evidence in support of the research idea.

The results offer some support for the hypothesis that the experimental treatment would be more effective at lowering subjects' CAS scores than would the control treatment. The between groups comparisons based upon the ANCOVA did not support the experimental hypothesis. The support came from one of the many repeated measures, within groups comparisons. Learners in the experimental group who scored in the upper 50% of their group on the pretest measure of computer anxiety did indeed have statistically significant, lower computer anxiety scores on their subsequent CAS measures.

There is a very practical issue that must be addressed, however, and that is the "so what?' issue. There are no norms for the CAS, therefore there is no basis for determining the meaning of a difference of "x" points in computer anxiety. Depending upon the pairwise chosen, subjects in the higher anxiety half of the experimental group experienced, on average, between a 4 to a 6 point decrease in their computer anxiety scores, or a 5%-7.5% "improvement." Until such time as CAS scores are normed for this population of undergraduate students, it will be difficult at best to ascribe meaning to such a difference in scores.

Nevertheless, the experimental treatment produced an immediate decrease in anxious learners' computer anxiety when using easy, similar, repeated tasks. For those instructional developers and educational researchers who are interested in working to assist learners to feel more comfortable with computers, in terms of reducing their computer anxiety, this study appears to support the use of Minimalist Principles as a set of guidelines for developing instruction responsive to the need of computer anxious learners to reduce their computer anxiety as quickly as possible.

The results of the study with respect to the control group subjects' computer anxiety scores must not be overlooked. There was evidence for an overall decrease in computer anxiety for the control group subjects based upon comparison of the Phase I pretest and the Phase II posttest CAS administrations, especially for the half of the control group that rated their computer anxiety lower on the pretest. This result suggests that, with time and continued experience, learners' computer anxiety will abate somewhat, irrespective of the treatment.

A third factor should be considered in this discussion, the factor of external reward. A significant condition of the study was that subjects received credit for their participation, credit which was required for successful completion of their introductory psychology course. It was in their interest as students to participate in the study sufficiently to receive at least partial credit toward their course requirements. This condition may have provided impetus for subjects to stick with the instructional program sufficiently to learn some basic word processing skills, and to feel more comfortable about using computers.

From this discussion of the study results thus far we can draw the following conclusions:

1. Computer instruction developed according to Minimalist Principles of instructional design produced an immediate decrease in anxious learners' computer anxiety. While the meaning of that decrease is not clear due to the lack of norms for the CAS measure, there is nevertheless an immediate, measurable decrease.

2. Having computer anxious students use computers over time appears to decrease their computer anxiety, irrespective of treatment. It may be enough to get them to sit down in front of a machine and use it

to decrease their anxiety. While the effects of this kind of treatment may not be immediately measurable, they do show up over the long run.

3. In order to get learners to sit down in front of the computer and use it long enough to begin to experience a decrease in computer anxiety, external rewards may play a significant role. This conclusion is necessarily weaker in that it was a byproduct of the study, and not the result of a principle line of inquiry.

A fundamental issue needs to be addressed, and that issue lies within the evidence for the efficacy of both the experimental and the control treatments in training subjects to use word processing software to complete a task. The results of the word processing task checklist scoring and time to complete the tasks suggest that both treatments were equally effective in training subjects to learn how to use word processing. One may then ask, why is it necessary to consider the issue of computer anxiety at all, when the end result is that learners learn how to use the computer to perform word processing regardless of the type of instruction used? On the basis of this study there is no simple answer. The first complication arises due to the presence of an external reward, that of the credit subjects received for their participation in the study. Had this reward not been present, then the intrinsic motivational effects of the instructional treatments may have acquired more importance. This study provided no means for addressing this issue. The point must be made, however, that it is probably more frequently the case that external motivators are at play in the case of learning computer skills than not at play. People, including those who are computer anxious, learn how to use computers for a variety of reasons: for example, to be able to qualify for better jobs or positions, or to meet course or curricular requirements.

The presence of such external motivators may be sufficient to "sit the student in front of the machine" and get one to lay one's fears of the technology aside in order to satisfy a strong motive.

A second consideration is the lack of difficulty of the tasks subjects were required to perform. It has been noted that the tasks appeared to be relatively easy for the subjects, given the prevalence of high performance checklist scores. One may speculate as to the effect of task difficulty on learners, and the need, if any, for addressing learner anxiety when learners are faced with relatively easy tasks. Given that the subjects in this study did not have to confront difficult challenges with respect to task, then perhaps the "user-friendliness" of the instruction never arose as an issue. Upon reviewing the word processing task materials, it is clear that subjects were strongly cued as the which computer operations they needed to perform. Subjects were instructed outright to use the tab function for indenting certain lines, for example, or to use the centering function to center document titles. It may be sufficient to expose computer anxious learners to very easy, clearly worded tasks early on in the learning process in order for learners to set aside their initial computer anxiety.

A third consideration arises, that of the relative difference in the designs of the instructional and control treatment. The fact that there were no significant differences between the experimental and control groups with respect to the performance outcome measures leads one to believe that the treatments, for all the differences described in the methodology, may not have been that different in the eyes of the subjects. Obviously, WordPerfect's "Getting Started" instruction was sufficiently well designed to meet subjects' instructional needs effectively for them to do well on the tasks. Whether or not the instruction was designed to address the special needs of computer anxious learners is ultimately irrelevant, given the fact that subjects acquired the skills.

Given that all study subjects were able to perform well on the word processing tasks as measured by their checklist scores and time to complete the tasks, irrespective of treatment, one may assert that any instruction that is relatively well-prepared - clear in its procedural explanations, setting easy tasks - may meet the instructional and motivational needs of most individuals, computer anxious or not, well enough such that computer anxiety need not be considered as a separate issue.

However, there may always exist a number of individuals who will try to avoid learning how to use computers or some other new technology out of fear of that technology. It may not be enough merely to hold out the reward of better job preparation or course performance in order to "seat them in front of the machine." In those cases where anxiety remains an issue, and where serious thought must be given to reducing a person's anxiety, then the Minimalist Principles have been shown in this study to provide a useful framework to guide the development of instruction for such individuals.

With respect to the motivational questions to which students responded, there was a lack of evidence supporting either of the experimental hypotheses concerning the efficacy of the experimental treatment to promote subjects' desire to learn word processing or other computer skills. The only significant difference found between the experimental and control groups favored the control group; subjects in the control group reported significantly more interest in learning computer skills irrespective of their kind, when asked immediately after the Phase II experimental session. One explanation for this result could be fatigue on the part of the experimental group, having been asked this question for the fourth time, the time which produced the significant result. Another possible explanation could be boredom with the experimental tasks, which were three variations on the same theme, and this boredom could have been reflected in subjects responses to this motivational question. Given the overall lack of variance in subjects' scores on all the motivational question measures, one may set aside this result as of little significance.

Limitations of the Study

The study population was limited to undergraduate students primarily in their first year of matriculation. Any generalizations drawn from this study must necessarily be limited to this population.

Female subjects were found to have significantly higher pretest computer anxiety than were male subjects as measured by the CAS. It was never the intention of this study to explore gender differences with respect to computer anxiety and the effect of instructional treatments on computer anxiety, thus, the design of the study never took this variable into consideration.

While subjects were asked to work on a "realistic" task, or one that they could possibly be called upon to perform in their -day-to-day lives, the task was not a "real" task in the sense that it filled a real life need. This injected a further measure of artificiality into the study, as subjects may or may not perform differently if they are called upon to perform a real task, such as completing all their homework assignments for one course, using word processing.

The tasks that subjects were instructed to complete were obviously quite simple, given the prevalence of the "ceiling effect." This limited the variance of checklist scores for the experimental and control groups and made comparison of the efficacy of the two treatments difficult at best. Given the absence of large differences in treatment effects, one must question whether there were real differences in the experimental and control treatments. The experimental and control treatments may have been less different than initially assumed.

The strictly controlled conditions of the experiment, in which all students were read the same instructions, and performed the same tasks the same number of times, differ significantly from work place or from school environments. It is unclear how, if at all, the study results would generalize to these other conditions.

The computer application used in the study was the WordPerfect word processing software, and the platform was DOS-based. Conclusions reached as a result of this study are not necessarily generalizable to other software packages such as spreadsheets, nor to other platforms such as the Macintosh.

CAS scores have a possible range from 20 - 100. Given the lack of norms for the CAS, it is unclear what constitutes a significant practical difference in CAS scores. Does a 5-point decrement in CAS scores result in a decrease in computer anxiety that has practical consequences for the learner? Must a 10-point decrease be attained before there are discernible effects on how a person feels about computers? Given the lack of norms for the CAS, it is not possible to determine what constitutes "high" computer anxiety from "moderate" computer anxiety, and what the effects of different levels of computer anxiety are on learners.

Analyses of 50th percentile half-groups based upon pretest Phase CAS scores were subject to reduced statistical power due to halving the numbers of subjects for purpose of within-percentile-group comparisons. Recalling the statistical power analysis presented at the end of chapter three, true differences based upon percentile groupings may have been missed due to insufficient statistical power resulting in Type II error.

Directions for Future Study

Future studies can take one of three directions: exploring further the implications of the results of this study, addressing some of the study's limitations, or combining these two approaches.

Future exploration of the application of Minimalist Principles of instructional design can focus on different computer applications, tasks, and conditions. For example, does instruction designed according to Minimalist Principles work as well for tasks and applications that are primarily mathematical in nature, such as using spreadsheets or statistical databases, as they do for word processing applications? Does instruction designed according to Minimalist Principles work effectively when tasks are more rather than less complicated? Does instruction designed according to Minimalist Principles work well in the workplace with subjects working on real tasks, rather than in the computer lab with subjects working on realistic tasks?

This question of whether or not the treatments were really different can be addressed in at least two ways. First, the word processing task difficulty could be increased, either by designing a more complicated task such as composing a resume, imposing a time limit, or some combination of features that would raise the level of difficulty. Second, a more difficult control treatment could be used in order to create the widest possible potential difference between experimental and control treatments. This could be accomplished, for example, by using an earlier version of a software program and its accompanying documentation, documentation which most experts would agree has been poorly designed. By comparing Minimalist documentation with such a package, one could determine the presence or absence of treatment effects. If positive effects are attributable to Minimalist documentation under these conditions, then parameters of the Minimalist documentation could be varied in future experiments to determine which parameters best account for the greater efficacy of the Minimalist documentation.

Future studies may want to use gender as a blocking variable in order to study whether or not there are any differential treatment effects that can be attributed to gender.

As mentioned in the discussion, there was insufficient power to conduct the split-group analyses based upon Phase I pretest computer anxiety scores. Sufficient samples of computer anxious learners are needed to form experimental and control groups of adequate size in order to maintain a desired level of statistical power when studying the effects of treatments on subjects within this population.

Work needs to be done in standardizing the results of the CAS and other computer anxiety measures. Until norms are discovered for the CAS, it will be difficult at best to determine the meaning, if any, of a decrease in computer anxiety scores.

A question arises as to the applicability of the CAS to this particular population of subjects. The copyright year of 1985 suggests that CAS may have been developed at a time when microcomputers were still relatively new to the market. Combined with the fact that a significant majority of the subjects reported previous experience using computers, one must ask 1) was the CAS the appropriate instrument to measure computer anxiety with this particular group of subjects, and 2) how significant an issue does computer anxiety remain in 1993? Technologies that have attained widespread acceptance such as the automobile or telephone were not initially embraced with open arms by grateful consumers. Perhaps the microcomputer is becoming much less of a novelty to the general public than it was ten years ago and, especially among a generation raised with the microcomputer as a ubiquitous tool, the phenomenon of computer anxiety is beginning to go the way of anxiety previously associated with the "horseless carriage."

Lastly, research can be done to see of the Minimalist Principles can be applied to technological domains other than computers. Mechanics who need to be trained on new automotive diagnostic technologies, or factory workers who require new skills in manufacturing processes, are only two examples of populations that could possibly benefit from instruction designed according to Minimalist Principles.

Conclusion

This study provides support for the proposition that computer skills instruction designed according to Minimalist Principles of instructional design has a positive effect on computer anxious subjects by reducing their computer anxiety while training them to acquire computer skills. This results of this study also suggests that, given a series of similar, very simple word processing tasks, subjects can learn to perform those tasks irrespective of their level of computer anxiety or of the types of instruction provided in the study. The possible lesson for instructional designers and trainers who face the challenge of preparing instruction for computer anxious students in the skillful use of current technology and technologies as yet undeveloped, is to start your students quickly on easy tasks, and do whatever it takes by way of reward to "sit them down in front of the machine."

APPENDIX A

Control Treatment Instructional Materials

Instructional Materials

APPENDIX A

Control Treatment Instructional Materials

Table of Contents

APPENDIX A

Control Treatment Instructional Materials

The Basics

This section will introduce you to WordPerfect and some of its basic functions and features. If you are new to WordPerfect, it will be to your advantage to take a few minutes to read through this section before you move on. If you are already familiar with WordPerfect, you may want to glance through this section as an introduction to some of the newer features that WordPerfect 5.1 has to offer.

Registration

Before you move on, take a moment to fill out and send in the Customer Registration card that came with your WordPerfect package. Registering will make sure that you stay informed of the latest releases, and entitles you to customer support as well as WordPerfect's quarterly newsletter, *WPCorp Report*. Keep the upper portion of the form with your manual for quick reference to your license number. If you are an update customer, you will want to use the license number from your previous version of WordPerfect. Your license number is needed for all disk updates.

Install WordPerfect

Included in your package is the WordPerfect *Installation Program*, which guides you step-by-step through the WordPerfect installation process. If you haven't yet installed WordPerfect on your computer, refer to the *Installation Instructions* card that came with your package.

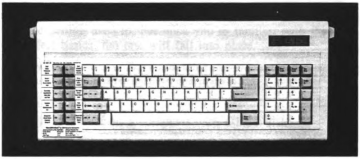
The Template

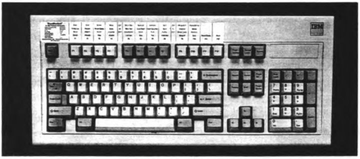
If all journeys begin with a simple first step, your experience with WordPerfect should begin with the template, a WordPerfect menu of feature options.

APPENDIX A

Control Treatment Instructional Materials

In your WordPerfect package, you received two color-coded templates, one of which is designed to fit over the function keys on your keyboard. These templates correspond to both the standard and enhanced IBM keyboards. Place the template on your keyboard as shown in the photographs below.





The different colors are your guide to using the WordPerfect function keys.

The color key is as follows:

Black	Press the function key
Green	Hold down **Shift** and press the function key
Blue	Hold down **Alt** and press the function key
Red	Hold down **Ctrl** and press the function key

Example: To **Center**, which is printed in green on the template, you would hold down the **Shift** key and press **F6**.

If neither template fits your keyboard, an address is provided for requesting a new template in the Getting Help *section immediately following this section.*

APPENDIX A

Control Treatment Instructional Materials

To remind you which key corresponds with each color, colored stickers called keycals have been provided in your package. You can, if you wish, peel the keycals from their backing and place them on the corresponding keys (Shift=Green, Alt=Blue, Ctrl=Red) on your keyboard.

Start WordPerfect

Once WordPerfect has been installed on your computer, you're ready to start the program. If you're a new user, some things will take some getting used to, but once you're familiar with the WordPerfect basics, the rest will fall into place.

Any time you are asked to Enter something throughout the documentation, simply type the required information and press ***Enter.***

Hard Disk

To start WordPerfect on a computer with a hard disk,

1 Turn on your computer and start DOS.

In most cases, the Disk Operating System (DOS) starts automatically when you turn on your computer. DOS is software that helps your computer communicate with WordPerfect. DOS must be started before any other program can be used, including WordPerfect. If you need further information, please see DOS and WordPerfect *in* Reference *and refer to your DOS manual.*

2 At the DOS prompt, enter **cd*directory name*** (*directory name* meaning the name of the directory where WP.EXE is located).

WP.EXE is a file that helps you to start WordPerfect. You start WordPerfect from the directory that contains WP.EXE. In most cases, the Installation Program will have copied WP.EXE to a directory called WP51, so you would type ***cd\wp51*** *and then press* ***Enter.*** *WP.EXE will be used every time you start WordPerfect and should not be deleted.*

3 Enter **wp**

Remember, when you see Enter, type the required information (in this case ***wp****) and then press* **Enter**.

Two Disk Drives

To run WordPerfect 5.1 on a two disk drive system, it is necessary that each of your drives be at least 720K or larger. If you are not sure whether your drives are at least 720K, please refer to your computer manual or contact your dealer.

To start WordPerfect on a computer with a two disk drive system,

1 Start DOS. (See the paragraph on DOS in the *Hard Disk* section above.)

2 Insert the WordPerfect 1 diskette into drive A.

APPENDIX A

Control Treatment Instructional Materials

3 Insert the diskette on which you want to store your files into drive B.

4 Enter **b:** to change the default drive to B.

5 Enter **a:wp** to start WordPerfect.

6 When prompted, replace the WordPerfect 1 diskette with the WordPerfect 2 diskette.

Clean Screen

Starting WordPerfect is like rolling a clean sheet of paper into a typewriter. When you begin a new document, WordPerfect gives you a clean screen to work from, which will be referred to throughout the documentation as the editing screen or the normal editing screen.

A CURSOR
B STATUS LINE
C DOCUMENT (1 OF 2)
D PAGE
E LINE
F POSITION

The dash near the top of your screen is the *cursor*. It points to your current position on the screen. The *status line* at the bottom of the screen displays the position of the cursor as well as messages and warnings. When you save a document, the status line can also display the filename of that document for as long as you continue to work on it. (See *Display Setup* in *Reference*.)

Initial (default) formats, such as margins, tabs, and line spacing, have already been set for you. You can, however, change them at any time and as many times as you like throughout a document (see *Appendix G: Initial Settings* for a complete list of initial format settings).

Keys to Know

Before you begin experimenting, you'll need to know where to look for help in case you get lost or make a mistake. WordPerfect

Control Treatment Instructional Materials

is a remarkably forgiving program; here are a few keys to remember in case you need them.

Backspace
The Backspace key is used to erase mistakes as you type. It erases characters to the immediate left of the cursor.

Cancel
This key (F1) backs you out of features that display a message on the status line, such as Block, Exit, and Retrieve, as well as backing you out of any menu. Cancel can also be used to restore text that has been erased by any of the delete keys.

Delete
The Delete key (Del) deletes text at the cursor position.

Help
Pressing Help (F3) displays on-screen information about any WordPerfect feature you are currently using. You can also use this feature to display the WordPerfect template and/or a list of features that begin with a particular letter. Pressing Enter or the Space Bar will exit you out of help. (See *Help* in *Reference* for more information.)

Function Keys

Function keys provide one gateway to WordPerfect features. Throughout this manual and the *WordPerfect Workbook*, you will often see key names. The guide to using these keys is simple:

- If a key name appears by itself (F8), press the key.
- When the key names are separated by a hyphen (Shift-F8), hold down the first key while you press the second key.
- If the key names are separated by a comma (Shift-F8,1), complete the first sequence (Shift-F8), release the keys, *then* press the second key (1).

Function keys work in different ways, and present you with different responses. Below are a few examples:

Feature	Function Key	How it Works
Bold	F6	Turns the feature either on or off
Print	Shift-F7	Presents a menu of options
Center	Shift-F6	Begins a feature that is ended when **Enter** is pressed
Save	F10	Requires e

APPENDIX A

Control Treatment Instructional Materials

The examples above refer to the original keyboard assignments. You can, if you want to, change these assignments to suit your needs. For example, the Help feature is currently assigned to the F3 function key. You could change the assignment so that Help would be assigned to the F1 function key. For further information on keyboard assignments, see *Keyboard Layout* in *Reference.*

Pull-Down Menus

In addition to the function keys, there is another way you can select WordPerfect features: *Pull-Down Menus.*

Edit Search Layout Mark Tools Font Graphics Help

Doc 1 Pg 1 Ln 1" Pos 1"

You can turn on the pull-down menus by holding down the **Alt** key and pressing the equal sign key (=) (Alt-=). The pull-down menu titles will appear in a bar at the top of the screen. You can also set up the Alt key so it will display the pull-down menu bar by pressing it alone (see *Menu Options* in *Reference*).

In WordPerfect, you can select features in the pull-down menus by using the arrow keys (↑,↓,→,←) and pressing Enter, or by using a mouse, if you have one connected to your computer. You can also select these features by typing the mnemonic letter that is highlighted in the feature name (e.g., S for Save). The pull-down menus can also be turned on and off by clicking the right-most button on the mouse.

If you don't have a mouse connected to your computer and set up to run with WordPerfect, the mouse pointer (█) will not appear. See Mouse Setup *and* Mouse Support *in* Reference *for further information.*

Control Treatment Instructional Materials

If you prefer to use the pull-down menus, look for this symbol: ⊟. Throughout the documentation, this symbol will be followed by the name of the pull-down menu where you can find the feature.

Example:
⊟ *Select Append from the Edit menu.*

Menu Options

Earlier in this section, when you were introduced to function keys, you learned that some features, such as Print (Shift-F7), present you with a menu of options.

```
Print

     1 - Full Document
     2 - Page
     3 - Document on Disk
     4 - Control Printer
     5 - Multiple Pages
     6 - View Document
     7 - Initialize Printer

Options

     S - Select Printer                      Standard Printer
     B - Binding Offset                      0"
     N - Number of Copies                    1
     U - Multiple Copies Generated by        WordPerfect
     G - Graphics Quality                    Medium
     T - Text Quality                        High


Selection: 0
```

Whenever you are presented with one of these menus, there are three ways that you can select an option:

- Type the option number, such as (1) for Full Document. (Use the numbers at the top of the keyboard as opposed to those on the number pad.)
- Type the mnemonic letter that is highlighted in the option name (e.g., **P** for Page).
- Position your mouse pointer on the option and click the left mouse button.

Codes

Codes are commands that tell WordPerfect and your printer what to do. Whenever you use a feature such as Block or Underline, WordPerfect inserts these hidden commands into your document. You can examine these codes in the Reveal Codes screen. For information, see *Appendix C: Codes* for a list of all codes, in addition to *Reveal Codes* and *Delete Codes* in *Reference*.

APPENDIX A

Control Treatment Instructional Materials

Exit WordPerfect

When you finish using WordPerfect, you must exit before turning off the computer.

1 Press **Exit** (F7) to begin exiting WordPerfect.

Select Exit from the ***File*** *menu.*

2 Press **y** to save the document, then enter a filename.

or

Press **n** to continue exiting without saving the document.

3 Press **y** to exit WordPerfect.

There are several saving options. For further information, see Save *in* Reference.

APPENDIX A

Control Treatment Instructional Materials

Getting Help

If you have problems as you work with WordPerfect, help is available from several sources.

Help Feature

The Help feature (F3) displays on-screen information about any feature you are currently using. For more information, see *Keys to Know* in *The Basics* section of *Getting Started* and *Help* in *Reference.*

Reference Manual

This manual contains an alphabetical list of WordPerfect features, describing how each feature works. Each section contains steps and information pertaining to individual features, as well as more detailed information under the *Notes* heading at the end of each section. *See Also* will direct you to related information. A comprehensive index is provided to direct you to the information you need, as well as an Appendix devoted exclusively to troubleshooting (see *Appendix O: Troubleshooting* for further help).

WordPerfect Workbook

The *WordPerfect Workbook* contains several lessons which show you how WordPerfect features may be used and combined for specific applications. Lessons include advanced applications as well as basic fundamentals.

On-Line Tutorial

WordPerfect includes a tutorial that takes you step-by-step through a number of basic skills. The tutorial is intended for use with IBM personal computers and 100% compatibles only.

Important: *The On Line Tutorial is installed with the WordPerfect learning files. If you did not instal the Learning files when you installed WordPerfect or have not subsequently done so, you must do so before running the Tutorial (see the* Installation Instructions *card).*

Hard Disk

To start the tutorial on a computer with a hard disk,

1 Start DOS on your computer. (See the paragraph on DOS in the *Hard Disk* section of *Start WordPerfect* in *The Basics.*)

2 Type **path**, then press **Enter**.

The path is a listing of the directories that are searched when you want to execute a program from the DOS prompt. The directories are searched in the order listed (see *DOS and WordPerfect* in *Reference* for further information).

APPENDIX A

Control Treatment Instructional Materials

3 Check the path to see if it contains the directories where WP.EXE, WP.FIL, and the Learning files are located.

The WordPerfect Auto-Install Program automatically asks you if you want these directories entered into your path. If you inserted these directories upon installation, they should now appear in the path. The directories are C:\WP51 and C:\WP51\LEARN. If your path contains these directories, move on to step 6.

4 If your path doesn't contain the proper directories, type **path=** then type the same directories that were listed in the original path *plus* the directories where WP.EXE, WP.FIL, and the Learning files are contained.

In the PATH command, the directories must be separated by a semicolon (;) (e.g., PATH=C:\WP51;C:\WP51\LEARN).

This PATH command remains in effect until you turn off your computer. If you want to use the PATH command permanently, you should include it in an AUTOEXEC.BAT file (see *DOS and WordPerfect* in *Reference*).

5 After you have finished typing the PATH command, press **Enter**.

6 Enter **tutor** to start the tutorial.

Read the messages on the screen and follow the instructions as directed. When you exit out of the tutorial, you are returned to the same DOS prompt.

If you have problems starting the tutorial after following these steps, try exiting out of any program that may still be running, then try step 6 again. If you're still having problems, go to the DOS prompt before you enter **tutor** and enter the following command:

set wp=/nk/nc

These startup options disable the Cursor Speed feature and enhanced keyboard calls and remain in effect until you turn off your computer or use a new SET command. See your DOS manual and *Appendix N: Startup Options* for more information.

Two Disk Drives

To start the tutorial on a two disk drive system,

1 Start DOS on your computer. (See the paragraph on DOS in the *Hard Disk* section of *Start WordPerfect* in *The Basics*.)

2 Insert the WordPerfect 1 diskette into drive A.

3 Insert the Learning diskette into drive B.

Control Treatment Instructional Materials

4 Enter **path=a:\;b:** at the prompt.

The path lists the directories that are searched when you want to execute a program file from the DOS prompt. The directories are searched in the order listed.

This PATH command remains in effect until you turn off your computer. If you want to use the PATH command permanently, you should include it in an AUTOEXEC.BAT file (see *DOS and WordPerfect* in *Reference*).

5 Enter **tutor** to start the tutorial.

6 When prompted, replace the WordPerfect 1 diskette with the WordPerfect 2 diskette.

Read the messages on the screen and follow the instructions as directed. When you exit out of the tutorial, you are returned to the original DOS prompt.

Customer Support

WordPerfect is backed by a customer support system designed to offer you fast, courteous service. If you've exhausted all other Help avenues and need a friendly voice to help you with your problem, follow these steps:

- Try to duplicate the problem, keystroke by keystroke, to see exactly what was done.
- Be at your computer when you call Customer Support. Have your manual and license number handy. Also know the model of printer you are using.
- Run the WPINFO file to gather information about your setup that Customer Support may need (see *Appendix O: Troubleshooting*).

If you are within the United States, Puerto Rico, the U.S. Virgin Islands, or Canada, toll-free* support is available by dialing:

(800) 533-9605	**5.1—Installation**
(800) 321-3383	**5.1—Graphics**
(800) 541-5097	**5.1—Printers**
(800) 541-5096	**5.1—Features**
(800) 321-3389	**5.1—Networks**

* *This is for English versions of WordPerfect 5.1. If you have a French version, consult your manual.*

APPENDIX A

Control Treatment Instructional Materials

If you are in an area where the phone system does not handle toll-free numbers, you can reach Customer Support by dialing:

(801) 226-4770 Graphics
(801) 226-7977 Printers
(801) 226-7900 Feature
(801) 226-4777 Networks
(801) 226-5444 Installation

You will be charged by the phone company for the call if you use the 801 number.

For IBM personal computers and compatibles, the customer support department takes calls Monday through Friday, from 7 a.m. to 6 p.m. Mountain time. For all other computers, support hours are from 8 a.m. to 5 p.m. Mountain time.

If you purchased this product within the U.S. and would like to update it outside the U.S., thereby receiving free customer support and update notices locally, you will be charged a maximum of $150 (U.S.) or 25% of the local list price, whichever is greater.

Ordering Templates

If neither template fits your keyboard, return both of them along with the name (and a photocopy or rough sketch) of the keyboard you are using to:

WordPerfect Corporation
Attn: Information Services
1555 N. Technology Way
Orem, Utah 84057

WordPerfect Corporation may be able to create or provide a template that will fit your machine.

APPENDIX A

Control Treatment Instructional Materials

A Brief Lesson

Now that you've gone through the basics, here is a brief lesson designed to help you get to know WordPerfect. It will introduce you to some WordPerfect basics and features that you might typically use. To begin, start WordPerfect as previously described.

Creating the Document

Equipped with the basics, you're now ready to start typing. The document you create will be a simple note. If you make any mistakes, use the Backspace key to erase them.

You'll notice that when a line fills with text, the cursor returns to the left margin in a new line. This automatic return is known as *word wrapping*.

1 Type the following note *without* pressing Enter at the end of a line.

Remember the discussion we had about starting a study abroad program? I've just returned from a study abroad conference in Illinois, and I have an outline I'd like you to take a look at. Why don't you stop by my office the next time you're at this end of campus, and we can talk about it.

Editing the Document

You've just created your first document. Looking it over, you see a few things that you'd like to change. WordPerfect has several features that make editing quick and efficient.

Moving the Cursor

You can move the cursor on your screen by using either the Up and Down Arrows (↑/↓) or the Left and Right Arrows (←/→) on your keyboard. To move the cursor with a mouse, simply position the pointer where you want the cursor to be, and click the left mouse button.

Some keyboards have a separate number pad that is also used for cursor control in WordPerfect. The ***Num Lock*** *key (or its equivalent) operates as a toggle to turn Num Lock on and off. When Num Lock is turned off, the number pad can be used for cursor control.*

1 Using the arrow keys, move the cursor to the uppercase R in Remember.

APPENDIX A

Control Treatment Instructional Materials

Insert vs. Typeover

WordPerfect uses Insert as the main form of editing. While in Insert, any text you type is inserted at the cursor, moving the existing text to the right. The alternative is to type over existing text by using Typeover.

2 Type **Do you** and press the **Space Bar**.

3 Press **Insert** (Ins). Notice that the word **Typeover** appears at the bottom left of the screen.

4 Type a lowercase **r** to replace the existing R.

5 Press **Insert** to end Typeover.

6 Move the cursor to the h in have in the second sentence.

7 Press **Delete** (Del) until the remainder of the sentence (including the period) is erased.

Many functions on the WordPerfect keyboard will repeat if you simply hold down the key. Use caution in doing this until you get used to the keyboard; holding down a key too long can insert unwanted codes into your document and delete other necessary codes.

8 Type **think I've come up with an outline that will make us all very happy**.

9 Move the cursor to the v in very.

Block and Underline

The Block feature is used to define portions of text for use with other features.

10 Press **Block** (Alt-F4), then press **Right Arrow** (→) until the word very has been highlighted.

*Select Block from the Edit menu, then press **Right Arrow** (→) until the word very has been highlighted. If you want, you can also hold down the left button on the mouse and drag until the word is blocked.*

11 Press **Underline** (F8) to underline the word.

Select Appearance from the Font menu, then select Underline.

You can block characters, words, sentences, and entire pages if you wish. If you had blocked the rest of the note from the word **very** forward, the entire block would have been underlined.

12 Move the cursor to the D in Do at the beginning of the note.

13 Press **Enter** two times to add blank lines at the beginning of the note.

APPENDIX A

Control Treatment Instructional Materials

Using the Home Key

The Home key can be used for quick movement throughout your document.

14 Press the **Home** key twice, followed by **Up Arrow** (↑). This returns you to the top of your document.

15 Type **Mitch,**

16 Return to the D in Do at the beginning of the note.

17 Press **Tab.**

```
Mitch,

     Do you remember the discussion we had about starting a study
abroad program?  I've just returned from a study abroad conference
in Illinois, and I think I've come up with an outline that will
make us all very happy.  Why don't you stop by my office the next
time you're at this end of campus, and we can talk about it.




                                    Doc 1 Pg 1 Ln 1.33" Pos 1.5"
```

Your edited document is complete.

Saving the Document

You've typed the note and now you want to save it for future reference. When you save a document in WordPerfect, all document initial settings are saved as well, including printer selection.

There is more than one way to save a document in WordPerfect, but for now we'll use the Save feature.

1 Press **Save** (F10).

Select Save from the File menu.

A message appears on the status line at the bottom of the screen: "Document to be Saved:"

2 Type **study** as the filename, and then press **Enter**.

The name of your document and the directory in which it is located appear on the status line at the bottom of the screen. This original document is now saved. Any changes you make

Control Treatment Instructional Materials

throughout the rest of the lesson are only temporary, and will not affect the original document unless you save them under the same filename at some future time.

Printing the Document

Now that you've edited and saved your document, you can send it to the printer. You can print from the screen or from disk. From the screen, you can print a document, page, or any block of text.

For this section of the lesson, you will print directly from the screen. To find out how to print from a disk, refer to *Print, Document on Disk* in the *Reference* section of this manual.

1 Press **Print** (Shift-F7) to display the Print menu.

Select Print from the File menu.

2 Select **Full** Document (1) from the Print menu to send the note to the printer.

If your printer does not print, check to make sure it is turned on, on-line, and that the printer cable is attached securely to your computer and printer. If you did not select a printer when installing WordPerfect, you may receive an error message.

For details on selecting a printer see Printer, Select *in* Reference.

Saving the Document and Exiting

You've saved your original document once. To show you another way to save your document, and also exit WordPerfect, you'll save the document under the same filename, using Exit.

For information on other saving and filing options, see *Save* and *List Files* in the *Reference* section of this manual.

To save the document and exit WordPerfect,

1 Press **Exit** (F7).

Select Exit from the File menu.

A message appears on the status line at the bottom of the screen asking you if you want to "Save Document? Yes (No)."

2 Type **y**, and press **Enter** to save it under the STUDY filename.

*Simply pressing **Enter** will automatically select the default option (the option* not *in parentheses).*

Since there is already a document with the filename STUDY, the message on the status line asks if you want to replace the previously-saved document. Though the text has not been

APPENDIX A

Control Treatment Instructional Materials

modified since you last saved the document, for the purpose of this lesson, you'll want to replace it. If you had changed any text, the new version of the text would replace the old version.

3 Type **y**.

The message on the status line asks if you want to "Exit WP? No (Yes)."

4 Type **y** to exit WordPerfect.

Now that you've finished this lesson, you may want to look through the *Reference* section for more information on individual features, or turn to the *WordPerfect Workbook* for a more in-depth introduction to WordPerfect.

APPENDIX B

Experimental Treatment Instructional Materials

Instructional Materials

Starting WordPerfect

Typing Text; Moving Text Around

Deleting Characters

Function Keys

Remembering Commands

Tabs; Centering

"Undoing"

Printing

Exiting WordPerfect

Summary

APPENDIX B

Experimental Treatment Instructional Materials

1. Getting Started - Opening the Application

Starting WordPerfect

a. At the C-prompt (the line where you type in commands), type "WP" without quotations marks. It should look like this:

C:/>WP

or this:

C>WP

b. Wait a few seconds. Eventually a blank screen will appear, along with some information in the lower right hand corner that looks like this:

Doc 1 pg 1 lin 1" Pos "

You are now ready to begin work.

APPENDIX B

Experimental Treatment Instructional Materials

2. Entering Text, Using the "Cursor" to Move Around a Document

Typing Text;
Moving Text Around

Entering text:

You enter text into the computer much like you would with a typewriter, but with an exception. Hit the "return/enter" key only if you want a space between lines. If you don't want a space between lines, then just continue typing when you get to the end of a line - WordPerfect will automatically continue entering text on the next line for you.

For example, the text in the above paragraph was entered without using the "return/ enter" key when coming to the end of a line. After the word "but" in the first line, the program automatically moved to the second line and continued entering "with an exception" without the writer using the "return/enter" key.

To get the space between the first and second paragraphs, however, the writer hit the "return/enter" key two times after the phrase "the next line for you" and began a new paragraph. That created the space between the two paragraphs.

Using the "cursor" controls:

A "cursor" is the blinking line which indicates your position in a document.

If you look at the right side of the keyboard, you'll find some "arrow keys," either by themselves, or as part of the #2, #4, #6, and #8 keys on the "numeric keypad," which is the set of numbered keys on the far right of the keyboard. You can use these keys to move around a document, either on line up and down, or one character left or right, at a time. They control the position of the cursor.

APPENDIX B

Experimental Treatment Instructional Materials

3. Deleting Text

There are several ways of deleting text:

1. Use the "back space" key. The cursor will move to the left, erasing letters as it goes.

<u>or</u>

2. Use the "delete" key (sometimes marked "del"). The cursor will stay in place, and the letter to the right of the cursor will be erased.

Deleting Characters

APPENDIX B

Experimental Treatment Instructional Materials

4. Using "Function Keys" to Enter Commands.

You enter commands such as "BOLD" and "PRINT" by using "function keys." These are special purpose keys that are located either along a row at the top of the keyboard, or in a bank of two columns on the far left side of the keyboard. They are labeled "F1" through "F10" or "F12," depending upon the keyboard. Here are some examples commands and their associated function keys:

BOLD:	F6
UNDERLINE:	F8

ATTENTION: Look in the appropriate section (eg., "printing") for instructions on how to used specific commands.

Function Keys

Function keys are pressed in order to enter commands. There are many more possible commands to enter than there are function keys, however. WordPerfect gets around this limitation by allowing the user to press combinations of function keys and, either the control key (abbreviated "ctrl"), or the alternate key (abbreviated "alt"), or the shift key. Here are some examples:

CENTER TEXT:	shift F6
PRINT:	shift F7
SPELL CHECK:	ctrl F2

In order to execute the previous commands, you would press and hold down the "extra" key (ctrl, alt, or shift) first, and then press the proper function key.

Throughout this tutorial, a command will be printed in capital letters, and the keys you should press to enter that command will follow in parentheses, for example:

PRINT (shift F7)

APPENDIX B

Experimental Treatment Instructional Materials

5. Remembering Commands: Using the Template

It is not easy, especially when learning, to recall the commands for WordPerfect. Because of this, the program comes with a nifty little template that lays over the function keys, and serves as a memory prompt for all the possible function key commands. There is one for each type of keyboard:

Both templates are color coordinated to allow you to determine the proper key combination to use for the desired command:

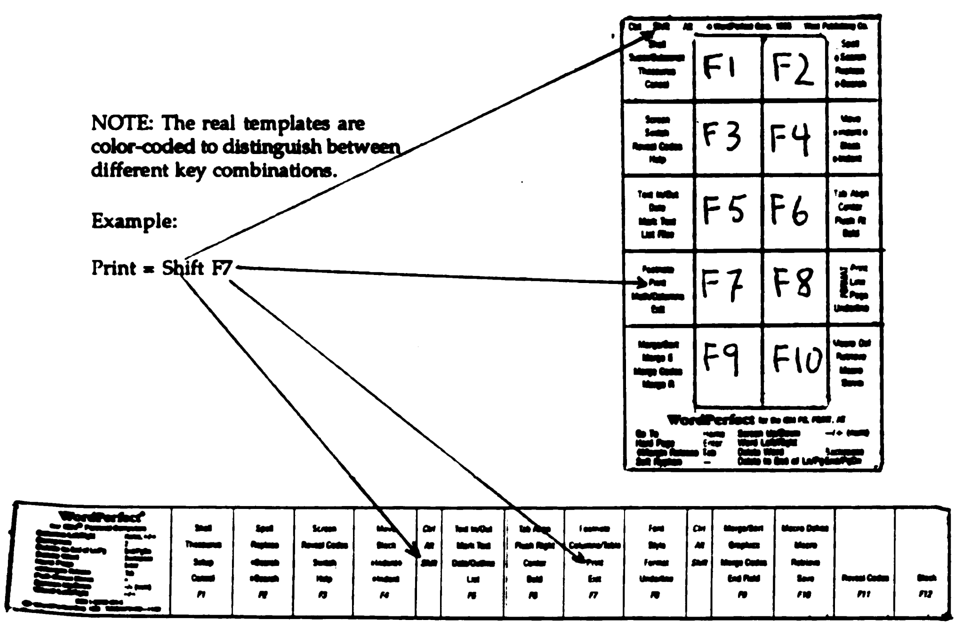
ctrl: red

shift: green

alt: blue

function key alone: black

For example, if you locate command "PRINT," it appears in green, meaning that you press the shift key and the F7 key to print your document.



APPENDIX B

Experimental Treatment Instructional Materials

6. Using Tabs and Centering Text

Using the tab key:

Whenever you have to indent to begin a new paragraph use the "tab key" rather than the space bar. If you rely on the space bar for formatting your document, the printer may make a mess of your carefully entered spacing.

Each press of the tab key will move the cursor over five spaces.

Centering text:

To center a word or a line of text that's already been entered:

1. Place the cursor at the beginning of the word or block.

2. Next, hit the CENTER (shift F6) command.

3. Finally, use the cursor keys to move to a new area of the page to continue working.

To center a word or line of text before entering it:

Tabs: Centering

1. Make sure the cursor is the beginning of the line where you will be entering the text.

2. Hit the CENTER (shift F6) command.

3. Enter your text.

If you will be centering more than one line you will need to enter the CENTER command at the beginning of each line.

APPENDIX B

Experimental Treatment Instructional Materials

7. Undoing a Deletion, Escaping From a Command

<u>Undoing text you've mistakenly deleted</u>

If you delete some text by mistake, WordPerfect has a means of restoring it. The program will store the last 3 deletions. You can "call back" the deletions and restore the desired one.

1. Enter the "CANCEL" (Fl) command. The most recently deleted text will be displayed in its original position, highlighted.
2. Use the up arrow key to display the 2nd and 3rd most recently deleted text. Each will be displayed in turn, and any other highlighted, deleted text will disappear.
3. If you accidentally "go too far," eg., display the 3rd deletion when you want to undo the 2nd deletion, use the down arrow key to re-display the desired deletion.
4. Select "UNDELETE" (1) to restore highlighted text.

<u>"Escaping" an unwanted command</u>

If you enter a command (eg., "PRINT" "CENTER") by mistake, one that you <u>don't</u> want to execute, you can frequently cancel the command by pressing the "ESC" or "escape" key immediately after entering the unwanted command.

"Undoing"

APPENDIX B

Experimental Treatment Instructional Materials

8. Printing a Document

1. Enter the PRINT (Shift F7) command.
2. The print menu displays on the screen.
3. Select FULL DOCUMENT (1), PAGE (2), or MULTIPLE PAGES (3) to print the whole document, the current page, or selected pages.
4. Wait for printer to print.

APPENDIX B

Experimental Treatment Instructional Materials

9. Exiting the WordPerfect Program

Once you've finished a work session and want to quit using WordPerfect:

1. Press the EXIT (F7) key.

2. This message will appear at the bottom of the screen:

   Save document? Yes (No)

   Press the "N" key, since you don't want to save your document at this time.

3. A final message will appear at the bottom of the screen:

   Exit WP? No (Yes)

   Press "Y" and you will exit WordPerfect and return to the C> prompt..

Exiting WordPerfect

APPENDIX B

Experimental Treatment Instructional Materials

10. Summary

Desired Action	Commands, Responses to Prompts, and Menu Choices
open WordPerfect	wp
moving around document	- arrow keys
deleting text	- del key - backspace key
quitting WordPerfect	- F7 (EXIT command) - press "n" - document won't be saved - press "y" to exit program
undoing	- F1 (CANCEL command) - use arrow keys to display deletion you want to undo - select "Undelete" (1) to restore
escaping an unwanted command	- ESC key
printing	- shift F7 (PRINT command) - select page, document, multiple pages

APPENDIX C

Computer Anxiety Scale

COMPUTER ANXIETY SCALE (CAS)

The items in this questionnaire refer to things and experiences that may cause anxiety or apprehension. For each item, darken the circle on the answer sheet corresponding to the letter which indicates how anxious each one makes you at this point in your life. Work quickly but be sure to answer each item individually.

1. Thinking about taking a class in computer language (e.g. BASIC, Pascal, COBOL, etc.).	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
2. Applying for a job that requires some training in computers.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
3. Sitting in front of a home computer.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
4. Being around people who are "into" computers.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
5. Watching a movie about an intelligent computer.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
6. Looking at a computer print-out.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
7. Getting "error" messages from the computer.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
8. Watching or listening to news programs about the increasing role of computers in society.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
9. Watching someone working at a computer terminal.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
10. Being refused information because a terminal is "down".	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much

APPENDIX C

Computer Anxiety Scale

COMPUTER ANXIETY SCALE CONTINUED
Page 2

11. Talking to a computer programmer.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
12. Learning to write computer programs.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
13. Using a typewriter.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
14. Visiting a computer store.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
15. Attending a workshop on the uses of computers.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
16. Erasing or deleting material from a computer.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
17. Thinking about prepackaged (software packages) programs for a computer.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
18. Taking a class about the uses of computers.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
19. Learning computer terminology.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much
20. Looking at a high speed computer printer.	A. Not at all	B. A little	C. Fair amount	D. Much	E. Very Much

APPENDIX D

Background Information (Phase I)

Name ____

1. Please check the category that most closely describes your class standing:

   _______first year

   _______second year

   _______third year

   _______fourth year

   _______fifth year

   _______sixth year

   _______more than sixth year

2. Please write your age in years:

   ____

3. Please indicate your sex:

   _______male _______female

4. Please record your grade point average:

   ____

5. Have you ever taken a course in computer literacy or usage, or a course in computer programming (including high school)?

   _______yes _______no

6. If your response to question 5 was "yes," how many semesters of total course work in computer literacy, usage or programming have you had (including high school)?

   _______less than a full semester or term

   _______one semester or term

   _______two semesters or terms

   _______three semesters or terms

   _______four semesters or terms

   _______more than four semesters or terms

continued on other side

APPENDIX D

Background Information (Phase I)

7. How would you describe your current word processing skills (any type of computer)?

_______none _______poor _______average ______good _______excellent

8. Please describe your current typing ability:

_______poor _______average _______good

9. Please indicate your academic major. If not decided, please write "not decided."

____

10. If an opportunity were to arise, how much time would you be willing to devote to learning word processing skills?

_______ none

_______ 1 hour or less

_______ 2-3 hours

_______ 4-5 hours

_______ more than five hours

11. How interested are you in learning computer skills, whatever they may be?

_______ not at all

_______ a little

_______ somewhat

_______ a lot

12. How much time would you be willing to devote to learning computer skills, whatever they may be?

_______ none

_______ 1 hour or less

_______ 2-3 hours

_______ 4-5 hours

_______ more than five hours

APPENDIX E

Background Information (Phase II)

Name ____

1 If an opportunity were to arise, how much time would you be willing to devote to learning word processing skills?

______ none

______ 1 hour or less

______ 2-3 hours

______ 4-5 hours

______ more than five hours

2. How interested are you in learning computer skills, whatever they may be?

______ not at all

______ a little

______ somewhat

______ a lot

3. How much time would you be willing to devote to learning computer skills, whatever they may be?

______ none

______ 1 hour or less

______ 2-3 hours

______ 4-5 hours

______ more than five hours

APPENDIX F

Feedback Form

Name ____________________________________

1. Were there any features of the instruction that you particularly enjoyed or appreciated?

2. Were there any features of the instruction that were particularly frustrating for you?

3. If an opportunity were to arise, how much time would you be willing to devote to learning word processing skills?

   _______ none

   _______ 1 hour or less

   _______ 2-3 hours

   _______ 4-5 hours

   _______ more than five hours

4. How interested are you in learning computer skills, whatever they may be?

   _______ not at all

   _______ a little

   _______ somewhat

   _______ a lot

5. How much time would you be willing to devote to learning computer skills, whatever they may be?

   _______ none

   _______ 1 hour or less

   _______ 2-3 hours

   _______ 4-5 hours

   _______ more than five hours

APPENDIX G

Data Collection Schedule

Phase 1

	Mon 1/25	Tues 1/26	Wed 1/27	Thu 1/28
AM	9:30 - 11:30 Group 1		9:30 - 11:30 Group 4	
PM	5:00 - 7:00 Group 2	2:00 - 4:00 Group 3		6:00 - 8:00 Group 5

	Mon 2/8	Tues 2/9	Wed 2/10	Thu 2/11
AM	9:30 - 11:30 Group 6		9:30 - 11:30 Group 9	
PM	5:00 - 7:00 Group 7	2:00 - 4:00 Group 8		6:00 - 8:00 Group 10

Phase 2

	Mon 2/22	Tues 2/23	Wed 2/24	Thu 2/25
AM	9:30 - 11:30 Group 1		9:30 - 11:30 Group 4	
PM	5:00 - 7:00 Group 2	2:00 - 4:00 Group 3		6:00 - 8:00 Group 5

	Mon 3/8	Tues 3/9	Wed 3/10	Thu 3/11
AM	9:30 - 11:30 Group 6		9:30 - 11:30 Group 9	
PM	5:00 - 7:00 Group 7	2:00 - 4:00 Group 8		6:00 - 8:00 Group 10

APPENDIX H

Consent to Participate in a Research Study

I volunteer to participate in this study related to motivation to learn computers. I understand that this study is being conducted by Christopher B. Reznich, a doctoral candidate and instructor at Michigan State University. The purpose of the study is to determine the opinions of adult learners regarding computers before and after self-instruction. I understand that participation in this study is not a part of a MSU course, is completely voluntary, and that participation will in no way affect my grade. I understand that the information I give is completely confidential and complete confidentiality will be maintained throughout the experiment. I understand that I am free to discontinue the experiment at any time during the process and that there are no guaranteed achievement results because of my involvement in the study. I understand that I will not be penalized for non-participation or for discontinuing my participation in the study. I understand that the maximum estimated time required to complete the study is approximately 4.5 hours.

______________________	______________________
Signature of Participant	Signature of Researcher
______________________	______________________
Printed Name of Participant	Printed Name of Researcher

____

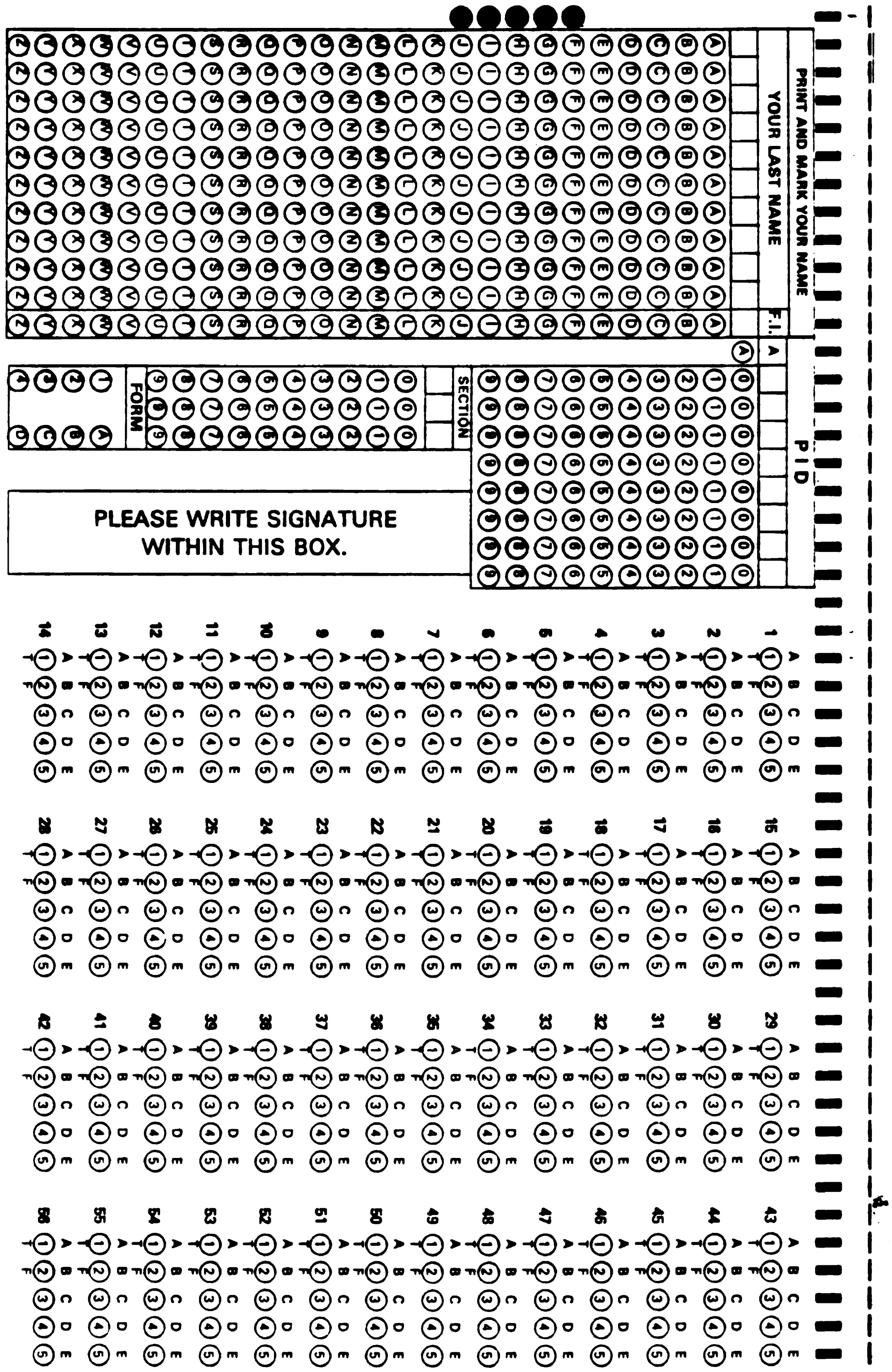
Date

____

Telephone Number

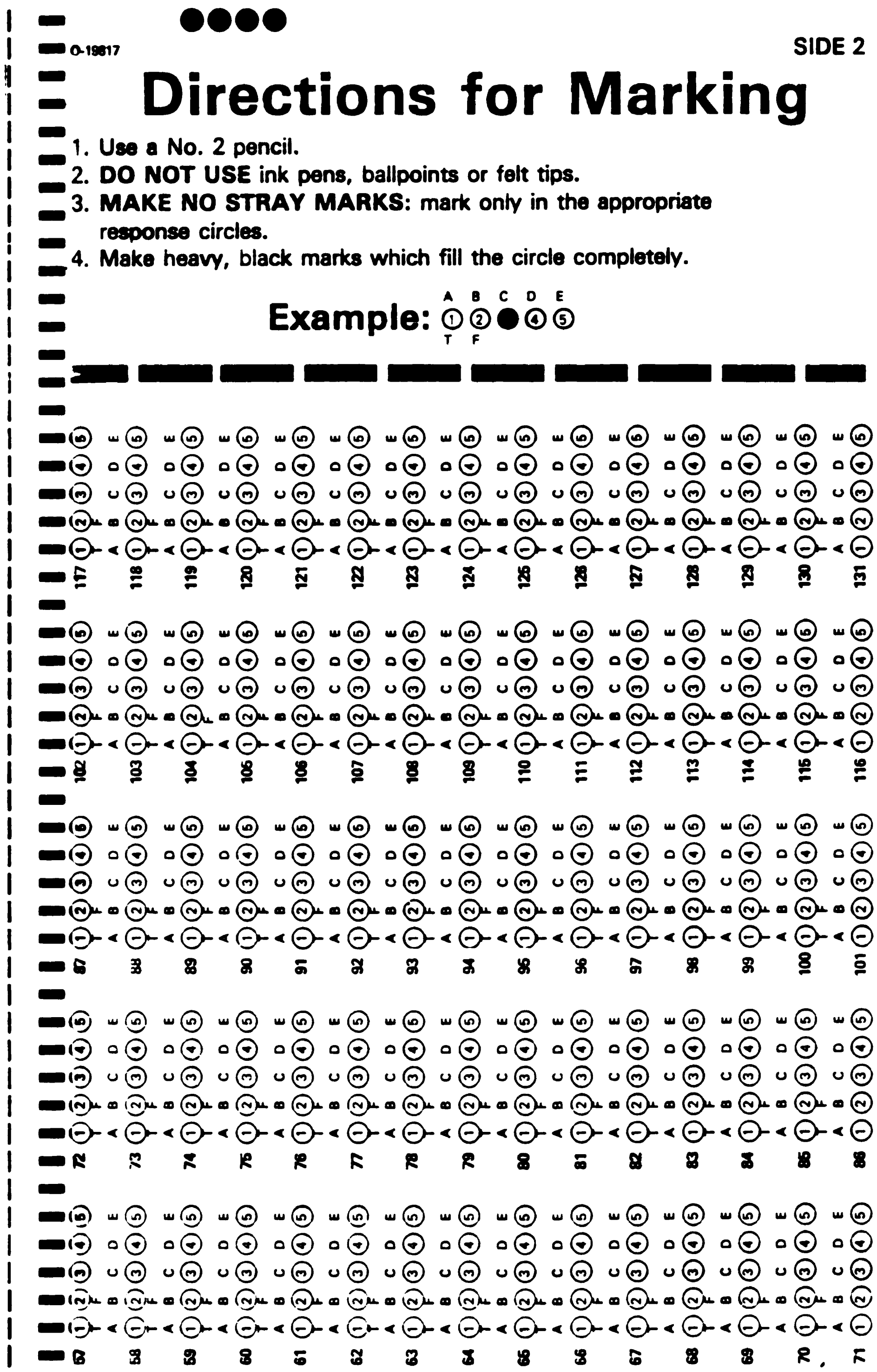
APPENDIX I

Machine Scoring Form



APPENDIX I

Machine Scoring Form


0-19817

SIDE 2

Directions for Marking

1. Use a No. 2 pencil.
2. **DO NOT USE** ink pens, ballpoints or felt tips.
3. **MAKE NO STRAY MARKS:** mark only in the appropriate response circles.
4. Make heavy, black marks which fill the circle completely.

Example: A ① B ② C ● D ④ E ⑤ (T F)

117 118 119 120 121 122 123 124 125 126 127 128 129 130 131

102 103 104 105 106 107 108 109 110 111 112 113 114 115 116

87 88 89 90 91 92 93 94 95 96 97 98 99 100 101

72 73 74 75 76 77 78 79 80 81 82 83 84 85 86

57 58 59 60 61 62 63 64 65 66 67 68 69 70 71

APPENDIX J

Directions for Students (Phase I)

There are two word processing tasks in this experiment. Please follow these directions as closely as you can, and please work alone. This is very important to assure the integrity of this study. Your cooperation is greatly appreciated.

1. Please record the starting time announced by the proctor on your Time Sheet in the space next to "Starting Time #1."

2. Please read the "Word Processing Task 1" sheet.

3. Use the "Instructional Materials" any way you see fit to try to complete the first word processing task. You may stop working on it at any time.

4. Please work alone and at a comfortable pace. You will not be graded on your performance or completion of this task. You will have a maximum of one hour and thirty minutes to complete the two word processing tasks. You may take less time if you so desire.

5. When you feel you have completed "Word Processing Task 1," or wish to stop work on it, record the time on your Time Sheet in the space after "Finishing Time #1." Then, please raise your hand. The proctor will give you instructions to begin "Word Processing Task 2." Please record the second starting time in the space after "Starting Time #2."

6. If you need to take a break, you may do so.

7. Use the "Instructional Materials" any way you see fit to try to complete the second word processing task. You may stop working on it at any time.

8. When you have completed "Word Processing Task 2," or wish to stop work on it, record the time on your Time Sheet in the space after "Finishing Time #2." Then, please raise your hand. You will be given further instructions at that time.

9. If you do not finish the task, please stop working when instructed to by the proctor. Place your keyboard on top of your computer. Record the time announced by the proctor on your Time Sheet. The proctor will give you further instructions.

APPENDIX K

TIME SHEET (Phase I)

STARTING TIME #1: ____________________

FINISHING TIME #1: ____________________

STARTING TIME #2: ____________________

FINISHING TIME #2: ____________________

APPENDIX L

Word Processing Task 1

Use WordPerfect to create a copy of the following text. Print out 1 copy of the completed document. Do NOT exit the program when you finish or wish to stop work, but record the time on the Time Sheet after "Finishing Time #1:" and raise your hand. The proctor will give you further instructions.

ANNOUNCEMENT

It's the end of the year, and all survivors are invited to celebrate!

Where: 4 South Assembly Hall

When: Friday, June 5

Music: "Stone Age"

All refreshments will be provided, courtesy of the Board of Student Government. Designated drivers will be available for a token fee.

signed:
(your name)

Include the following:

- enter all of the text
- use the centering function to center the title word "ANNOUNCEMENT". Only the title word should be centered.
- indent where indicated using the "tab" feature.
- use upper and lower case characters as indicated.
- use the preset computer settings (margins, tabs, type style) - don't try to change them. Don't try to replicate the dotted lines at the top and the bottom of the announcement.
- enter your own name under the word "signed:"

APPENDIX M

Word Processing Task 2

Use WordPerfect to create a copy of the following text. Print out 1 copy of the completed document. Do NOT exit the program when you finish or wish to stop work, but record the time on the Time Sheet after "Finishing Time #2:" and raise your hand. The proctor will give you further instructions.

MOVIE NIGHTS!

The classics are here for your viewing pleasure:

"Casablanca" - May 21

"Beau Geste" - May 23

"Gone With The Wind" - May 25

All films will be shown in the Multi-Purpose room, Cannon Hall, at 7:00 pm. Admission is a buck.

Any questions? Call the Film Board Rep:
(your name)
345-6789

Include the following:

- enter all of the text
- use the centering function to center the title words "MOVIE NIGHTS". Only the title words should be centered.
- indent where indicated using the "tab" feature
- use upper and lower case characters as indicated.
- use the preset computer settings (margins, tabs, type style) - don't try to change them. Don't try to replicate the dotted lines above and below the text.
- enter your own name under the words "Any questions?"

APPENDIX N

Scheme for Naming WordPerfect Document Files

This scheme provides unique identifiers for all WordPerfect word processing document files:

file name: first four letters of subject's last name

file extension: three numbers, the first two representing the subject's experimental group (1-10), the third number representing the order of the subject's word processing task: 1, 2 (Phase I), or 3 (Phase II).

Example:

If subject Robert Slickgard in group 9 has just completed his second word processing task, then his document file would be labeled SLIC.092.

APPENDIX O

Word Processing Task (Phase II)

Use WordPerfect to create a copy of the following text. Print out 1 copy of the completed document. Do NOT exit the program when you finish or wish to stop work, but record the time on the Time Sheet after "Finishing Time #1:" and raise your hand. The proctor will give you further instructions.

CHECK THIS OUT!

I offer maximum discounts on all school supplies. My prices are second to none!

- 2500 sheets computer paper: $10 per box

- textbooks: 50% off list price (three weeks for delivery)

- 8.5 x 11 ruled pads: 10 for $2

Stop by Room 17, Marshall Hall, Monday through Wednesday. I'm open for business from 8 pm until 11 pm. I will not be undersold!

You can believe it, or my name isn't
(enter your name here).

Include the following:

- enter all of the text

- use the centering function to center the title words "CHECK THIS OUT!". Only the title words should be centered.

- indent where indicated using the "tab" feature.

- use upper and lower case characters as indicated.

- use the preset computer settings (margins, tabs, type style) - don't try to change them. Don't try to replicate the dotted lines at the top and the bottom of the announcement.

- enter your own name under the words "or my name isn't".

APPENDIX P

Directions for Students (Phase 2)

There is one word processing task in this experiment. Please follow these directions as closely as you can, and please work alone. This is very important to assure the integrity of this study. Your cooperation is greatly appreciated.

1. Please record the starting time announced by the proctor on your Time Sheet in the space next to "Starting Time."

2. Please read the "Word Processing Task" sheet.

3. Use the "Instructional Materials" any way you see fit to try to complete the word processing task. You may stop working on it at any time.

4. Please work alone and at a comfortable pace. You will not be graded on your performance or completion of this task. You will have a maximum of 45 minutes to complete the word processing task. You may take less time if you so desire.

5. When you feel you have completed the Word Processing Task or wish to stop work on it, <u>record the time on your Time Sheet in the space after "Finishing Time."</u> Then, please raise your hand. You will be given further instructions at that time.

6. If you do not finish the task, please stop working when instructed to by the proctor. Place your keyboard on top of your computer. Record the time announced by the proctor on your Time Sheet. The proctor will give you further instructions.

APPENDIX Q

TIME SHEET (Phase II)

STARTING TIME: ________________

FINISHING TIME: ________________

APPENDIX R

Word Processing Task 1 Checklist

Score 1 point for each checked item:

1. Entering at least 1 line of text of the task document............______
2. Entering at least 5 lines of text of the task document..........______
3. Entering all the text of the task document...........................______
4. Centering the title of the document....................................______
5. Indenting the line "It's the end of the year, and..." 1x..........______
6. Indenting the lines "Where:..", "When:...", and
   "Music:..." 2x..______
7. Indenting the line "All refreshments....." 1x........................______
8. Using upper and lower case letters where indicated..........______
9. Printing out the document..______

total score: ______

APPENDIX S

Word Processing Task 2 Checklist

Score 1 point for each checked item:

1. Entering at least 1 line of text of the task document............______
2. Entering at least 5 lines of text of the task document..........______
3. Entering all the text of the task document...........................______
4. Centering the title of the document.....................................______
5. Indenting the line "The classics are here for ....." 1x...........______
6. Indenting the lines "Casablanca", etc. ..2x..........................______
7. Indenting the line "All films....." 1x.....................................______
8. Using upper and lower case letters where indicated..........______
9. Printing out the document..______

total score: ______

APPENDIX T

Word Processing Task Checklist (Phase II)

Score 1 point for each checked item:

1. Entering at least 1 line of text of the task document............______
2. Entering at least 5 lines of text of the task document...... ....______
3. Entering all the text of the task document..........................______
4. Centering the title of the document....................................______
5. Indenting the line "I offer maximum discounts ..." 1x..........______
6. Indenting the lines "- 2500 sheets", etc. ..2x......................______
7. Indenting the line "Stop by room 17..." 1x........................______
8. Using upper and lower case letters where indicated....... ...______
9. Printing out the document...______

total score: ______

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