1995

Investigating the aptitude treatment interaction: Age, gender, computer self-efficacy and computer training

Alexandra Anggraini Adhyatman

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INVESTIGATING THE APTITUDE TREATMENT INTERACTION:
AGE, GENDER, COMPUTER SELF-EFFICACY
AND COMPUTER TRAINING

A Thesis
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
in
Psychology

by
Alexandra Anggraini Adhyatman
June 1995
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[Signatures and dates redacted]
This study was designed to investigate the impact of individual differences on age, gender and computer self-efficacy on computer performance and training. The Aptitude Treatment Interaction (ATI) model was used to assess the effectiveness of computer training methods (interactive tutorial or visual instruction) on computer performance. A cross sectional 2 X 2 factorial design for gender (male or female) and computer training (interactive tutorial or visual instruction) was used in the study. The subjects were 171 undergraduate and graduate students from California State University, San Bernardino. In hypotheses 1A and 2, Pearson correlations were used to investigate how age and self-efficacy would negatively and positively correlate with computer performance, respectively. Pearson correlations, Fisher's $r$ to $z$' transformation, and moderated regression were performed on Hypothesis 1B. In hypotheses 3 and 4, an analysis of variance assessed the differences between computer performance with training methods, computer knowledge, and learning style. Analysis of covariance was used for Hypothesis 5 to examine the influence of gender and computer training on performance after correcting for age and computer self-efficacy. Results indicated that there was a significant negative relationship between age and
computer performance for Hypothesis 1A, no interaction between age and computer training results for Hypothesis 1B, and a significant positive relationship between self-efficacy and computer performance for Hypothesis 2. There were no significant interactions for hypotheses 3, 4, and 5. Limitations and future recommendations of the study are suggested in the discussion.
# TABLE OF CONTENTS

ABSTRACT .................................................. iii
LIST OF TABLES ............................................. viii
LIST OF FIGURES ........................................... x

**INTRODUCTION**

Aptitude Treatment Interaction ......................... 3

**INDIVIDUAL DIFFERENCES**

Learning Style Inventory ................................ 6
Age .......................................................... 8
Gender ....................................................... 9
Self-Efficacy .............................................. 11

**COMPUTER TRAINING**

Computer Training and Aptitude Treatment Interaction 13
Computer Training and Behavioral Modeling ............. 15

**PRESENT INVESTIGATION**

Hypothesis 1A .............................................. 17
Hypothesis 1B .............................................. 17
Hypothesis 2 ............................................... 18
Hypothesis 3 ............................................... 18
Hypothesis 4 ............................................... 18
Hypothesis 5 ............................................... 18

**METHOD**

Subjects .................................................... 19
Measurements ........................................... 19
  Computer Self-Efficacy Scale .................... 20
  Computer Knowledge Test Scale .................. 21
  Learning Style Inventory Scale ................. 21
  Computer Background ............................... 22
  Demographics ..................................... 22
  Quattro Pro for Windows: Version 5 ............. 22
  Computer Performance Task ....................... 23
Procedure .............................................. 23
  Interactive Tutorial Instruction ............... 24
  Audio Visual Instruction ......................... 25

RESULTS
  Characteristics of the Sample ................... 26
  Hypothesis 1A .................................... 31
  Hypothesis 1B .................................... 31
  Hypothesis 2 ..................................... 32
  Hypothesis 3 .................................... 33
  Hypothesis 4 .................................... 34
  Hypothesis 5 .................................... 36
  Other Analyses .................................. 38

DISCUSSION
  Age ............................................... 40
  Gender .......................................... 40
  Self-Efficacy .................................... 43
  Aptitude Treatment Interaction ................ 44
LIST OF TABLES

Table 1. Descriptive Statistics for Age, Computer Use and Educational Factors .......... 28
Table 2. Subject Demographics for Gender, Computer Ownership, Computer Access, Class Status and Major ..................... 29
Table 3. Moderated Multiple Regression on the Effects of Age by Training Condition ... 32
Table 4. Analysis of Variance for Computer Performance with Audio Visual Condition and Computer Knowledge Scale ............. 34
Table 5. Analysis of Variance for Computer Performance with Computer Training and Learning Style Inventory .................. 35
Table 6. Moderated Multiple Regression on the Effects of the Learning Style Inventory Traits by Training Condition .............. 36
Table 7. Means, Unweighted Means, Standard Deviations and Correlations for Age, Computer Performance, and Computer Self-Efficacy . . 37
Table 8. Analysis of Covariance for Computer Performance with Gender and Computer Training after correcting for Age and Computer Self-Efficacy .................. 38
Table 9. Moderated Multiple Regression on the Effects of Age by Gender .................. 39
Table 10. Reliability Analysis for Computer Self-Efficacy Scale (Before Instruction) ........ 77
Table 11. Reliability Analysis for Computer Self-Efficacy Scale (After Instruction) . . 78

Table 12. Reliability Analysis for Computer Knowledge Scale (Before Item Deletion). . . 79

Table 13. Reliability Analysis for Computer Knowledge Scale (After Item Deletion) . . . 80

Table 14. Reliability Analysis for Computer Performance Task. . . . . . . . . . . . . . 81
LIST OF FIGURES

Figure 1. No Aptitude Treatment Interaction . . . . . . 4
Figure 2. Disordinal Aptitude Treatment Interaction . 4
INTRODUCTION

In recent years there has been considerable interest in the area of training and computer training in particular. A growing number of organizations utilize computer training programs to prepare for a more competitive market that will require advanced computer expertise of the majority of employees. Organizations from all professions already make use of computer technologies and equip their employees with the necessary computer skills through "on-site" training.

Organizations have also acknowledged the importance of individual differences as age, gender and computer self efficacy that may affect the effectiveness of training success. These individual differences, within organizational training instruction, have been of long-standing interest in the field of psychology (Ackerman, 1992; Behrens, 1988; Chen, 1986; Hill, Smith, & Mann, 1987; Jagacinski, LeBold, & Salvendy, 1988; Kanfer & Ackerman, 1989; Miura, 1987; Mumford, Harding, Weeks, & Fleishman, 1988; Snow, 1986; Vernon-Gerstenfeld, 1989). The relationship between individual differences and computer training has been extensively studied over the years. Due to the complexity of this relationship, different research areas have emphasized partial combinations of individual differences with the types of computer training (Dalbey,
Tourniaire, & Linn, 1986; Shahnasarian and Peterson, 1988; Shute, 1994). For instance, these investigations have included individual differences such as age and computer background (Dalbey, et. al., 1986) with computer exploration (Shute, 1994) or behavioral modeling training. Several authors have suggested that the nature and function of age, gender, and self-efficacy with computer training instruction deems further exploration (Jagacinski, et. al., 1988; Miura, 1987; Snow, 1986; Snow & Lohman, 1983). The focus of this study is to examine the effectiveness of computer training programs with respect to certain individual differences and computer performance outcome.

The Aptitude Treatment (ATI) model has been used as a framework to assess the relationship of various types of computer training with individual differences and performance outcome. A variety of individual differences have been correlated with the success of training performance (Ackerman, 1992; Cronbach, 1957; Kanfer & Ackerman, 1989; Mumford, et. al., 1988; Snow & Lohman, 1983; Wexley & Latham, 1991).

**Aptitude Treatment Interaction.** Since 1974, psychologists at Stanford's Aptitude Research Project have been working on a theory that would explain how cognitive aptitude interacts with training instruction (Snow & Lohman, 1983). The purpose of ATI is to demonstrate how individuals
will perform more productively and effectively if exposed to the ideal type of training program that meets the needs of those individuals.

There are two basic types of ATI relationships described by Cronbach (1957) and Wexley & Latham (1991): 1) No aptitude treatment interaction, and 2) Disordinal aptitude treatment interaction. In both treatment conditions, performance using different training treatments has been plotted for each training group with a performance or utility level on the y-axis and aptitude on the x-axis. In Figure 1, the two treatment lines do not intersect. Figure 1 shows there is a mean difference between the treatments; aptitude is predictive of training performance. The aptitude measure in this case, although valid as an overall predictor of performance, does not predict differential performance for the two different treatments since there is no interaction between the low and high aptitude groups (Cronbach, 1957). The performance level of those individuals will increase, but the performance levels remain relative to one another using the treatment method (Treatment A or Treatment B), regardless of the aptitude level.
Figure 1
No Aptitude Treatment Interaction

<table>
<thead>
<tr>
<th>Performance</th>
<th>O</th>
<th>O + Treatment A</th>
<th>O + Treatment B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
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<td></td>
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<tr>
<td>High</td>
<td></td>
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</table>

Figure 2 indicates the two treatment lines cross because the aptitude level of the individuals differ. This result indicates that for maximal utility low and high aptitude groups should be given different training treatments (Wexley & Latham, 1991). The group with the low aptitude will learn best with Treatment A, while the high aptitude group will benefit more from Treatment B (Cronbach, 1957; Wexley & Latham, 1991).

Figure 2
Disordinal Aptitude Treatment Interaction

<table>
<thead>
<tr>
<th>Performance</th>
<th>O</th>
<th>O + Treatment B</th>
<th>O + O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
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</tr>
</tbody>
</table>

Aptitude

Low

High
According to Ackerman (1992) and Snow (1986), individual differences yield a wide range of training performance outcomes. Specifically, these individual differences (age, gender, and self-efficacy) influence the performance outcomes in various learning methods or techniques (interactive tutorial or audio visual instruction). Past studies (Snow, 1986; Snow & Lohman, 1983; Wexley & Latham, 1991) report success in predicting an individual's maximum performance, when enough training is permitted to compensate for the differences in their past abilities, and when the individual's optimal method is determined and utilized in training. For example, in a study by Snow and Lohman (1983), individuals' achievement level and GPA were determinants for the success and the use of a networking training strategy. The study revealed that low GPA individuals were successful and motivated in learning the new technique while performing poorly in a controlled or normal environment. On the other hand, high GPA individuals were less motivated in learning the training technique since they had effective learning strategies prior to training and successfully completed the task in the controlled condition. Thus, individual success in performance depended on a combination of individual
differences and an optimal training method selected for the individuals' aptitude level.

This investigation will focus on the relationship of age, gender and computer self efficacy on the effectiveness of different computer training programs. These variables have frequently been used in previous research on computer training (cf. Mumford, et. al., 1988).

Learning Style Inventory. While the focus of this paper is on aptitude differences and how they interact with training method, individual learning preferences may also affect individual computer performance. This study uses the Learning Style Inventory (Kolb, 1985), a self-report inventory that measures individual learning preferences with experiential learning (Ruble & Stout, 1991).

Kolb introduced the Learning Style Inventory (LSI) in the 1970s (Kolb, 1976) as a measure of his theory of experiential learning. The LSI was revised in 1985 to address criticisms concerning the psychometric properties of the questionnaire, such as the low test-retest reliability (correlations ranged from 0.30 to 0.71) and limited construct validity (Cornwell, Monfredo, & Dunlap, 1991). The inventory measures individual behaviors and preferences, such as cognitive, affective and psychological behaviors that are relatively stable indicators of the individual's
perception, interaction and response to the learning environment.

The four styles of the experiential learning theory are: 1) concrete experience (CE), CEs prefer to learn with the feeling mode; 2) reflective observation (RO), ROs prefer to watch; 3) abstract conceptualization (AC), AC is associated with the thinking mode; and 4) active experimentation (AE), AEs prefer to learn through doing. These modes exist in bipolar relationships in which CE and AC are bipolar opposites for a preferred level of abstractness continuum; AE and RO are bipolar for opposite ends of the preferred level of activity continuum.

The use of Kolb's LSI (1985) leads to four separate learning styles that are considered to be enduring traits. The accommodator prefers the feeling and doing styles. Individuals with this learning style have the ability to learn primarily from "hands-on" experience. The assimilator prefers the thinking and watching styles. Individuals with this learning style are best at understanding a wide range of information and putting it into concise, logical form. The diverger prefers the feeling and watching styles. Divergers have the ability to construct concrete situations from many different points of view. Lastly, the converger prefers the thinking and doing styles. Convergers are best at finding practical uses for ideas and theories. These
types of learning styles are consistent with a combination of factors involving human cognition processes as well as the different stages of experiential learning theory.

In this study using Aptitude Treatment Interaction, the present interest is whether learning can be increased by matching different training treatments (interactive tutorial and audio visual instruction) with the learning style traits (CE, RO, AC, and AE).

Age. This study will use adults as subjects for two different methods of computer training. Thus, the operational definition of the age variable is the phase of life after adolescence (18) and before retirement (65). Within this range (18 to 65), previous research has found age to be negatively correlated with computer performance (Czaja & Sharit, 1993; Gist, Schwoerer, & Rosen, 1989).

For example, Czaja and Sharit (1993) investigated the effect of age differences on the performance of computer-based work. They proposed that age differences in adulthood impact the performance levels of the individuals in computer training. The study indicated that previous computer experience among adults had a significant positive relationship on the performance of the simulated tasks. Older subjects, however, ranging from 40 to 75 displayed slower work performance and less productivity in producing computer based work.
Another study by Gist, et. al. (1989) investigated the relationship between age and computer software learning. Their study, too, concluded that the age variable resulted in a negative relationship with computer performance. Gist, et. al. (1989) proposed further research with older subjects to identify the reasons for their lower level of performance on the computer software measure.

The present investigation of age seeks to confirm whether age will negatively correlate with computer training performance success (Czaja & Sharit, 1993; Gist, et. al., 1988).

**Gender.** The development of gender role differences across the life-span has received close attention by researchers in developmental psychology (Jagacinski, et. al., 1988; Vernon-Gerstenfeld, 1989). The various characteristics that systematically covary with gender may impact individuals' computer performance. There is ample research to demonstrate that female subjects perform at a lower level on computer tasks than male subjects. Several variables have been investigated in an attempt to explain this consistent gender difference. Females tend to be more anxious and computer-phobic than males. (Chen, 1988; Jagacinski, et. al., 1988; Stevens, Bavetta, & Gist, 1993; Vernon-Gerstenfeld, 1989). Women have been found to have less computer experience and self-efficacy levels than men.
when using computers. Yet, even when these factors are controlled for, women tend to perform more poorly on computer tests than men (Chen, 1986).

Jagacinski, et. al. (1988) attempted to determine the potential causes of the observed development of gender differences in computer related fields. Their study investigated high school and college students in their rate of participation and persistence. The researchers concluded that GPA and SAT were significant predictors in determining the male and female persistence rates while computer related courses were significant predictors for males only. A reason for this differential prediction could be that males are more likely to take computer courses; further, a statistical artifact (greater variance among the male sample) may have accounted for the effect.

Other researchers (Chen, 1988; Lockheed, 1985; Stevens, et. al., 1993; Vernon-Gerstenfeld, 1989) have demonstrated that female students are less likely than males to be involved in computer related areas. Programming courses in computers are perceived as being math-oriented and therefore in the male domain (Vernon-Gerstenfeld, 1989). Thus males may simply be more predisposed to use the computer than females.

The present focus, therefore, is to examine the extent to which performance measures differ among men and women.
The use of two different computer training instructions will be used to examine if differential performance by gender can be affected by training.

**Self-Efficacy.** Self-efficacy is the belief in one's capability of performing a specific task or a certain course of behavior (Gist, et. al., 1989; Miura, 1987). People's perceptions of their capabilities are likely to influence how well they perform. Considerable research conducted within the framework of self-efficacy theory (Bandura, 1977; Gist & Mitchell, 1992; Gist, et. al., 1989; Murphy, Coover, & Owen, 1989) has supported the contention that self-efficacy can influence the choice to engage in a task, the effort put forth on that task, and the level of performance.

The individual differences in self-efficacy, as presented by Hill, et. al. (1987), indicate that some people may believe that they will never be able to interact with computers and control them. In their study, they investigated the relationship between people's computer expectations of being able to control computers and their decision to use computers. The researchers predicted that the more controllable computers were perceived to be, the more likely people were to use them. The research findings indicated that high self efficacy may enhance an individual's motivation to use computers.
Dalbey, et. al. (1986), investigated computer programming instructions among novice users. The study used teachers and computer assisted training as the training methods. The results were that teacher training methods elicited differentially effective responses and feedback. In contrast, the computer training methods provided consistent response and accurate feedback and thus enhanced the efficiency of computer instruction.

Gattiker (1992) addressed the issue of computer skills acquisition on three factors: individual factors (socio-demographic factors, abilities and motivation), individual skill factors (basic, social, conceptual, technology, and task skills), and computer training design (learning setting, teaching method, and duration of skill acquisition). According to Gattiker (1992) computer skills represented a combination of mental processes and learned behaviors. These computer skills were categorized by the potential ease of transferability from the five levels of individual skill factors. In this particular continuum, basic skills were categorized as the easiest to transfer, task skills were the hardest to transfer, while computer skills were classified as the technology skills.
Furthermore, Gattiker (1992) developed nine propositions concerning the issues of computer skill acquisition categorized as: 1) individual differences, technology-task interface and computer skills acquisition, and 2) training delivery and computer skills acquisition. In the first section, Gattiker (1992) included five propositions that reflect the relationship between task consistency and psychomotor abilities, and the relationship between person-computer interface and such variables as age, ability, and computer expertise. The second section listed the additional four propositions which describe the relationship between knowledge on the first three levels of the skill hierarchy (basic, social, and conceptual skills) and training time, as well as the relationship between the skills and training methods. Gattiker's nine propositions then provide a basic framework that supports the current investigation of the effects of age and self efficacy on learning and computer skills acquisition.

**Computer Training and Aptitude Treatment Interaction.** Adapting ATI into computer instruction was explored by Shute (1994). Shute explored the use of computer instruction as an instructional design for individuals. The individuals were either given or not given exploratory practice time. The researcher also investigated two instructional environments: rule application and rule induction. These
two environments differed in the type of feedback provided for the participants on the subject of current flow and circuit boards. In rule application, feedback was stated as a rule or known principle where the learners proceed to apply the rules and solve the problem. In contrast, rule induction provides feedback that identified relevant variables in the problem, but the learner has to induce the relationships among those variables. The aptitude level measured in this study was the final performance score of the individuals. Rule induction with exploratory practice time yielded better performance than rule application with no exploratory time, while rule application with exploratory time yielded better performance than the rule induction condition with no exploratory time. Thus, the use of the ATI model was found to be an important factor in computer instruction.

The use of computer training and ATI application in the previous study by Shute (1994) is of interest to the present investigation with respect to computer self-efficacy, age and gender differences. Shute (1994) investigated the ATI model through computer instruction and feedback input. In this study, the use of ATI and computer instruction will further investigate the role of self efficacy, age and gender differences on computer performance. Therefore, the present study measured computer training success with
Quattro Pro for Windows (Version 5, 1993), and self efficacy with the Computer Self-Efficacy Scale (Swigert, 1994).

Computer Training and Behavior Modeling. According to Gattiker (1992), past research has investigated numerous teaching methods to train individuals in educational or professional settings. The article concluded that new technologies such as videos and computer-aided instruction are popular methods used in training research.

Shahnasarian and Peterson (1988) proposed a cognitive structuring intervention or interaction in computer instruction with a video introduction to the information beforehand. This model of presentation is similar to Gist's (1989) study on the interaction between audio visual instruction and computer instruction. Behavior modeling was used by Gist, et. al. (1989) to describe a process in which a live or video taped model demonstrates the behaviors required for successful performance. Both studies investigated the advantages and the disadvantages of exposure to audio visual instruction prior to computer instructions. The advantages of audio visual instruction were that individuals become more confident in their task performance, and performed the required tasks efficiently after the audio visual presentation. The disadvantage was that computer instruction alone, without the exposure to behavioral modeling, could confirm an individual's
perception of abilities, values and interests without the use of videotape instruction or behavior modeling training (Gist, et. al., 1989).

Modeling training or behavior modeling provide learning assistance for individuals and enhances their performance (Gist, et. al., 1989). Gattiker (1992) also reported that behavior modeling seemed to be the most successful training method as compared to others including peer training and self study. The individuals are given instruction through an audio visual presentation, and then given the opportunity to imitate the model's behavior and performance. Therefore, by providing brief summaries, the behavioral modeling facilitates symbolic coding, improves retention, and enhances the individual's effectiveness and performance.

In this study behavior modeling was predicted to be an effective computer training, and one half of the subjects were exposed to audio visual instruction. A packaged video instruction on Quattro Pro for Windows (Version 5, 1993) provided by Via Graphix (1993) was used in this study. The other half of the participants explored an interactive tutorial provided by Quattro Pro for Windows (Version 5, 1993).
PRESENT INVESTIGATION

It is crucial that researchers increase the understanding of individual differences and how they affect computer training (Mumford, et. al., 1988; Snow & Lohman, 1983; Wexley & Latham, 1991). To fully appreciate the value of different computer training instructions, it is imperative to consider individual differences in age, gender and self-efficacy to assess the effectiveness of a training method (Snow, 1986).

The focus of this thesis was to investigate the interaction of two computer training methods (one with and one without the use of audio visual instruction) and individual differences in self efficacy, age, and gender differences (Ackerman, 1992; Dalbey, et. al., 1986; Shahnasarian & Peterson, 1988; Snow, 1986). Several hypotheses were made based upon the above rationale:

H1A: Age will negatively correlate with computer performance on a spreadsheet task, using Quattro Pro for Windows (Version 5, 1993).

H1B: The relationship between age and computer performance is not expected to be different for the two
training methods (interactive tutorial and audio visual training).

H2: Self-efficacy will positively correlate with computer performance.

H3: Performance will be superior in the audio visual condition for both high and low computer knowledge levels.

H4: An interaction is expected between the computer training methods (interactive tutorial and audio visual instruction) and the Learning Style Inventory's (1985) learning style of Active Experimentation and Reflective Observation. Specifically Active Experimenters are expected to perform better in the interactive tutorial condition and Reflective Observers are expected to perform better in the audio visual condition.

H5: After correcting for age and computer self efficacy on computer performance, differences in computer performance will remain for gender and computer training method.
METHOD

Subjects. A cross sectional study was conducted. Because this is a cross sectional study, the differences in ages are expected to reflect developmental cohort differences.

Subjects were recruited from undergraduate and graduate college students in California State University, San Bernardino. Only subjects with no spreadsheet experience were used. All participation in the study was voluntary. Most of the subjects were drawn from liberal arts classes (psychology, sociology and anthropology). Using Cohen's (1992) power primer table to determine the appropriate sample size for a medium effect size of 0.30, power of 0.80 at alpha = .05, a 2 X 2 Factorial Design with a sample size of 121 subjects was proposed. In fact, 171 subjects were drawn from the undergraduate and graduate classes at California State University, San Bernardino. Although the level of education within the sample is higher than within the population in general, it is nevertheless consistent within each factorial design treatment.

Measurements. For this study, the following instruments were used: Computer Self-Efficacy Scale, Computer Knowledge Test Scale, Learning Style Inventory Scale, Computer Background, Demographics, and a Performance
Task. The spreadsheet program used for the training was Quattro Pro for Windows (Version 5, 1993).

The mean, standard deviation, and alpha reliability for the measures Computer Self-Efficacy (before instruction), Computer Self-Efficacy (after instruction), Computer Knowledge Scale (before item deletion), Computer Knowledge Scale (after item deletion) and Computer Performance Scores are recorded in Tables 7, 8, 9, 10, and 11 in Appendix J.

Computer Self-Efficacy Scale. The Computer Self-Efficacy Scale (Murphy, et al., 1989) was a 33-item likert scale format used to assess the levels of computer self-efficacy (Appendix A). Three dimensions measured levels of self-efficacy for beginning users, advanced users and mainframe users. Murphy, et al. (1989) computed an internal consistency reliability for a sample of 414 graduate students, adult vocational students, and professionals (nurses) who attended computer courses in the university. The coefficient alphas were 0.97, 0.96, and 0.92 for the three factors, respectively.

For this study, results of the reliability analyses indicated alpha for Computer Self-Efficacy (before instruction) was .959 (see Table 7 in Appendix J). The alpha for Computer Self-Efficacy (after instruction) was .973 (see Table 8 in Appendix J).
Computer Knowledge Test Scale. The Computer Knowledge Test Scale was a 24-item scale survey in a multiple choice format (Appendix B). The questionnaire was used to determine the extent of the subjects' computer literacy. This scale was used to determine which students had high or low computer knowledge aptitude. To accommodate the traditional ATI model, a median split was used to group the subjects into the two levels of aptitude for Hypothesis 3.

The alpha for the Computer Knowledge Scale was .662 (see Table 9 in Appendix J). Although the reliability for the Computer Knowledge Scale was not high, it may have been expected because the scale is used as an ability test with multiple content areas. Therefore, the relatively low alpha reliability reflects that the 24 items are somewhat heterogeneous. After reviewing the item-total correlations and alphas if item were deleted for the Computer Knowledge Scale, five items were deleted from the measure (Item 5, Item 6, Item 11, Item 16, and Item 24). The alpha reliability for the second Computer Knowledge Scale was .701 (see Table 10 in Appendix J). The alpha was considered satisfactory for research purposes (Nunnally, 1978).

Learning Style Inventory Scale. The Learning Style Inventory (1985) was a 12-item scale inventory measuring individuals' ability to learn in a particular setting.
There were four sub-scales in the inventory: a) concrete experience (CE), b) reflective observation (RO), c) abstract conceptualization (AC), and d) active experimentation (AE). Ipsative and difference scoring results in two scores CE - AC, and AE - RO.

Computer Background. The computer background section was an 7-item questionnaire on the subjects' computer experience and history of using the computers (Appendix D). Sample items were: "Do you currently own a computer?", "Please list the number of courses you have taken.", and "About how many hours of computer work do you do, on average, per week?".

Demographics. The demographics section was an 8-item questionnaire on the subjects' age, gender, high school grades, high school G.P.A., Math and Verbal S.A.T. scores, year of school, and major (Appendix E). The demographic information determined whether individual differences existed for the independent variables age and gender.

Quattro Pro for Windows: Version 5. Quattro Pro for Windows (Version 5, 1993), specifically the Quattro Pro for Windows Tutorial (Appendix F), and a videotape of a Quattro Pro audio visual instruction called "Introduction to Quattro Pro" (Via Graphix, 1993) were used for the computer training conditions in this study. The Quattro Pro program allowed
the participants to create spreadsheets through step by step computer instructions.

**Computer Performance Task.** The Computer Performance Task (Baeza, 1990) consisted of 27 instructions (Appendix G) completed during the course of the experiment. All participants were asked to perform specific tasks (i.e., type the label "Loan" in cell B1 right aligned; type "+B9(B6*12)" in cell C9; Print your work; etc.) Finally, when the subjects completed and printed their spreadsheets, the researcher collected the printouts.

The alpha reliability for Computer Performance Task was .920 (see Table 11 in Appendix J).

**Procedure.** The research was conducted during the end of Winter Quarter 1995, and the beginning of Spring Quarter 1995, at California State University, San Bernardino. Subjects were recruited from introductory and psychology major (Psychology 100, 210, 301, 302s, 355) classes. The volunteer subjects were asked to sign-up and schedule a computer training session in order to participate in the experiment.

At the beginning of the experiment, the researcher introduced herself and stated the purpose of the experiment. Each subject was given an informed consent form. The informed consent form provided a detailed explanation of confidentiality, testing procedures, purpose of the study.
and the value of their participation prior to the training experiment. The subjects were informed of confidentiality for their participation in the research design, and were required to sign and date the informed consent form (Appendix H).

During the experiment, detailed instructions were given to all participants. The researcher also informed the participants that no assistance were available during the course of the experiment.

The participants then completed an 84-item survey consisting of the measures previously noted. The survey collected data for the independent variables, age, gender, computer self-efficacy, and learning style.

Subjects drawn from the college population were randomly assigned into one of the two groups: an interactive tutorial instruction group and an audio visual instruction group. The subjects had access to a personal computer. The content of the two sets of instruction was the same; only the presentation of material was different. The sessions were conducted and held in a computer laboratory room at Jack Brown Hall at California State University, San Bernardino.

Interactive Tutorial Instruction. One half of the subjects received a step by step interactive tutorial provided by Quattro Pro for Windows (Version 5.0, 1993; see
Appendix F). The tutorial was retrieved from the Quattro Pro software by clicking on the "Help" menu and selecting the "Tutorial" option. The tutorial training was uniform and consistent for all the subjects in this treatment group. The subjects received step-by-step instructions and practice for a maximum of 30 minutes before completing the performance task. The subjects explored the information on their computer monitors prior to the performance tasks' instruction.

Audio Visual Instruction. The other half of the subjects received the packaged audio-visual instruction prior to the computer performance task (Shansharian & Peterson, 1988; Gist, et. al., 1989). The packaged audio-visual instruction for Quattro Pro (1993) provided instructions of introductory materials on how to use Quattro Pro, as provided by Via Graphix (1993). The subjects viewed the narrated instruction from a television monitor and a video player. The duration of the audio video instruction was approximately 30 minutes.

After the different treatments were administered, all of the subjects were asked to complete a computer performance task (Appendix G) using the Quattro Pro (1993) spreadsheet program. The subjects then performed the requested performance tasks, demonstrating their ability in using the computer software. When the subjects completed
their computer performance task and printed their results, the researcher was notified, and she collected the subjects' materials.

After the computer training and performance task, the subjects completed a second Computer Self-Efficacy Survey. Once subjects completed and returned the second Computer Survey, the experimenter distributed written debriefing statements among the subjects. Subjects were debriefed and informed on how they could receive the results of the experiment. The debriefing statement also removed any misconceptions or anxieties that the subjects may have had concerning the study (Debriefing statement is provided in Appendix I). Appreciation was then extended for the subjects' contribution to the study. Finally, extra credit slips were distributed for the subjects' participation.

RESULTS

The statistical analyses in this study were performed using SPSS for Windows.

Characteristics of the Sample. A visual examination of the variables in this sample verified that the data were within the range of a normal distribution. There was concern on a possible restriction of range in the distribution of the age variable. The mean age was 25.465
(median = 23, minimum = 17, maximum = 63, N = 170) with only three individuals above the age of fifty.

The mean, median, minimum, maximum and sample size (N) of the subject population are presented in Table 1, for variables age, computer activity, computer at work, Wordprocessing, database, graphics, communications, other computer use, Math, Science, English, G.P.A., Math S.A.T., and Verbal S.A.T.
Table 1
Descriptive Statistics for Age, Computer Use and Educational Factors

<table>
<thead>
<tr>
<th>Description</th>
<th>Mean</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>25.465</td>
<td>23.000</td>
<td>17.000</td>
<td>63.000</td>
<td>170</td>
</tr>
<tr>
<td>Introductory*</td>
<td>0.741</td>
<td>1.000</td>
<td>0.000</td>
<td>4.000</td>
<td>170</td>
</tr>
<tr>
<td>Application*</td>
<td>0.365</td>
<td>0.000</td>
<td>0.000</td>
<td>6.000</td>
<td>170</td>
</tr>
<tr>
<td>Programming*</td>
<td>0.206</td>
<td>0.000</td>
<td>0.000</td>
<td>7.000</td>
<td>170</td>
</tr>
<tr>
<td>Mainframe*</td>
<td>0.400</td>
<td>0.000</td>
<td>0.000</td>
<td>6.000</td>
<td>170</td>
</tr>
<tr>
<td>Miniframe*</td>
<td>0.171</td>
<td>0.000</td>
<td>0.000</td>
<td>6.000</td>
<td>170</td>
</tr>
<tr>
<td>Microcomputer*</td>
<td>2.621</td>
<td>1.000</td>
<td>0.000</td>
<td>40.000</td>
<td>169</td>
</tr>
<tr>
<td>Computer Activity**</td>
<td>13.871</td>
<td>6.000</td>
<td>0.000</td>
<td>112.000</td>
<td>161</td>
</tr>
<tr>
<td>Computer at Work**</td>
<td>6.307</td>
<td>0.000</td>
<td>0.000</td>
<td>50.000</td>
<td>167</td>
</tr>
<tr>
<td>Wordprocessing***</td>
<td>62.651</td>
<td>80.000</td>
<td>0.000</td>
<td>100.000</td>
<td>168</td>
</tr>
<tr>
<td>Database***</td>
<td>5.250</td>
<td>0.000</td>
<td>0.000</td>
<td>100.000</td>
<td>168</td>
</tr>
<tr>
<td>Graphics***</td>
<td>4.383</td>
<td>0.000</td>
<td>0.000</td>
<td>95.000</td>
<td>168</td>
</tr>
<tr>
<td>Communications***</td>
<td>4.657</td>
<td>0.000</td>
<td>0.000</td>
<td>100.000</td>
<td>168</td>
</tr>
<tr>
<td>Other Computer Use***</td>
<td>7.958</td>
<td>0.000</td>
<td>0.000</td>
<td>100.000</td>
<td>168</td>
</tr>
<tr>
<td>Math</td>
<td>5.062</td>
<td>6.000</td>
<td>1.900</td>
<td>9.000</td>
<td>168</td>
</tr>
<tr>
<td>Science</td>
<td>5.961</td>
<td>6.000</td>
<td>2.000</td>
<td>9.000</td>
<td>167</td>
</tr>
<tr>
<td>English</td>
<td>6.977</td>
<td>7.000</td>
<td>2.000</td>
<td>9.000</td>
<td>168</td>
</tr>
<tr>
<td>G.P.A.</td>
<td>3.043</td>
<td>3.000</td>
<td>1.000</td>
<td>4.000</td>
<td>166</td>
</tr>
<tr>
<td>Math S.A.T.</td>
<td>502.540</td>
<td>500.000</td>
<td>300.000</td>
<td>800.000</td>
<td>50</td>
</tr>
<tr>
<td>Verbal S.A.T.</td>
<td>481.694</td>
<td>500.000</td>
<td>130.000</td>
<td>650.000</td>
<td>49</td>
</tr>
</tbody>
</table>

Note: * = years; ** = hours; *** = percentage.
In addition, the subject demographics in percentages are presented in Table 2 for the categorical variables gender, computer ownership, computer access, Class Status, and Major.

Table 2
Subject Demographics for Gender, Computer Ownership, Computer Access, Class Status, and Major

<table>
<thead>
<tr>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>32.7%</td>
</tr>
<tr>
<td>Female</td>
<td>67.3%</td>
</tr>
<tr>
<td><strong>Computer Ownership</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>56.7%</td>
</tr>
<tr>
<td>No</td>
<td>43.3%</td>
</tr>
<tr>
<td><strong>Computer Access</strong>*</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>86.7%</td>
</tr>
<tr>
<td>No</td>
<td>13.3%</td>
</tr>
<tr>
<td><strong>Class Status</strong></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>10.5%</td>
</tr>
<tr>
<td>Sophomores</td>
<td>9.4%</td>
</tr>
<tr>
<td>Junior</td>
<td>24.6%</td>
</tr>
<tr>
<td>Senior</td>
<td>40.4%</td>
</tr>
<tr>
<td>Graduate</td>
<td>14.6%</td>
</tr>
<tr>
<td><strong>Major</strong></td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td>53.2%</td>
</tr>
<tr>
<td>Liberal Studies</td>
<td>9.9%</td>
</tr>
<tr>
<td>Sociology</td>
<td>7.0%</td>
</tr>
<tr>
<td>Business</td>
<td>5.8%</td>
</tr>
<tr>
<td>Economics</td>
<td>2.3%</td>
</tr>
<tr>
<td>Other</td>
<td>19.3%</td>
</tr>
<tr>
<td>Undeclared</td>
<td>2.3%</td>
</tr>
</tbody>
</table>

Note: * = Computer access for computer owners was 100%.
Independent t-test were performed to assess any differences within the computer demographics information, and the measures as compared to the two training conditions (interactive tutorial and audio visual instruction). There was no significant difference between the two training conditions in age, the four Learning Style Inventory traits (CE-Feeling, AC-Thinking, AE-Doing, and RO-Watching), Introductory, Computer Application, and Programming courses, Mainframe, Miniframe, and Microcomputer experience, hours in computer activity, hours in using computers at work, and Computer Knowledge Scale. Of these, only the Computer Knowledge Scale, with the mean of 13.39 for the interactive tutorial group, and the mean of 14.44 for the audio visual instruction group approaches significance (t = -1.78, p = .076).

Independent t-tests were performed to assess any differences for the gender variable, and the subjects' computer experience or computer use. The variables Introductory, Applications, and Programming courses, Mainframe, Miniframe, and Microcomputer (PC) use, computer activity, computer use at work, percentage of computer use such as word processors, database, graphics, communication, and other computer use were not significant except for word processors (independent t = -2.20, 2 tail significance = .030, N = 168) in which females had more word processing
experience (mean for females = 67.407, SD = 40.132; Mean for males = 52.878, SD = 40.265), and graphics (independent t = 2.41, 2 tail significance = .019, N = 168) in which males had more graphics use (mean for males = 9.060, SD = 21.112; mean for females = 2.106, SD = 3.369).

Hypothesis 1A. Hypothesis 1A predicted that age would negatively correlate with computer performance. Using a Pearson correlation between age and computer performance scores, the hypothesis was supported (r = -.279, p < .001, N = 170). Because of a possible restriction of range, additional correlations for Hypothesis 1A removing subjects over the age of sixty (r = -.242, p = .002, N = 169) and removing subjects over the age of fifty (r = -.188, p = .015, N = 167).

Hypothesis 1B. The second hypothesis predicted that there would not be a difference in the relationship between age and computer performance within the two training methods (interactive tutorial and audio visual training). Pearson correlations between age and computer performance were performed within the two training conditions. The correlation for the interactive tutorial group was .382 (p < .001, N = 84) while the audio visual group results were r = -.132 (p = .226, N = 84).

A Fisher's r to z' transformation was performed to test for a statistically significant relationship between the two
training conditions and the age variable. The resulting z score (1.73) was not significant. Thus, the hypothesis was supported.

In addition, a moderated multiple regression was performed to assess the effect of age by training condition. Three variables were entered into the analysis: age, training, and age by training (an interaction term based on the multiplicative factor of age and training). The results of the finding indicate $R = .307$ ($R^2 = .094$), $F = 5.755$, $p < .001$. Table 3 displayed the moderated regression results which include the Betas and t tests of significance for those Betas. The interactive term was not significant.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>Beta</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age X Training</td>
<td>.177</td>
<td>.126</td>
<td>.480</td>
<td>1.400</td>
</tr>
<tr>
<td>Age</td>
<td>-.474</td>
<td>.185</td>
<td>-.570</td>
<td>-2.558*</td>
</tr>
<tr>
<td>Training</td>
<td>-3.492</td>
<td>3.340</td>
<td>-.286</td>
<td>-1.045</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>26.989</td>
<td>4.938</td>
<td>5.466**</td>
<td></td>
</tr>
</tbody>
</table>

Note: * = $p < .05$; ** = $p < .01$.

Hypothesis 2. Hypothesis 2 predicted that self-efficacy would be positively correlated with computer
performance. A Pearson correlation was used to analyze this relationship. The hypothesis was supported ($r = .226$, $p = .003$, $N = 166$) for Computer Self-Efficacy (Before Instruction). The After Instruction Computer Self-Efficacy correlation was also significant ($r = .426$, $p < .001$, $N = 161$).

**Hypothesis 3.** The third hypothesis predicted that performance would be superior in the audio visual condition, regardless of computer knowledge. An ANOVA indicated no effect for training method ($F = .417$, $p = .520$). There was, however, a significant main effect for computer knowledge ($F = 16.681$, $p < .001$). Hypothesis 3 was not supported ($F = .221$, $p = .639$). High computer knowledge individuals had a mean performance test of 16.965 (Median = 18.500, SD = 5.542, N = 86); low computer knowledge individuals had a mean score of 15.918 (Median = 14.000, SD = 6.355, N = 85). The results of the ANOVA are displayed in Table 4.
Table 4
Analysis of Variance for Computer Performance with Computer Training and Computer Knowledge Scale

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Knowledge Scale</td>
<td>595.163</td>
<td>1</td>
<td>595.163</td>
<td>16.681</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Training Methods</td>
<td>14.861</td>
<td>1</td>
<td>14.861</td>
<td>.417</td>
<td>.520</td>
</tr>
<tr>
<td>Interaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CKS Training</td>
<td>7.898</td>
<td>1</td>
<td>7.898</td>
<td>.221</td>
<td>.639</td>
</tr>
<tr>
<td>Explained</td>
<td>638.433</td>
<td>3</td>
<td>212.811</td>
<td>5.965</td>
<td>.001</td>
</tr>
<tr>
<td>Residual</td>
<td>5958.304</td>
<td>167</td>
<td>35.678</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6596.737</td>
<td>170</td>
<td>38.804</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hypothesis 4. Hypothesis 4 predicted that subjects who prefer "doing" would perform better in the interactive tutorial condition while those who prefer "watching" would perform better in the audio visual condition.

An ANOVA was performed to assess Hypothesis 4 which predicted two of the Learning Style Inventory's traits, the Active Experimentation (Doing Trait) and the Reflective Observers (Watching Trait) would interact with computer performance. Hypothesis 4 was not supported (F = .098, p = .755). There were no significant main effects found in the analysis done for Hypothesis 4. The results of the ANOVA are displayed in Table 5.
Tables
Analysis of Variance for Computer Performance with Computer Training and Learning Style Inventory

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effects</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning Style Inventory</td>
<td>103.331</td>
<td>1</td>
<td>103.331</td>
<td>2.731</td>
<td>.100</td>
</tr>
<tr>
<td>Training</td>
<td>43.343</td>
<td>1</td>
<td>43.343</td>
<td>1.145</td>
<td>.286</td>
</tr>
<tr>
<td>Interaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSI Training</td>
<td>3.697</td>
<td>1</td>
<td>3.697</td>
<td>.098</td>
<td>.755</td>
</tr>
<tr>
<td>Explained</td>
<td>136.009</td>
<td>3</td>
<td>45.336</td>
<td>1.198</td>
<td>.312</td>
</tr>
<tr>
<td>Residual</td>
<td>5941.022</td>
<td>157</td>
<td>37.841</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6077.031</td>
<td>160</td>
<td>37.981</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An initial concern was in categorizing subjects into distinct bipolar traits, instead of considering the learning modes as continuous variables. Therefore, Pearson correlations were performed on the "watching" trait with training condition \( r = .099, p = .210, N = 161 \) and the "doing" trait with training condition \( r = -.046, p = .565, N = 161 \).

Furthermore, a moderated regression was used to assess the effect of the learning traits by training condition. Five variables were entered into the analysis: the "doing" trait, the "watching" trait, training, the interaction term "doing" trait by training, and the interaction term...
"watching" trait by training. The results of the moderated regression revealed $R = .107$ ($R^2 = 0.012$), $F = .362$, $p = .874$. The Betas, and t test results are displayed in Table 6. No significant effects were found.

Table 6
Moderated Regression on the Effects of the Learning Style Inventory Traits by Training Condition

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>Beta</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do X Training</td>
<td>.038</td>
<td>.173</td>
<td>.120</td>
<td>.219</td>
</tr>
<tr>
<td>Watch X Training</td>
<td>.038</td>
<td>.164</td>
<td>.124</td>
<td>.232</td>
</tr>
<tr>
<td>Do</td>
<td>.008</td>
<td>.261</td>
<td>.009</td>
<td>.033</td>
</tr>
<tr>
<td>Watch</td>
<td>-.057</td>
<td>.227</td>
<td>-.066</td>
<td>-.250</td>
</tr>
<tr>
<td>Training</td>
<td>-1.459</td>
<td>9.491</td>
<td>-.121</td>
<td>-.154</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>16.665</td>
<td>13.406</td>
<td>1.243</td>
<td></td>
</tr>
</tbody>
</table>

Hypothesis 5. Hypothesis 5 predicted there would be a difference in computer performance task by gender and computer training condition, after correcting for age and computer self-efficacy. The means, unadjusted means, adjusted means, standard deviations, and correlations for age, computer performance, and computer self-efficacy (before instruction) are presented in Table 7.
Table 7

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Unadjusted Mean</th>
<th>Adjusted Mean</th>
<th>Standard Deviation</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer (1)</td>
<td>16.444</td>
<td>16.160*</td>
<td>16.559*</td>
<td>6.103</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td></td>
<td>17.048**</td>
<td>17.547**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (2)</td>
<td>25.465</td>
<td>25.123*</td>
<td>25.067*</td>
<td>7.361</td>
<td>-.279</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>25.345**</td>
<td>25.401**</td>
<td>.171</td>
<td>.226</td>
<td></td>
</tr>
<tr>
<td>Computer Self-Efficacy</td>
<td>3.314</td>
<td>3.256*</td>
<td>3.309*</td>
<td>.656</td>
<td>-.171</td>
<td>.226</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.380**</td>
<td>3.431**</td>
<td>(165)</td>
<td>(166)</td>
<td></td>
</tr>
</tbody>
</table>

Note: * = Interactive Tutorial Condition; ** = Audio Visual Condition.

An Analysis of Covariance (ANCOVA) was used to assess whether differences remained for gender and training method after partialling the effects of age and computer self-efficacy (before instruction). Both covariates were significant; age ($F = 13.241, p < .001$) and computer self-efficacy ($F = 6.334, p = .013$). A significant gender main effect was found ($F = 6.689, p = .011$). There was no significant effect for training method. Finally, there was no significant interaction between gender and computer training ($F = .800, p = .372$). Therefore, Hypothesis 5 was not supported. The results of the analysis are presented in Table 8.
### Table 8
Analysis of Covariance for Computer Performance with Gender and Computer Training After Correcting for Age and Computer Self-Efficacy

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig of F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Covariates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>459.861</td>
<td>1</td>
<td>459.861</td>
<td>13.241</td>
<td>.000</td>
</tr>
<tr>
<td><strong>Main Effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>232.316</td>
<td>1</td>
<td>232.316</td>
<td>6.689</td>
<td>.011</td>
</tr>
<tr>
<td>Training</td>
<td>21.020</td>
<td>1</td>
<td>21.020</td>
<td>.605</td>
<td>.438</td>
</tr>
<tr>
<td><strong>Interaction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender Training</td>
<td>27.790</td>
<td>1</td>
<td>27.790</td>
<td>.800</td>
<td>.372</td>
</tr>
<tr>
<td><strong>Explained</strong></td>
<td>960.972</td>
<td>5</td>
<td>192.194</td>
<td>5.534</td>
<td>.000</td>
</tr>
<tr>
<td>Residual</td>
<td>5522.204</td>
<td>159</td>
<td>34.731</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6483.176</td>
<td>164</td>
<td>39.532</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other Analyses. In order to test for the effect for age by gender, a moderated multiple regression was performed. The variables age, gender, and age X gender were entered into the analysis. The results of the analysis indicate $R = .372$ (R Square = .138), $F = 8.860$, $p < .001$. The moderated regression results were displayed in Table 9.
Table 9
Moderated Regression on the Effects of Age by Gender

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>Beta</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age by Gender</td>
<td>-.051</td>
<td>.151</td>
<td>-.151</td>
<td>-.336</td>
</tr>
<tr>
<td>Age</td>
<td>-.136</td>
<td>.278</td>
<td>-.163</td>
<td>-.488</td>
</tr>
<tr>
<td>Gender</td>
<td>-1.918</td>
<td>3.931</td>
<td>-.148</td>
<td>-.488</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>25.260</td>
<td>7.224</td>
<td>3.497*</td>
<td></td>
</tr>
</tbody>
</table>

Note: * = P < .01.

DISCUSSION

Almost all organizations utilize some form of "on-site" training in order to remain competitive in their industries. Further, in today's high technology environment, many companies are conducting computer training to prepare their employees with the necessary skills required of them. The ultimate objective is to equip employees with current and up-to-date skills.

This investigation explored and attempted to explain the different components of a successful training program. The study examined such factors as age, gender differences, self-efficacy level, learning style trait, computer knowledge, and computer performance as they apply to the Aptitude Treatment Interaction model. These elements have been considered to influence the acquisition of computer skills, as presented in this exploratory study.
Age. As expected, the age variable in the study proved to be a significant factor in determining an individual's computer performance. Thus, both parts of Hypothesis 1A and 1B were supported.

Past research by Czaja and Sharit (1993) and Gist, et. al. (1989) suggested a negative relationship between age and computer acquisition was likely. Both research studies investigated the effect of age differences using computer based learning. The variable age continues to be negatively correlated to performance in computer related studies, probably due to slower work performance and less productivity among older subjects (Czaja & Sharit, 1993).

In addition, young adults today (24 and under) are more than likely to have previous computer use exposure since more high schools are offering computer classes for their students. The significant negative correlation between age and computer performance in this sample may have resulted from sample subject demographics. The correlations may be spurious because of the nature of the distribution (the three oldest adults performed poorly in the computer performance task).

Gender. The study examined possible gender role differences as they relate to computer performance and outcome. This investigation revealed a significant difference between gender on computer performance as was
found by researchers Chen (1986), Jagacinski, et. al. (1988) and Vernon-Gerstenfeld (1989). Results of the ANCOVA revealed that the gender main effect was present after partiailling out the covariates of self-efficacy and age, but no significant interactions between gender and the two training methods (interactive tutorial and audio visual instruction).

Female subjects generally performed at a lower level than male subjects. A possible explanation in past studies has been that female subjects had less computer exposure and experience than male subjects (Chen 1986; Vernon-Gerstenfeld, 1989). Male subjects often have more exposure to computer use. Additionally, male dominated majors such as mathematics, engineering, and computer science could contribute to a more superior performance among male subjects due to its computer relatedness.

Interestingly, however, this sample had no significant gender differences in computer use and background, except for word processing and graphics use. Perhaps female subjects had more anxiety on the spreadsheet task. The nature of the task may have been intimidating for female subjects, thus indicating a lower performance level in the computer task. Future research of this kind may want to use a computer anxiety measure to test for this effect.
Another reason for this phenomenon could be that females tend to be more anxious in general and computer-phobic while males are more logical and math-oriented (Vernon-Gerstenfeld, 1989). Thus, the findings of this study provide additional support on the existence of gender differences with respect to computer performance.

In addition, Chen (1986) asserts that gender role differences in connection with cohort differences may affect the performance of the individuals. As discussed earlier in the results about the age differences among individuals, younger adults today (male and female) are exposed to more computer courses in high school and college. Although the level of performance differed between males and females within this cohort, their computer experience did not differ significantly. The moderated multiple regression on determining the effect of age by gender indicated that there were no significant difference between gender and age.

With this in mind, organizations might have to consider the impact of the gender role differences among their employees. Implications of prior computer experiences as an indicator of computer performance could be related to the issue of gender role differences, as well as cohort differences (Chen, 1986). The significant differences between female and male workers may potentially impact the overall effectiveness and productivity of computer the
training program. Careful consideration of all aspects of gender differences should be considered thoroughly to ensure a successful training program.

Self-Efficacy. Gist, et. al. (1989) found that individuals with a high self-efficacy level performed better than individuals with low self-efficacy. The prediction that a positive relationship between computer self-efficacy and computer performance was supported in this study (Hypothesis 2).

Previous research on self-efficacy, and computer self-efficacy specifically, revealed that the more controllable computers are perceived to be, the more likely individuals use them (Hill, et. al., 1987). Thus, a high computer self-efficacy level may enhance an individual's motivation and confidence in using a computer. As expected, a significant positive correlation between computer self-efficacy and computer performance was obtained.

There may also be possible gender differences which accounted for the support of this positive relationship. The assessment of this phenomenon revealed that male subjects rated themselves having higher computer self-efficacy than female subjects. Male subjects were probably more confident then in performing computer related task than female subjects.
Participants with high self-efficacy performed better on the computer performance than participants with a low self-efficacy score for both administrations of the Computer Self-Efficacy Scale. Furthermore, the computer performance tasks required participants to demonstrate knowledge and comprehension of a few basic features, functions, and formulas using the spreadsheet program Quattro Pro for Windows (Version 5, 1993).

Aptitude Treatment Interaction. The Aptitude Treatment Interaction (ATI) model was not supported in this study, as it pertains to computer training methods (Hypothesis 3), a result attributed to the lack of no differentiated effect for training. This finding was not consistent with Gist, et. al. (1989) which predicted that individuals given the audio visual instruction would perform significantly better than the interactive tutorial condition.

The results of the behavioral modeling training was not conclusive and contradicted past research findings (Gist, et. al., 1989). In their study, Gist, et. al. (1989) described the main advantage of using behavior modeling training is due to subjects' increase in their performance after watching someone perform specific computer tasks and then given the opportunity to imitate the behavior.

Hypothesis 3's non-significant result could be explained by examining the two training conditions. The
interactive tutorial allowed subjects to read, interact and practice basic functions and options using the spreadsheet program (i.e. inputting numbers, inputting letters, and writing formulas, etc.). The video instruction, however, did not allow students to take notes or pause the videotape and practice the basic computer functions (non-interactive). Both conditions lasted for approximately 30 minutes. If subjects in the video condition had been allowed to pause the lesson and practice in the computer, there may have been a significant difference between the two conditions.

A consideration in this study was the use of a common performance measure in comparing the interactive tutorial and audio visual training. All training instructions were consistent with the software program in the tutorial instruction. There were several critical inconsistencies within the video instruction which could deter the participants in their performance tasks (i.e. the location of the Quick Rule Menu and the Utility Bar features). For the purposes of this study, all performance measures used in both the training conditions and the performance task required the use of Quattro Pro for Windows (Version 5, 1993) application.

Hypothesis 4 was also not supported in this investigation. The Learning Style Inventory's Active Experimentation (Doing Trait) and Reflective Observation
(Watching Trait) did not reveal any significant interactions with the two training methods. The ATI model was not confirmed for this variable.

A reason for this non-significant result may be the use of a dichotomization of the AE-RO bipolar relationship. In the ANOVA analysis the AE-RO split was made using the median. Perhaps subjects who fell close to the cutoff scores could have been attributed to the misplacement of borderline subjects during the transformation of the AE-RO score. In addition, participants may have difficulty in responding to self-report questionnaires, in terms of accuracy and possible individual repression.

**Limitations of the Study.** Several reasons for the non-significant results in Hypotheses 1B, 3, 4, and 5 may have been due to the following factors: 1) fatigue effects in the duration of the two hour sessions. 2) The limitations of the Learning Style Inventory Scale as discussed in the literature review and the difficulty in self-assessing distinct personality or learning traits. 3) The applicability of the research findings in group oriented training rather than individualized training (Vernon-Gerstenfeld, 1989). The presumption was workers would benefit from a variety of training methods when given ample time to practice. Careful attention to learning styles within the context of a particular organization, as well as
the tasks to be performed could lead to a more efficient training program, although costly at times. 4) The generalizability of the results, since the findings might be idiosyncratic to this sample of college students.

Conclusion. In future years, computer technology will play an increasingly important role in organizational development. Organizations are already spending 40% of their investment dollars on computers, double their 1978 budget (Gist, et. al., 1989). The training of employees in learning computer technology should be of the highest priority, with regard to the immense organizational expenditures.

In consideration of the research findings in this study, investments in development of computer training models that accounts for such factors as age, gender differences, and computer self-efficacy may yield a more proficient and productive employee performance.
Appendix A

Computer Self-Efficacy Scale

Please CIRCLE the number which corresponds to your LEVEL OF AGREEMENT with the following statements.

**KEY:**
1 = Strongly disagree (SD)  
2 = Disagree (D)  
3 = Neither agree or disagree (N)  
4 = Agree (A)  
5 = Strongly agree (SA)

<table>
<thead>
<tr>
<th>I FEEL CONFIDENT:</th>
<th>SD</th>
<th>D</th>
<th>N</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In my abilities to use computers.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I can learn to use a computer spreadsheet program.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Entering and saving data (number of words) in a file.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Calling up data file to view on the monitor screen.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Storing software correctly.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. Handling floppy disk correctly.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. Escaping/exiting from a program or software.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. Making selections from an on screen menu.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. Copying an individual file.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. Using the computer to write a letter or essay.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. Moving the cursor around the monitor screen.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
12. Working on a personal computer (microcomputer).
13. Using a computer to make a "hardcopy" of my work.
14. Getting rid of files when they are no longer needed.
15. Copying a disk.
16. Adding or deleting information from a data file.
17. Getting software up and running.
18. Organizing and managing files.
19. Understanding terms/words relating to computer software.
20. Describing the function of computer hardware.
21. Trouble shooting computer problems.
22. Explaining why a software will or will not run on a computer.
23. Understanding the three stages of data processing.
24. Learning to use a variety of programs.
25. Using the computer to organize numbers.
26. Learning advanced skills within a specific program.
27. Using the computer to organize information.
28. Writing simple programs for the computer.
29. Using the user's guide when help is needed.  

30. Getting help for problems in the computer system.  

31. Logging on to a mainframe computer system.  

32. Logging off the mainframe computer system.  

33. Working on a mainframe computer.
Appendix B

Computer Knowledge Test Scale

Please select the response which BEST answers the question by marking the appropriate box.

1. What is the main role of a computer program?
   ( ) to put data into a computer.
   ( ) to give the computer memory.
   ( ) to tell the computer what to do.
   ( ) to let the computer know if it is doing a good job.

2. What does a modem do?
   ( ) it stores information in a computer's memory.
   ( ) it copies data from disk to disk.
   ( ) it lets you connect a joystick to a computer.
   ( ) it lets you connect a computer to a telephone line.

3. Which of the following is an input device?
   ( ) a plotter.
   ( ) a light pen.
   ( ) a dot-matrix printer.

4. Which of the following is an output device?
   ( ) a keyboard.
   ( ) a light pen.
   ( ) a plotter.

5. Which of the following was used earliest with computers?
   ( ) floppy disk.
   ( ) transistor.
   ( ) vacuum tube.
   ( ) integrated circuit.

6. Which of the following contributed most to increased use of microcomputers?
   ( ) cathode-ray tubes.
   ( ) useful software applications.
   ( ) letter-quality printers.
   ( ) hard disks.
7. Robert Jones had always paid his bills on time. However, he was denied at the bank because a computer report indicated that most of his bills had not been paid. Which of the following is the most likely explanation.
   ( ) Robert Jones' memory was wrong about paying his bills.
   ( ) The computer did not work properly.
   ( ) The wrong information was entered into the computer.
   ( ) Robert Jones did not receive his bills in the mail.

8. What is an algorithm?
   ( ) a step-by-step process for solving a given type of problem.
   ( ) a word processing program for the computer language ALGOL.
   ( ) a special procedure for interpreting computer output.
   ( ) a special program for algebra.

9. To have your microcomputer communicate with a mainframe computer in another city, you will probably need each of the following EXCEPT:
   ( ) an account on the mainframe computer.
   ( ) a modem.
   ( ) a database program.
   ( ) a terminal emulation program.

10. The visual aid that is electronically presented on the CRT screen to mark the location of the next point of input is called a(n):
    ( ) mouse.
    ( ) electronic input indicator.
    ( ) light pen.
    ( ) cursor.

11. Headers and footers:
    ( ) have to be typed into each page of the file.
    ( ) are placed in the gutter margins.
    ( ) are placed on each page automatically.
    ( ) have none of the above characteristics.
12. To edit a letter, you need to learn:
   ( ) all the features of your word processor.
   ( ) how to move blocks of text.
   ( ) how to search and replace.
   ( ) how to move the cursor, scroll text, and add and delete characters.

13. After loading his new tutorial disk into the computer, James Felty was dismayed to find that no image was displayed on the unit's CRT screen. James should immediately:
   ( ) assume the machine is broken.
   ( ) demand his money back from the vendor.
   ( ) check the machine's disk drive.
   ( ) unplug the computer before further damage occurs.

14. Programs are actually:
   ( ) hardware.
   ( ) applications.
   ( ) auxiliary equipment.
   ( ) synchronous networks.

15. George Jones just selected an option from a bar-menu of alternatives. Suddenly another set of choices appeared on the screen. This second choice is called a(n):
   ( ) icon.
   ( ) scratch pad.
   ( ) worksheet.
   ( ) pull-down menu.

16. Joyce Davis just selected option 7 from a list of possibilities in order to copy a file. Joyce is probably using a ________ interface.
   ( ) command-driven
   ( ) graphics oriented
   ( ) natural language
   ( ) menu-driven

17. Manual search and replace:
   ( ) will make a replacement each time a match is found.
   ( ) asks whether the current match should be replaced or ignored.
   ( ) will, if replacing "his" with "her", change all "history's" to "herstory's".
   ( ) will do both a and c.
18. Being able to answer "what if" questions means that spreadsheets take full advantage of the computer's ability to:

- store large quantities of data.
- perform multitasking functions.
- recalculate based upon different set of assumptions.
- transmit data across communication lines.

19. The compiler will detect ________ errors.
   - spelling
   - grammatical
   - syntax
   - tense

20. Which of these statements about the computer's memory is true?

   - each complete instruction occupies two memory cells.
   - each data item occupies two memory cells.
   - control units fetch the last instruction of a program first.
   - instructions occupy one area of memory; data reside in another.

21. Harvey Tuck works for a large chemical plant located on the Delaware. His specialty is in research methods. Many of his reports to his supervisor must be numerically oriented, and many of his numbers require scientific notation to be expressed. Harvey should strongly consider programming the computer in:

   - COBOL.
   - FORTRAN.
   - PC-DOS.
   - UNIX.

22. When a block is deleted from the document:

   - it is usually thrown away permanently.
   - it is removed into a separate area of memory called a buffer.
   - it is highlighted.
   - it is displayed in reverse video.
23. Firmware is best defined as:
   ( ) a software that has undergone complete debugging and testing.
   ( ) ROM computer circuits functioning under programmed instructions.
   ( ) hardware that has been tested to meet laboratory specifications.
   ( ) integrated circuits controlled by an arithmetic logic unit.

24. The term "bits per second" is a measure of:
   ( ) speed.
   ( ) length.
   ( ) velocity.
   ( ) capacity.
Appendix C

Learning Style Inventory Scale

Please complete the 12 sentences shown below by ranking each of the four endings according to how well you think each one fits with how you would go about learning something. Try to recall some recent situations where you had to learn something new, perhaps in your job. Then, using the spaced provided, rank a "4" for the sentence ending that describes how you learn best, down to a "1" for the sentence ending that seems least like the way you learn. Be sure to rank all the endings for each statement unit. Please do not make ties.

Example of a completed sentence set:

1. When I learn:
   4 I am happy.
   1 I am fast.
   2 I am logical.
   3 I am careful.

Remember: 4 = most like you, 3 = second most like you, 2 = third like you, 1 = least like you.

1. When I learn:
   ___ I like to deal with my feelings.
   ___ I like to watch and listen.
   ___ I like to think about ideas.
   ___ I like to be doing things.

2. I learn best when:
   ___ I listen and watch carefully.
   ___ I rely on logical thinking.
   ___ I work hard to get things done.
   ___ I trust my hunches and feelings.

3. When I am learning:
   ___ I tend to reason things out.
   ___ I am responsible about things.
   ___ I have strong feelings and reactions.
   ___ I am quiet
4. I learn by:
   ___ doing.
   ___ feeling.
   ___ watching.
   ___ thinking.

5. When I learn:
   ___ I am open to new experiences.
   ___ I look at all sides of issues.
   ___ I like to analyze things, break them into parts.
   ___ I like to try things out.

6. When I am learning:
   ___ I am an observing person.
   ___ I am a logical person.
   ___ I am an active person.
   ___ I am an intuitive person.

7. I learn best from:
   ___ rational theories.
   ___ a chance to try out and practice.
   ___ personal relationships.
   ___ observations.

8. When I learn:
   ___ I like to see results from my work.
   ___ I feel personally involved in things.
   ___ I take my time before acting.
   ___ I like ideas and theories.

9. I learn best when:
   ___ I rely on my feelings.
   ___ I rely on my observations.
   ___ I rely on my ideas.
   ___ I can try things out for myself.

10. When I am learning:
    ___ I am a reserved person.
    ___ I am a rational person.
    ___ I am a responsible person.
    ___ I am an accepting person.
11. When I learn:
   ___ I evaluate things.
   ___ I like to be active.
   ___ I get involved about ideas.
   ___ I like to observe.

12. I learn best when:
   ___ I am practical.
   ___ I analyze ideas.
   ___ I am open-minded.
   ___ I am careful.
Appendix D

Computer Background

1. Do you currently own a computer?
   ____ Yes  ____ No

2. If "No", do you have access to a computer?
   ____ Yes  ____ No

3. Please list the number of computer courses you have had in the following areas: (if none, put a "0")
   
   Introductory ____
   Applications ____
   Programming ____

4. How many years of experience do you have for the following types of computers: (if less than one year, put a "1"; if none put a "0")
   
   Mainframe  ____
   Miniframe  ____
   Microcomputer (PC)  ____

5. About how many hours per week, on average, are you engaged in computer activities?
   ____ hours (average week)

6. About how many hours per week do you use your computer at work?
   ____ hours

7. Out of 100% about how much total computer time is spent using:
   
   ____ % Wordprocessing
   ____ % Database
   ____ % Graphics
   ____ % Communications
   ____ % Other ______________ (please specify)
Appendix E
Demographics

1. What is your age? ______ years

2. What is your gender? _____ Male _____ Female

3. What is your cumulative high school grades for the following classes? (9 = A, 8 = A-, 7 = B+, 6 = B, 5 = B-, 4 = C+, 3 = C, etc.)

   Math ______
   Science ______
   English ______

4. What is your high school G.P.A.? _____
   (4 = A, 3 = B, 2 = C, D = 1, F = 0)

5. What is your Math S.A.T. score or A.C.T. Score? _____

6. What is your Verbal S.A.T. score or A.C.T. Score? _____

7. Please indicate your year of school:
   _____ Freshman
   _____ Sophomore
   _____ Junior
   _____ Senior
   _____ Graduate

8. What is your major? ___________________________
Appendix F
Quattro Pro Tutorial Narrative

Interactive Tutor Catalog: Entering Data Section.
Click on Entering Numbers.

Entering Numbers

1. This Interactive Tutor helps you write numbers into spreadsheet cells.
   Click the Next button to continue.

2. You need to select data to use.
   * To use sample data, click this button: "Sample Notebook"
   * To use your own data instead, click in an open notebook, or open another one.
   When you click the Next button, the tutor saves your notebook. You'll be able to make changes, when you exit, you'll be able to save or undo them.
   Click the Next button to continue.

3. Each page in a Quattro Pro notebook is made up of a grid of cells. Each cell is named by the row and the column that contain it. For example, cell C3 is in column C, row 3.
   Click the Next button to continue.

4. You can enter two types of data into cells: values and labels.
* Values can be numbers, formulas, or dates. You can make calculations with values.
* Labels are text entries. You can use labels as identifying text, such as column headings.

Click the Next button to continue.

5. Now you’re ready to begin.
   * Click the cell where you want to enter the number.
   * When you are satisfied with your selection, click the Next button.

6. The selector (the dark outline) appears around the active cell. Start by typing the first digit (1-9) of the number or a decimal point.
   To enter a negative number, type a minus sign before the first digit.

7. The character you type appears in the input line, and the Cancel and OK buttons appear next to the entry.
   * Continue typing the number, and include only numeric digits (or a decimal point).
   Don’t add a comma (or any other character) to mark thousands and don’t add a currency symbol, because these are part of the cell’s format.
   * When you’re finished typing the entry, either click on the OK button to complete it, or click the Cancel button to remove it.
8. The entry appears in the cell, and the Cancel and OK button disappear.
Click the Next button to continue.

9. You can now use any of these related tutors (you'll continue working with your current notebook).
Click a tutor's button, or click the Cancel button to return to the Interactive Tutor Catalog.

Interactive Tutor Catalog: Entering Data Section.
Click on Entering Text.

**Entering Text**

1. This Interactive Tutor helps you write text entries into spreadsheet cells.
Click the Next button to continue.

2. You need to select data to use.
   
   * To use sample data, click this button: "Sample Notebook"
   * To use your own data instead, click in an open notebook, or open another one.

When you click the Next button, the tutor saves your notebook. You'll be able to make changes, when you exit, you'll be able to save or undo them.
Click the Next button to continue.

3. Each page in a Quattro Pro notebook is made up of a grid of cells.
Each cell is named by the row and the column that contain it. For example, cell C3 is in column C, row 3.

Click the Next button to continue.

4. You can enter two types of data into cells: values and labels.
   * Labels are text entries. You can use labels as identifying text, such as column headings.
   * Values can be numbers, formulas, or dates. You can make calculations with values.

Click the Next button to continue.

5. Now you're ready to begin.
   * Click the cell where you want to enter the number.
   * When you are satisfied with your selection, click the Next button.

6. The selector (the dark outline) appears around the active cell.
   A text entry can begin with any letter or punctuation mark except the following: / + - $ ( @ . #
   To begin an entry with one of the above characters or with a digit (0-9), first type an apostrophe (').
   Start by typing the first character of the entry.

7. The character you type appears in the input line, and the Cancel and OK buttons appear next to the entry.
* Continue typing the label, using any characters you want (including spaces).
* When you're finished typing the entry, either click on the OK button to complete it, or click the Cancel button to remove it.

8. The entry appears in the cell, and the Cancel and OK button disappear.
   Click the Next button to continue.

9. You can now use any of these related tutors (you'll continue working with your current notebook).
   Click a tutor's button, or click the Cancel button to return to the Interactive Tutor Catalog.

Interactive Tutor Catalog: Entering Data Section.
Click on Changing Column Widths.

Changing Column Widths

1. This Interactive Tutor helps you make one or more columns wider or narrower.
   Click the Next button to continue.

2. The tutor opened a fresh copy of the sample notebook for you to work with.
   The most common reason to change column width is to make room for an entry that's too wide to fit in its cell.
   A label entry is too wide if spills across the right cell boundary, or if it's cut off by an entry in the
cell to the right: ABCDEFGHIJKL

A value entry is too wide if it appears as a row of asterisks, or if it's converted to scientific notation (containing E+ or E-): 2.3E+11 or ****

Click the Next button to continue.

3. There are several ways to change column width:
   Click the button to the left of the method you want to use.
   
   A. To make a column one character wider than its widest entry, use the Fit button. This is the quickest way.
   
   B. To set the column to any width, drag the column border. This way is best for trying out different widths.
   
   C. To set a column to an exact number of characters, use the Column Width property.

A1. Click the borders of the column or columns you want to resize.
   You can select contiguous (adjacent) columns by dragging across a group of borders.
   When the columns you want to resize are highlighted, click the Next button.

A2. Click the Fit button.

A3. Each column you select is now one character wider than its widest entry.
* To go back and try one of the other two column changing methods, click the Previous button.
* Otherwise click the Next button to continue.

B1. Click the borders of the column or columns you want to resize.
You can select contiguous (adjacent) columns by dragging across a group of borders.
You can select noncontiguous columns by clicking the first one, holding down the Control key, and clicking additional borders.
When the columns you want to resize are highlighted, click the Next button.

B2. Move the mouse pointer to the right edge of a column border until a double arrow appears.
Then drag the double arrow right to widen or left to narrow the column.
When you're satisfied with the column with, click the Next button.

B3. Each column you selected is resized to the same width.
If asterisks appear in one of the columns you resized, those entries are too wide for the new column width.
* To go back and try one of the other two column changing methods, click the Previous button.
* Otherwise, click the Next button to continue.
C1. Click the borders of the column or columns you want to resize.

You can select contiguous (adjacent) columns by dragging across a group of borders.
You can select noncontiguous columns by clicking the first one, holding down the Control key, and clicking additional borders.
When the columns you want to resize are highlighted, click the Next button.

C2. Right-click anywhere in a selected column.
Then choose Block Properties from the SpeedMenu.

C3. The block Object Inspector appears.
Choose the Column Width property.
Type the number of characters you want for the Column Width setting.
If there are other properties of the block that you'd like to change, you can do so now.
When you're finished, click OK.

C4. Each column you selected is resized to the same width.
If asterisks appear in one of the columns you resized, those entries are too wide for the new column width.

* To go back and try one of the other two column changing methods, click the Previous button.
* Otherwise, click the Next button to continue.
Interactive Tutor Catalog: Entering Data Section.
Click on Writing Formulas.

Writing Formulas
1. This Interactive Tutor helps you make calculations with formulas.
   Click the Next button to continue.
2. The tutor opened a fresh copy of the sample notebook for you to work with.
   Formulas let you add (+), subtract (-), multiply (*), and divide (/) values.
   After you enter a formula in the input line, the result of the calculation appears in the cell that contains the formula.
   For example, if the input line contains 12+10, the formula's cell contains 120.
   Click the Next button to continue.
3. Most formulas use cell references so they can operate on the contents of other cells. For example, the formula +A1+B1 displays the total of the contents of cells A1 and B1 in the active cell (C2).
4. Click the cell where you want to enter the formula.
   When you're satisfied with your selection, click the Next button.
5. Type a plus sign to begin your formula.
6. Type the contents of your formula.
For example, to multiply entries in cells B3 and B4, type B3*B4. If B3 contains 6, and B4 contains 2, the result (12) appears in the active cell.

You can type cell references, but it's faster to click a cell to enter it in a formula. Click a cell after you type an operator (+, -, *, or /). When you're finished typing the entry, either click the OK button to complete it or click the Cancel button to remove it.

7. The calculated result of the formula appears in the cell.

Click the Next button to continue.

Interactive Tutor Catalog: Entering Data Section.

Click on Totaling Columns and Rows.

**Totaling Columns and Rows**

1. This Interactive Tutor helps you use the SpeedSum button to total block of values.

   Click on the Next button.

2. The tutor opened a fresh copy of the sample notebook for you to work with.

   Whether you're totaling a row, a column, or a block, select the cells you want to total, plus one blank cell for the total in each direction.

   When you're satisfied with your selection, click the
SpeedSum button.
Click on the Next button.

3. A total appears in each blank cell.
Select the cell where a total appeared.
Click on the Next button.

4. The input line contains a formula beginning with @SUM,
followed by the beginning and ending cells that are
totaled.
@SUM is one of hundreds of @functions available in
Quattro Pro.
@Functions are computational shortcuts that can save you
lots of time.
See the Help system for additional information.
Click on the Next button.

Click on Done button to stop Tutorial.
Appendix G
Computer Performance Task

Complete the following tasks:

1. Place the coded number on your questionnaire sheet in cell A1.
2. Type the label "Loan" in cell A3. Right align.
3. Right align and type "Rate" in the same column under "Loan".
4. "Years" should be added to the same column, and right align.
5. Enter "Payment" and right align in the same column.
6. The loan is 9000 ($9,000). Type the value in B3.
7. In B4, insert the rate value as .10 (10%).
8. The loan is for 3 years. Insert 3 in cell B5.
9. Type the formula "+(B4*B5)*B3+B3)/(B5*12)" in B6.
10. Change the column-width in column B ONLY to 11 spaces.
11. Type the column-headings: "Year" in A8; "Begin" in B8; "End" in C8; and "Total" in D8. Center align all column-headings.
12. Change the column-width in column D ONLY to 15 spaces.
14. Enter the first year's beginning balance which is the Loan amount including the interest rate value by using
the formula "+(B4*B5*B3)+B3".
15. The ending balance for the first year is "+B9-(B6*12)".
16. The total in cell D9 is "Begin - End = Total".
17. Copy the first year's end value in the second year's "Begin" value.
18. Calculate the second year's end value by revising the formula from the first year's end value.
19. Calculate the total for the second year in cell D10.
20. Copy the begin value for the third year by revising the formula used in the first and second year.
21. Calculate the end value in cell C11.
22. Calculate the total value of 1997.
23. Go to the File Menu and select Print to print your work on the printer.
24. Notify experimenter that you have finished.
Appendix H
Informed Consent

The study in which you are about to participate is designed to investigate how different variables may be related to types of computer training and performance. This study is being conducted by Alexandra Adhyatman under the supervision of Dr. Janet Kottke, professor of Psychology. This study has been approved by the Institutional Review Board of California State University, San Bernardino.

In this study you will be asked to complete a Computer Survey (takes 15 minutes). After the survey is completed you will be given computer instruction for a spreadsheet software program (takes 30 minutes). Then you will be given a performance task to complete on the computer and print your results (takes 45 minutes). After the task is completed you will be asked to complete another Computer Survey (takes 10 minutes).

Please be assured that any information you provide will be held in strict confidence by the researchers. At no time will your name be reported along with your responses. All data will be reported in group form only. At the conclusion of this study, you may receive a report of the results.

Please understand that your participation in this research is totally voluntary and you are free to withdraw
at any time during this study without penalty, and to remove any data at any time during this study.

I acknowledge that I have been informed of, and understand, the nature and purpose of this study, and I freely consent to participate. I acknowledge that I am at least 18 years of age.

_________________________  _______________________
Participant's Signature     Date

_________________________  _______________________
Researcher's Signature      Date
Appendix I
Debriefing Statement

The surveys and computer task objectives that you have completed were done to assess the impact of individual differences such as age and gender differences with computer training and performance. You can be assured that your participation and confidential results will remain according to ethical and professional codes by the Institutional Review Board which oversees research involving human subjects. Group results will be available to you after the thesis is completed (approximate date of completion is June 1995). Please contact the researcher, Alexandra Adhyatman, by leaving a message at the Psychology Department at California State University, San Bernardino. A message can be left at (909) 880-5585 and I will respond to your inquiries.

To maintain the integrity of the research project, please do not reveal the contents of the survey to other potential participants. Finally, I want to extend my appreciation for your valuable contribution to the study.
Appendix J

Reliability Analyses

Table 10
Reliability Analysis for Computer Self-Efficacy (Before Instruction)

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Alpha = .959; Standardized Item Alpha = .959; N = 166.

Computer Self-Efficacy Scale: Mean = 3.314; Median = 3.318; SD = .656; Minimum = 1.333; Maximum = 4.939; N = 166.
Table 11
Reliability Analysis for
Computer Self-Efficacy (After Instruction)

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Computer Self-Efficacy Scale: Mean = 3.269; Median = 3.333; SD = .790;
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Table 12
Reliability Analysis for
Computer Knowledge Scale
(Before Item Deletion)

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Computer Knowledge Scale: Mean = 13.345; Median = 13.000; SD = 3.688;
Minimum = 1.000; Maximum = 23.000; N = 171.
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Computer Performance Task: Mean = 16.444; Median = 16.000; SD = 6.103; Minimum = .000; Maximum = 25.000; N = 171.
REFERENCES


