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The Evaluation of Company-Sponsored Test-Preparation Courses: Training Different Aged Employees on General Test-Taking Skills and Basic Cognitive Skills

Kerrie D. Quinn
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The Evaluation of Company-Sponsored
Test-Preparation Courses: Training Different
Aged Employees on General Test-Taking Skills and
Basic Cognitive Skills

by

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M.S. May 1989, Old Dominion University

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ABSTRACT

THE EVALUATION OF COMPANY-SPONSORED TEST-PREPARATION COURSES: TRAINING DIFFERENT AGED EMPLOYEES ON GENERAL TEST-TAKING SKILLS AND BASIC COGNITIVE SKILLS

Kerrie D. Quinn
Old Dominion University, 1992
Director: Dr. Terry L. Dickinson

Test performance in general has been found to decline with increasing age. However, this decline has not been accompanied consistently by lower job performance. Subsequently, factors external to the test are being more closely examined for their effects on test performance. Two such factors, a lack of general test-taking skills and a reduced level of basic cognitive skills, are thought to contribute most to the test performance of older adults. These factors occur because of the lower level of education and greater length of time since formal schooling for older adults. Accordingly, organizations have been offering test-preparation training to all employees to enhance such skills. The present research was designed to examine components of one such training program.

Three hundred thirty-six employees from a large telecommunications company received training on general test-taking skills, cognitive skills, both skills, or no training. Before and after training, participants completed a standardized set of tests as well as questionnaires

measuring their attitudinal dispositions toward test taking. A 2 (Pre-Test) by 2 (Training) analysis of variance design was utilized to examine the effects of testing at time 1 on test scores at time 2. A 4 (Experimental Training Groups) by 2 (Age Categories) by 2 (Time) repeated measures analysis of variance design was then employed to evaluate the effects of different types of training on fluid and crystal ability test score composites. Next, another variable (Prepost) was included in the design to examine test-taking dispositions before and after the tests.

Results showed pre-test and training effects; each positively influenced fluid test score composites at time 2. Findings also indicated that basic cognitive skills training positively affected crystal test score composites at time 2. Differences in fluid test scores between participants under age 40 and age 40 and over were found across time. There were no age differences for the crystal test scores. Finally, exposure to the tests and training influenced test dispositions.

This research investigation offers support for the effectiveness of training programs designed to assist adults in their test-preparation. In addition, it provides insight into test-taker dispositions, and their relationship to test scores. Possible explanations for differences in test scores and dispositions due to training and age are provided.

DEDICATION

I would like to dedicate this work to three very special people. The first two individuals are my mom and dad, Sarae and Joe Quinn. You are always there for love, guidance, encouragement, and support. Through the ups and downs, even circles and spins, you stand by me. Mom, you are a great role model; I can never thank you enough. The third very special person is my fiancée', Todd Baker. You are my best friend, lover, comic relief, and mentor. I am so fortunate to have someone like you in my life. With you, I have worked hard; now with you, I would like to celebrate!

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I. INTRODUCTION

Aging of The Workforce

The American population is aging steadily. Factors causing the shift in mean age include: longer and healthier life spans, a slowing birth rate, and baby boomers reaching their middle years. The average age of our population has risen from 23 years to over 29 years since 1900, and it is projected to climb to 38 years by the year 2035 (Sheppard & Fisher, 1982). These demographic factors indicate an emergence of an older workforce. The average age of the workforce is projected to jump from 32 to approximately 40 by the turn of the century (American Association of Retired Persons, 1990).

At the same time the workforce is aging, our economy has experienced major problems due to federal budget deficits and heightened foreign competition in world markets. One of the major consequences of these economic problems is the restructuring of parts of the economy. The restructuring is causing widespread plant closings, particularly in the manufacturing industries. While the

manufacturing sector has increased its productivity via the use of new technology in the last few years, it has done so without hiring additional workers (Hansen, 1988). As a result, there are substantial numbers of senior workers who are being displaced. The Bureau of Labor Statistics defines displaced workers as people who have lost their jobs due to plant closings, lack of work, or abolished positions, and who had significant attachment to their former positions with employment tenure of at least three years (Hansen, 1988). The displacement of many of these workers is perpetuating unemployment. Subsequently, many workers are actively searching for new jobs.

While the economy is generating new jobs for these individuals, most of the jobs are in service industries. Data from the Joint Economic Committee of Congress (Seaberry, 1986) suggest that almost 50% of the displaced blue-collar workers who lost jobs recently in the manufacturing sector will not be reemployed in their former industries. According to Hansen (1988), most of them can expect to find only lower paying jobs in the service sector.

Effects on Human Resource Practices

The older workforce and reduced economic conditions are issues that will take on increasing importance for human resources management in upcoming years (McLaughlin, 1989). For instance, many employers expect the shift in age composition of the workforce to exacerbate promotional

bottlenecks at the upper levels of organizations. Bottlenecks will develop particularly in occupations affected by the 1986 removal of mandatory retirement (Howard, 1988). In response, many organizations have confronted bottlenecks and economic conditions by offering early retirement packages.

The increasing number of older workers, combined with a shrinking supply of qualified younger workers, has caused labor shortages at the entry level to increase. Lower level positions have traditionally been held by younger generations. Subsequently, new policies and managerial practices are required that are aimed at a more effective utilization of the talents of older workers. With the smaller supply of qualified younger workers, employers may be forced to look to older persons to fill traditional entry-level jobs in the future. Thus, it is necessary for them to revise their policies and practices to ensure that they facilitate the recruitment, selection, motivation, and retention of older workers.

Effects on Employees' Careers

In order for employers to revise policies and practices, it is first important to examine how aging affects individual careers. People ranging in age from 40 to 65 are in the maintenance stage of their careers (Super & Bohn, 1970). Super and Bohn stated that individuals entering this stage have already become established in a

particular field and are near the limit of advancement. Under conditions of organizational stability, they continue to hold their own in their field in a career plateau. Yet in times such as the present, many of these same people are receiving early retirement offers because there is an abundance of people in this stage and organizations are trimming upper level positions or lower level manufacturing jobs for financial reasons. While some are choosing to retire early, there are many who either do not wish to retire or cannot financially afford to retire. Instead, they may consider a career change. As a result, for some people this becomes a time for embarking on a new career, rather than maintaining the old one (Hall, 1976).

There are also those people opting for a career change, not because their organization is "trimming the fat," but because they simply want to change their environment. Drucker (1980) noted that people remain in the same job until they become bored. They may want to switch jobs to meet different challenges or relieve responsibilities. Such individuals may accept a lateral transfer or even a demotion in return for a decreased level of pressure and constraint.

Regardless of the reason for change, a transition from one job to another for mid-career employees may be even more stressful than the move from school into a first job by younger employees (Hall, 1976). Increased stress during this period of change may result from the loss of vested

benefits, seniority, and status accumulated throughout years of service. At the same time, stress is also caused by a lack of current skills. With the increased administrative demands in mid-career, there is often little opportunity for these employees to remain current in all of the required skills. Mid-career employees may not have learned much of today's technology in their field, and perhaps even have forgotten a great deal of what was learned. So during the maintenance stage when people often make complete breaks with their old careers, much of their skill repertoire is no longer fully developed and up-to-date. Consequently, mid-career employees may be unable to perform a particular motor or cognitive task that is required for placement into a new job, causing them to feel less mobile and less attractive in the job market (Hall, 1976).

Employers' Response

Educational programs can be developed to lessen the stress associated with a career transition. According to Ansello and Hayslip (1979) and Wood (1978), education greatly facilitates continued cognitive and affective growth throughout middle and late adulthood. Organizations have therefore increased efforts to offer such programs to their employees, in order to prepare them for other positions within the organization and to minimize difficulties during the midlife period.

Most workers realize the importance of updating their

skills, and they are willing to become more educated in order to move on in their careers. Accordingly, a significant amount of learning time and effort by adults is spent in self-improvement for practical reasons (Hiemstra, 1982). More people in our society are participating in counseling programs, degree programs, conferences, retraining, and basic skill programs to develop their skill repertoire fully and to cope with changing job skill requirements. In fact, Aslanian and Brickell (1980) found that 83% of the adults participating in educational programs were doing so because of some life change (e.g., job loss).

The large volume of literature produced in the last two decades related to adult learning and education in the workplace is evidence of its increasing importance.

"Workplace training and development is now roughly equivalent in size to the entire elementary, secondary, and higher education systems" (Carnevale, 1986, p. 18).

Corporate training has grown into a \$30 billion industry. Each year, employers provide over 17.6 million formal courses to almost 15 million trainees. These figures indicate that roughly 13% of working Americans participate in at least one formal training course (Carnevale, 1986). Further, approximately two-thirds of the courses include instruction to enhance intelligence and are taught in-house.

Despite its widespread use, the amount of research devoted to workplace practices in training and development

does not equal that devoted to formal education. However, economic and technological changes are now fueling a larger interest in training and development research to ensure employees have the necessary knowledge, skills, and abilities to perform their jobs. As employers compete for a smaller qualified workforce, they are realizing they must maintain or increase their share of a shrinking economy by augmenting investments in training to attract and retain employees. Consequently, research that leads to the enhancement of training effectiveness is of growing importance.

Offering training to midlife career employees can play an important role in their successful work experience (Morgan, Patton, & Baker, 1985). More specifically, Hansen (1984) stated that employees will experience significantly lower rates of unemployment, have less income loss, and suffer fewer social pathologies (e.g., drug abuse, spouse abuse). In return, the employer retains good performers, and benefits from the employees' additional potential and value. To the extent that training is cost effective in promoting such qualities, it will be utilized in industry as a strategic tool.

Lawmakers' Response

Although organizations are opening pathways for their employees by providing training and education, problems remain. As the average age of our workforce rises, an

increasing number of age discrimination cases are being filed (Rosen, 1988; Sparrow & Davies, 1988). For example, Gribbin, Schaie, and Parham (1980) reported a 76 percent increase in age discrimination cases filed between 1977 and 1982. Recently, about 25% of all cases filed with the Equal Employment Opportunity Commission have been related to age discrimination (Morse, 1990).

A legal statute of particular relevance to these cases is the Age Discrimination in Employment Act. This Act was enacted in 1967 and amended in 1978. The purpose of the Act is threefold: 1) prohibit arbitrary age discrimination in employment, 2) help employers and workers find ways of solving problems arising from the impact of age on employment, and 3) promote employment of older persons based on ability rather than age. This statute pertains to every aspect of human resources management (e.g., recruitment, selection, training, compensation, and performance assessment).

Age and Test Performance

Although there has been a dramatic rise in the number of reported age discrimination cases in the United States, there are few empirical investigations that focus on the older worker. Of those that do exist, the majority focus on termination cases (Morse, 1990). Research is relatively scarce relating to human resource practices that take place at the start of or transition in an older worker's career

(i.e., selection and testing). Subsequently, the interpretation of differences on selection instruments and practices between older and younger individuals remains problematic (LaRue & D'Elia, 1985).

Differences on test performance for some younger and older workers have been reported by a few researchers. In one investigation, analyses were conducted on scores from a cognitive ability test used for the selection of non-managerial positions. The test was administered to individuals of various ages. The sample of older workers, however, was restricted in size. Their results showed a general and gradual decline in test scores with increasing age (Howland, Quinn, & Schneider, 1990).

In another investigation, Avolio and Waldman (1987) administered a battery of personnel aptitude tests to people working at a surface coal-mining operation. Test scores were then correlated with age. Their findings showed that a negative correlation between cognitive test performance and age was more pronounced for unskilled workers. This finding would be expected, since more intelligent older workers were more likely promoted into higher level, skilled jobs. However, Avolio and Waldman (1987) found that the correlations between age and test performance were not significantly reduced when the effect of education was held constant for skilled and unskilled workers. In contrast, Lefever, Van Boven, and Banarar (1946) found that holding

educational level constant resulted in an almost-zero correlation between age and test performance on aptitudes necessary for clerical and mechanical positions.

Despite the weak correlations found between age and cognitive test scores, research shows that certain mental abilities decline with age. For example, Craik (1977) reported that the memory system declines with age. Such a decline is thought to be due to a failure in ability to utilize more abstract codes as an individual grows older and the use of more shallow, inefficient processing modes. Cohen (1979) reported deficits in reading comprehension and language processing. Such deficits have been attributed to the failure of ability to organize information inferentially. At the most general level, therefore, decreases in mental processes of older individuals have been attributed to a disintegration of the kinds of higher-order operations that permit the integration and transfer of information (Craik, 1977; Horn & Donaldson, 1980). The breakdown of such operations may negatively affect test performance.

There is an abundant accumulation of evidence (e.g., Salthouse, 1985) which suggests that declines in mental speed also adversely affect test performance. As a result of this decline, faster presentation rates of test items have been found to heighten anxiety, create overarousal, undermine self-confidence, and reinforce a tendency toward

cautiousness (Botwinick, 1978; Falk & Kline, 1978). Such circumstances tend to lead to errors of omission (Birkhill & Schaie, 1975).

Based on this evidence, Stankov (1988) argued that if one cannot think quickly, one cannot think well. Findings and arguments like these have raised concern about testing conducted in industry. A question frequently asked is, "Is it fair to expect older workers to compete on paper and pencil tests with those considerably younger in years?" (Lefever et al., 1946, p. 351). People of various ages may possess different levels of test-taking skills that contribute to the maintenance or decline of cognitive functions pertinent to test performance. The examination of such skills may more effectively determine how individuals have developed to their current levels of test-taking. Before discussing test-taking skills in more depth, however, the effects of age on test performance will be examined.

When an individual performs poorly on a job information test, different explanations are given for that performance, depending on the age of the individual. One explanation normally given for the low performance of a younger worker on these tests is the possession of less information about the job (i.e., lack of job experience). Explanations for a low test score for an older worker, however, are more complex. Lefever et al. (1946) pointed to a few.

Lefever and his colleagues administered a number of job

information tests and aptitude tests to a group of male and female mechanics of various ages. The correlations between age and job information test scores indicated that age is not a serious handicap to the adult worker when taking job information tests. Similarly, there was no decline in performance with age on learning ability tests developed by the Air Technical Service Command. However, results of a clerical aptitude test pointed to a steady decline in typing and perceptual speed test scores with advancing age.

Likewise, when workers were given the Otis and Wonderlic intelligence tests, the older age group (50 years and over) scored lower on these tests (Lefever et al., 1946). Lefever and his colleagues thought that since some of the younger workers graduated from a high school where the Otis test was administered, it was possible that the Otis scores were higher for the younger age group because of a practice effect. In contrast, older individuals who did not have previous experience with this test generally scored lower.

Lefever et al. (1946) also discovered that many of the older individuals whose scores fell below the mean of the total population had less education. This finding coincides with Sheppard and Fisher's (1982) and Avolio and Waldman's (1987) findings that the greater an individual's age, the less formal education received by the person. According to Cijfer (1966), age-related differences in education level make the assessment of learning difficult, since an

individual's education may influence test performance. Lefever et al. (1946) concluded that the age handicap of taking paper and pencil tests was apparently in part the effect of fewer years of formal schooling and a consequent lack of experience in test taking for the older workers. In addition to less schooling, older workers were removed from the formal schooling environment for a greater length of time than younger workers. Younger workers, in contrast, had more recently been involved in formal educational programs.

Granick and Friedman (1973) arrived at similar conclusions using a range of tests including cognitive ability. According to Blum and Jarvik (1974), such findings illustrated that for older workers, who have been removed from educational experiences longer, the content of the test may be unfamiliar. As a result of their unfamiliarity with the learning tasks and assessment procedures, older workers may be confused or undermotivated, and thus not perform at their highest ability levels. Hayslip and Kennelly (1982) suggested that when the effects of noncognitive factors such as education level or time away from school are controlled, age deficits in performance are lessened.

Another factor to consider when evaluating age differences in test performance is the similarity between the type of skills used daily on the job and those required for the test. Thumin (1979) reported that different job

experiences can affect the relationship between age and test performance. For example, secretarial experience was found to off-set rates of decline on tests involving perceptual speed, finger dexterity, and eye-hand coordination. Green (1969) stated that daily activity patterns of workers were significantly related to performance on intelligence tests. Thus, it appears that the similarity between skills used frequently and those tested may moderate the relationship between age and test performance. Because of the paucity of research on this issue, however, no firm conclusions can be made.

Age and Job Performance

The relationship between a worker's age and job performance has been examined more recently. In three investigations (Avolio, Waldman, & McDaniel, 1990; Giniger, Dispenzieri, & Eisenberg, 1983; Jacobs, Hofmann, & Kriska, 1990), length of job experience, rather than age, was found to be the best predictor of job performance across occupations (i.e., the more experience on the job, the better the performance). Results of two meta-analyses (McEvoy & Cascio, 1989; Waldman & Avolio, 1986) confirmed these results. However, when job level was taken into account, there was some tendency for lower performance among older workers in specific lower level jobs. For jobs with higher levels of complexity or mastery, experience appeared to interact with age to predict performance.

Problem for Present Research

In general, research findings (e.g., Blum & Jarvik, 1974; Lefever et al., 1946) suggested that poor test performance is due in part to low levels of education, greater elapses of time since formal schooling, and less experience with recent test taking. Potential for successful job performance is therefore underpredicted by a selection test that is administered to those who have lower levels of education, greater lapses of time since formal schooling, and less experience with recent test taking.

The selection literature assumes that individuals who pass a valid cognitive test are more likely to be successful on the job. Yet, if low scores on valid tests for older workers are not substantiated by poor job performance, then it is suspected that factors external to the test itself (e.g., lack of test-taking preparation) are responsible. Such factors may be contributing to the inaccurate measurement of the competency levels of older adults. That is, even though older adults have the skills and abilities necessary for successful job performance, they cannot demonstrate their competency in a testing situation. Subsequently, the chances of these individuals passing a selection test may be reduced. Passing a test may be especially difficult for middle-aged and older adults who, in comparison to their younger counterparts, are lacking the background and skills necessary for taking tests.

In order to obtain a better estimate of true capabilities, strategies have been adopted that minimize the negative effects of extraneous factors in the testing situation. Educational efforts have recently included test-preparation training for employees. This training concentrates on general test-taking skills and cognitive skills. The primary purpose of providing training in these areas is not to increase the employees' chances of passing a test or to inflate their test scores, but to obtain accurate measurement of the basic ability reflected by the test (Bookman & Iwanicki, 1983). By doing so, selection tests can predict job performance with a higher level of accuracy. Accordingly, the present research was designed to examine components of a test-preparation program.

General Test-Taking Skills

General test-taking skills are noncognitive or ability extraneous skills (Furry & Baltes, 1973). A person who has a number of these skills is often considered to be test-wise. In a broad sense, test-taking skills are distinct from the examinee's knowledge of the test content (Diamond & Evans, 1972). Some examples of test-taking skills are: appropriate time-using strategies, careful attention to directions, careful checking of answers, appropriate confidence levels, effective guessing and deductive reasoning strategies, and appropriate levels of test anxiety (Frierson, 1986).

Because inferences about job performance are made on the basis of test performance, it is quite possible that test-taking skills may counteract or conceal the basic abilities reflected by the test and jeopardize subsequent employment (i.e., an individual may not do well on a test, giving the impression that he or she is not competent to perform a job). Several authors (e.g., Diamond & Evans, 1972; Ebel, 1965) have considered test-taking skills an additional source of variance in test scores, beyond that due to item content or random error. However, the specific amount of variance contributed by test-taking skills to test scores is unknown. Nevertheless, because test-wisness has been shown not to be highly related to cognitive ability, these authors have argued that its effect should be removed from test scores. When individual differences in test-taking skills are removed or controlled, observed test performance differences should reflect genuine differences in basic test-related ability (Furry & Baltes, 1973). Individual differences in test-taking skills can be controlled, and consequently test validities improved, by training those who are lacking in test-taking skills.

Several researchers (e.g., Ford, 1973; Sarnacki, 1979) have investigated how to train test-taking skills, in order to eliminate a possible detriment for individuals who are not test-wise. The research evidence regarding the long-term effectiveness of various training programs has been

quite positive. For example, Oakland (1972) conducted a training program in test-taking skills with Head Start classes over a six-week period. Significant differences were found on the Metropolitan Readiness Test between the experimental group and the control group on the post-test given immediately after training. However, on a second post-test given four months later, group differences were not significant. Callenbach (1973) conducted eight training sessions on test-taking skills over a four-week period with second-grade students. Experimental and control groups were tested on the Stanford Reading Test after training and again four months later. The experimental group achieved significantly higher test scores on both tests.

Samson (1985) conducted a meta-analysis of 24 studies on the effectiveness of test-taking training programs on achievement test scores. Findings indicated that training on test-taking skills produced significant improvements in students' scores on achievement tests ($\bar{r}=.33$, $p<.05$). No significant differences were found among any of the additional treatments (e.g., test anxiety reduction procedures, motivational techniques). These findings supported Sarnacki's (1979) suggestion that training on test-taking skills decreases some of the measurement errors resulting from the influence of test-wisness on test scores.

In a longitudinal study, Crehan, Koehler, and Slakter

(1974) utilized four test-taking strategies for choosing a response option to multiple-choice items: 1) select option that resembles aspect of stem, 2) eliminate options that are known to be incorrect and choose from among the remaining options, 3) eliminate similar options, and 4) eliminate those options that include specific determiners (e.g., always or never). The first and last test-taking strategies are cue-using techniques. The second and third strategies are examples of deductive reasoning techniques (Millman, Bishop, & Ebel, 1965). Crehan et al. showed that test-wiseness was a stable characteristic across several grade levels. Specifically, they concluded that: 1) the stability of test-wiseness adds to the stability of aptitude or achievement tests; 2) students low in test-wiseness tend to be penalized every time they take a test; and 3) since there seems to be little possibility of removing the effect of test-wiseness completely from standardized tests, more thought should be given to its teaching.

Wilson (1986a) conducted research with low-achieving and under-achieving sixth-grade students. Four sessions were designed to teach general test-taking skills. In the first session, the purpose of tests and test-taking habits and attitudes were reviewed. Second, students were given a checklist of study and test-taking habits for self-monitoring. In the third session, their adherence to the checklist items was reviewed. Finally, students and their

instructors discussed any problems they encountered when taking tests, and their solutions. This study showed that students who had participated in the project attained significantly higher test score averages than did students in the control group. Thus, Wilson concluded that study skills instruction can have positive effects on the academic performance of low-achieving and under-achieving individuals.

In a similar study, Frierson (1986) conducted an intervention program to teach test-taking skills to low-achieving nursing students who were preparing to take licensing exams. Findings from this research revealed that test-taking instruction in a group setting led to improved licensing exam scores. This effect of test-taking skills instruction on standardized test performance has significant implications for enhancing student performance, particularly for those who are generally expected to score below the mean on standardized achievement tests.

A number of techniques used in other efforts to help individuals to improve basic test-taking skills appear to be producing positive results. In a recent review (Wilson, 1986b), successful treatment programs included leader-structured approaches, group counseling, and counseling with study skills instruction. Wilson (1986a) pointed out, however, that although classroom guidance programs focusing on study skills and habits are now appearing in the

literature (e.g., Beale, 1981; Castagna & Codd, 1984), the impact of these programs on performance is unclear since only a portion of the programs have been experimentally evaluated.

Of those that have been evaluated, the majority have been designed to teach test-wiseness to those in childhood and young adulthood. Few comparable research projects have addressed the middle and older adult population (Willis, Blieszner, & Baltes, 1981), and none have focused on middle-age and older workers who, in light of today's economic and workforce changes, will again be required to take tests.

Test Dispositions

Other factors that may affect test performance are dispositions toward test taking. Of the various dispositions toward test taking (e.g., motivation, anxiety, ease, difficulty level), test anxiety seems to have the most effect on test performance. It is widely accepted that high levels of anxiety more often impair, rather than facilitate, performance on most cognitive tasks (Eysenck, 1982). For example, Wark and Bennett (1981) demonstrated that adults with high levels of test anxiety perform much more poorly on a reading comprehension task than those with low levels of anxiety. Subsequently, many test-taking educational programs are including efforts to reduce anxiety.

In a typical college population, it is estimated that twenty percent of the students suffer from debilitating test

anxiety (Spielberger, 1971). Oberleder (1967) has maintained that anxiety factors increase with age. In general, test anxiety has been depicted as: a possible cause of cautiousness in test situations (Botwinick, 1978); a basis for avoiding assessment entirely (Whitbourne, 1976); and a contributing factor to older persons' lower scores on tests of learning and memory (Woodruff & Walsh, 1975).

Anxiety can be described as a set of responses to a class of stimuli that have been associated in the individual's testing experiences (Sieber, 1980). An anxious person, according to Sarason (1980), is one who sees him or herself as ineffective in handling a task that is viewed as difficult, challenging, or threatening. As a result, the person expects and anticipates failure. In this context, test anxiety is defined as inefficient coping with a test situation (Vlek & Pruyn, 1984).

The anxiety a person experiences in a testing situation is of two types: the trait anxiety brought to the test; and the state anxiety evoked by details of the testing situation. According to Schwarzer (1984), state and trait test anxiety are each comprised of two components: worry and emotionality. Worry is a situation-specific personality trait with a cognitive component. Characteristics of worry include negative expectations of success, anticipation of failure, and thoughts about failure that interfere with performance by diverting the individual's attention from the

task at hand. On the other hand, emotionality is an affective, arousal-related component. Emotionality is characterized by unpleasant feelings, tensions, an anticipated loss of control over a threatening situation, and subsequent public failure. Of these two components, worry is the predominant source of test-taking interference. It takes the form of self-derogatory, self-evaluative thinking that hinders performance. Performance will improve only when the test-anxious person attends to task-relevant cognitions during the test administration (Wine, 1980).

The relationship between test anxiety and performance is frequently assumed to be monotonically negative; that is, as anxiety increases, performance decreases. Yet, some laboratory studies (e.g., Mandler & Sarason, 1952) have reported an inverted U relationship. In such a relationship, there is an optimum level of anxiety for effective performance. At this optimum level, students experience feelings of stress before a test that prompt them to study the material thoroughly. When this occurs, test anxiety may have facilitating effects on achievement.

Covington (1985) argued that the relationship between test anxiety and performance changes as an individual progresses through the achievement cycle. The achievement cycle is composed of four phases (Weiner, 1979). Initially, in the test-anticipation or evaluation stage, students assess their probability of either succeeding or failing an

upcoming test. While doing so, they make judgments about the quality and quantity of their available resources. In the second phase, test-preparation, students prepare for the upcoming test while harboring various feelings, expectancies, and cognitions regarding the appropriateness and efficiency of their study habits. The third phase, test-taking, is the stage in which anxious students experience sources of disruption like emotional tension, distractive worry or cognitions, and physical upset. Becker (1984) proposed that emotionality during this phase may impact differently on performance, depending on the amount of an individual's test preparation. In the last stage, test-reaction, students' worries, hopes, and fears are confirmed or disconfirmed depending on the quality of their test performance. As people cycle through these four phases of the achievement cycle, they may experience a number of anxious feelings to varying degrees.

The level of anxiety experienced is dependent upon a number of factors. Such factors include: the intensity of preparation, the familiarity of the test items, the estimated difficulty of the exam, the personal importance of the exam, and the confidence level in one's ability to succeed. With regard to preparation, Culler and Holahan (1980) proposed that some students are anxious simply because they are not well-prepared to take a test. In this case, anxiety is interpreted as a skill deficiency, and may

play no significant causal role in the achievement process apart from being correlated with variations in study habits. In effect, anxiety resulting from a sense of inadequate preparation after test failure eventually comes to interfere with the preparation for subsequent tests. Consequently, a closed, self-defeating loop is created (Culler & Holahan, 1980).

Depending on the familiarity and difficulty level of test items, anxiety can instill different levels of arousal. Less familiar and more difficult tests evoke more anxiety, because they are naturally failed more often. In reference to the self-defeating loop described above, excessive affective arousal may disrupt test preparation for future examinations. Inferior test performance may result, especially in difficult test situations (Sarason & Palola, 1960).

Cornelius (1984) conducted research in relation to the familiarity and difficulty level of test items. His research was based on Denney's (1982) proposal that abilities which are relevant to adults' experiences and are used often may remain relatively constant in adulthood. Unused abilities, in contrast, may decline as a function of disuse and lack of practice. To explain his theory, Cornelius gave reference to age-irrelevant and age-relevant tests. Age-irrelevant tests are defined as ability tests that show small increments or constancy with age, since they

involve more familiar content or skills. On the other hand, age-relevant tests are defined as ability tests that exhibit decrements with increasing age. Cornelius hypothesized that if age-irrelevant tests measure skills that are used in adulthood, but are not used in age-relevant tests, then ratings of the familiarity and difficulty by younger and older age groups should differ only for the age-relevant tests.

Analyses of the age group ratings confirmed his hypotheses. Overall, items on the age-irrelevant tests were rated as significantly more familiar than those on the age-relevant tests. When comparing age groups, older adults rated age-relevant tests as less familiar than did the younger adults. Older adults also rated age-relevant tests as being more difficult, and requiring more time and higher levels of effort to complete.

Results of this study indicated that adults' ratings of age-irrelevant versus age-relevant types of ability tests differed systematically on characteristics of familiarity, difficulty, and effort required. Age-irrelevant tests had comparable familiarity and difficulty levels and required equivalent effort for adults of different ages. For the age-relevant tests, however, it appeared that different patterns of intellectual aging were a function of differences in familiarity and test difficulty. In other words, age differences in age-sensitive tests reflected

generation differences (i.e., the type of skills necessary for test performance were demanded more often of younger individuals than of older individuals). If test familiarity and difficulty account for the classic pattern of aging as shown by Cornelius (1984), the implications are that practice or retesting conditions should facilitate performance on age-relevant tests, particularly for older adults.

Another factor affecting the level of anxiety experienced is the importance of a test. The arousal experienced in this case is thought to be a function of either the value of the task (Atkinson & Raynor, 1977) or the circumstances of failure. According to Deffenbacher (1978), anxiety is often task-focused and experienced as worry. The amount of anxiety can be raised or lowered accordingly, depending on whether or not personal responsibility is taken for performance results (Covington & Omelich, 1981).

Discussing the importance of a test can have motivating qualities for students. In a study by Omvig (1971), an experimental group was given information on why tests were given and the importance of performing well. Results showed that this group performed significantly better than a group who received no information. In a study with three groups of college students, Morris and Fulmer (1976) found that students performed better on tests when they were aware of

how performance would affect their grades. Similarly, Petty and Harrell (1977) found students who participated in a motivational and informational testing program exhibited higher standardized scores than students who did not participate.

An additional factor influencing a person's anxiety level is the amount of confidence he or she has in succeeding. The attribution of failure, primarily due to a lack of confidence in one's ability to succeed, has been implicated in the lowered performance of some older persons (Prohaska, Parham, & Teitelman, 1984). When a situation is of sufficient importance to the individual with regard to its expected positive and negative consequences, the level of confidence in controlling the situation becomes a crucial question. Because highly anxious individuals are likely to face higher demands from the total situation, they invest more effort into the task in an attempt to compensate for any detrimental effects on task performance (Eysenck, 1979). For these people, perceived control over task performance might be more important than the quality of task performance. Analogous to the way in which the repeated performance of a task may become familiar, gradually automatic and thereby more easily controllable, they may gradually adapt to contextual factors and gain control of the situation, thereby reducing stress.

In the event a problem arises, however, and the person

loses the sense of control over the situation, performance deficits will occur. Lavelle, Metalsky, and Coyne (1979) argued that in cases of stress and anxiety, attentional deficits may cause helplessness and depression, thereby affecting a person's capacity to perform. This is what occurs to individuals with test anxiety. Because of feelings of anxiety, depression, and helplessness, attention is shifted from the test to internal worries. Such a diversion of attention could account for a wide range of deficits in cognitive abilities seen in the adult learner (Hartley, Harker, & Walsh, 1980).

Related to this issue is Wilson's (1973) "dynamic theory of conservatism," which posits that certain genetic and environmental factors lead to feelings of anxiety, insecurity and low self-esteem. To test this theory, Wilson focused on age and rigidity, a genetic and an environmental factor, respectively. When structural path coefficients were computed, age and rigidity were found to have an impact on anxiety and motivation. Old age and high degrees of rigidity coincided with high degrees of anxiety and low degrees of motivation. It appeared that individuals who score high on rigidity measures attempt to solve tasks by using traditional strategies. In many cases, the preferred strategies do not work for new and unusual tasks, and individuals who score high on rigidity have difficulty in trying new problem-solving strategies. This inflexibility

causes them to experience failure more often, leading to a decrease in self-esteem. As a result, they become uncertain as to whether a situation can be controlled, and therefore become anxious. Consequently, rigid people try to avoid the demands of novel or unfamiliar achievement situations.

According to Wilson's theory, as people age, they tend to fall back on their own experiences. Moreover, they have acquired a certain routine of solving problems, even if the situation demands different ways of approaching a problem. So as rigidity increases with age, it is accompanied by increased feelings of anxiety and decreased achievement motivation. As a result, those with more rigid routines in midlife tend to experience more decline in psychological competence with advancing age (Schaie, 1983). Hence, from this perspective, anxiety arises from the realization that one's abilities are insufficient for the task at hand. Consequently, failure is inevitable, and feelings of inadequacy and incompetency result.

Feelings such as these were experienced by older workers in Merriam's (1987) investigation. Middle-aged and dislocated workers reported that they were fearful and that they would not be able to successfully complete a retraining course. The participants, particularly those with no college education, agreed that their age was a source of fear for returning to school. Once the course was completed, the middle-aged group rated the coursework as

being very difficult. Middle-aged women, in particular, felt that learning the material was not easy. These findings suggested that middle-aged workers returning to school have anxieties, fears, and insecurities about their ability to perform basic skills. Therefore, Merriam (1987) suggested that practitioners who teach middle-aged learners should incorporate confidence building activities and study skills into their lessons to deal with the anxiety of relearning.

Other findings in the literature are less clear as to the extent of anxiety experienced by younger, middle-aged, and older adults. Participants in Himmelfarb and Murrell's (1984) research reported age-related increases for trait anxiety. These effects were small and nonlinear. For performance anxiety, older individuals were found to be more anxious (Whitbourne, 1976) or as anxious (Ross, 1968) as younger people.

There are equally ambiguous conclusions regarding the impact of anxiety on cognitive performance for different aged adults. Cohen, Eisdorfer, Vitaliano, and Bloom (1980) found that the performance of older people was most adversely affected by high anxiety. In contrast, Costa, Fozard, McCrae, and Bosse (1976) reported no age differences. Woodruff and Walsh (1975) also did not find any performance differences among people of different ages when time pressure was minimized and they were exposed to

the testing process and the task at hand. Under these conditions, Woodruff and Walsh concluded that tests of reasoning could be given to older adults without inducing anxiety high enough to invalidate cognitive assessment.

Cognitive Skills

In addition to a lack of general test-taking skills, poor test performance may be a result of reduced levels of basic cognitive skills (i.e., mental power to answer intricate mathematical, spatial, or figural questions). Numerous employees have suggested that their level of cognitive ability decreases over time, due to a lack of use (J. Pavlakis, personal communication, October 15, 1990). That is, they are required to use few mathematical, spatial, or figural skills after their formal schooling.

Based on this explanation, test-preparation programs have recently included practice exercises with test content that requires the use of cognitive skills. Practice in this context is defined as working on problems similar in nature to those contained in the test (Bookman & Iwanicki, 1983). Practice familiarizes students with the types of problems that they should expect to encounter. This familiarity with types of test problems should increase actual performance as well as student confidence that they will perform successfully on the test.

Bookman and Iwanicki (1983) conducted an investigation in this area with school-aged children. They found that

test preparation significantly affected performance on a mathematical achievement test. The group who worked on practice problems performed significantly better than those who received a lecture on test importance and those who did not receive any type of preparation.

A few researchers have examined the influence of providing practice problems on test anxiety and fluid intelligence (i.e., intellectual abilities used to identify complex relations among stimuli and draw subsequent inferences). Labouvie-Vief and Gonda (1976) provided test-preparation training to four groups of older adults. Results indicated that the training group given items to practice showed the strongest positive effects on anxiety and fluid abilities. This type of training was superior to the other training conditions (i.e., how to perform intellectual tasks, how to cope with anxiety and failure, and no training).

Paniccuci (1974) provided training on fluid intelligence tasks to two groups. Participants in the first group practiced the tasks, without being provided specific instructions on how to solve the tasks. The second group was specifically trained in the solution of fluid intelligence tasks. Results showed that the first group significantly outperformed the second group. Similar results have been obtained by Plemons, Willis, and Baltes (1978), and Willis et al. (1981). Paniccuci's explanation

for these results was that simple exposure to problems allowed them to become familiar with upcoming cognitive tasks. As they practiced the tasks, they may have rehearsed strategies that helped them perform efficiently, with higher levels of motivation and lower levels of anxiety. Such exposure thereby resulted in a decrease in participants' anxiety levels. This explanation was confirmed by research conducted by Hofland, Willis, and Baltes (1981) who observed decreases in anxiety for those given an opportunity to practice tasks requiring fluid intelligence.

Fluid and Crystallized intelligence

The use of practice problems that require a particular component of intelligence (i.e., fluid or crystallized intelligence) for their solution has been investigated by few researchers. One reason for the small number of efforts in this area may be due to the long-time disagreement among researchers regarding the components of intelligence.

Four theoretical positions presented throughout this debate have influenced empirical research on intelligence. Spearman's work, initially conducted around the year 1904, suggested the existence of a general dimension of intelligence. This "g factor" was thought to underlie all purposeful intellectual products. Any remaining intelligence was thought to be task or item specific. This theory was embodied in Simon and Binet's family of assessment devices. Another theory of intelligence was

developed by Thorndike and Woodworth (1901). According to Thorndike and Woodworth, there were different dimensions of intelligence. Wechsler's work exemplified this approach by specifying 11 distinct scales that were later combined into two broad dimensions (i.e., verbal and mathematical). Thurstone (1938) developed a third theory in which he stated intelligence was composed of factorially simpler dimensions. These dimensions, called primary mental abilities, were included on assessment instruments developed by the Educational Testing Service. Finally, a fourth theory was developed from second-order factor analyses of the primary mental abilities conducted by Cattell (1963) and Horn (1982). These analyses have resulted in the specification of higher-order dimensions, such as fluid and crystallized intelligence.

The theory of fluid (Gf) and crystallized (Gc) intelligence is perhaps the most popular theory of individual differences in human cognition (Stankov & Chen, 1988). Both crystal and fluid intelligence involve processes such as reasoning, concept formation and attainment, problem solving, and the education of relations and correlates. In short, they both require processes typical of intelligence tests. Yet, the two components are believed to be distinct from one another. The distinction between the components is supported by neurological studies showing differential effects for brain damage and cerebral

lateralization (Stankov, 1983). Also, research on genetics shows that Gf and Gc have independent elements that are inherited. Finally, developmental evidence has indicated that Gf and Gc follow different patterns of change over one's lifespan.

Previously, the distinction between these two types of intelligence was based on the nature versus nurture argument. Cattell (1971) postulated that Gf was mostly genetically determined, whereas Gc reflected the investment of genetic potential in events emphasized by our culture. On this basis, it was assumed fluid intelligence was less amenable to changes based on learning than was crystallized intelligence. However, it is now believed that the most important feature distinguishing fluid from crystallized intelligence is the nature of, not the sheer presence of, learning that contributes to the formation of these two abilities.

According to the literature, fluid intelligence reflects largely idiosyncratic and casual learning that occurs outside organized educational systems via experience. Such learning is most often displayed in novel situations through abilities that are readily accepted as indicative of intelligence (e.g., problem-solving abilities). The basic processes of fluid intelligence involve identifying complex relations among stimulus patterns and drawing inferences on the basis of those relationships. Such processes are

measured on cognitive tasks, wherein performance is not greatly aided by an individual's breadth of knowledge (Horn, 1982). A few examples of the type of tasks that require fluid intelligence to solve are: letter series, paper folding, visual recognition, and matrices.

In contrast, crystallized intelligence reflects lessons organized in culture. It pertains primarily to factual knowledge (e.g., spelling, vocabulary, analogies, computations, mathematical word problems) that is learned via formal education. A person's level of crystallized intelligence is manifested by breadth of knowledge, sophistication, comprehension of communication, judgment, quantitative thinking, understanding of conventional interpretations, and general wisdom (Horn, 1982). All of these manifestations are influenced by an individual's motivational system of reward and punishment.

While evidence exists for Gf and Gc abilities, many researchers are speculative about the stability of these abilities over an individual's life span. Several investigators describe intellectual functioning from a normative perspective. For example, Blieszner, Willis, and Baltes (1981) postulated that intellectual functioning, in general, peaks at a young age, remains relatively stable through middle age, and then declines through old age. Bayley (1955) believed that general intelligence continues to rise to at least age 50. Similarly, Green (1969)

demonstrated that intelligence, as measured by the Wechsler Adult Intelligence Scale, continues to rise until about age 65. In contrast, some researchers (e.g., Jones, 1959; Wechsler, 1958) suggested that general intelligence declines between ages 25 and 65. Yet others, like Horn (1986) and Stankov (1988), argued that performance on both types of intelligence (Gf and Gc) increases only until about age 20. After age 20, Gc abilities remain either at the same level or improve slightly, but Gf abilities decline.

The decreases in fluid abilities, as Horn (1986) and Stankov (1988) suggest, have been detected primarily in the short-term memory and performance speed of older adults. Such declines are believed to be a result of losses in a person's capacity to maintain spontaneous alertness, intensively focus and concentrate, and be aware of organizational patterns. More limited attentional processes may also lead to declines in fluid abilities (Stankov, 1988). Such decreases in capacity are similar to behavioral changes that accompany sensory and neurophysiological changes in the body. Thus, some researchers (e.g., Horn, 1985) believe it is the loss of these capacities that lead to a decline in fluid abilities during the middle and later years of adulthood.

Other researchers, however, have investigated factors unrelated to biological deficits that may be responsible for the general decline in abilities of older adults. These

factors included: the complexity and familiarity of a situation, and the generation in which the individual was born. To examine the first factor, a longitudinal study was conducted by Schaie (1983) and Schaie and Hertzog (1986). They assessed a large number of individuals using measures of fluid and crystal abilities. On average, intelligence was found to rise into the individuals' late 30s or early 40s, then stabilize until their mid-50s or early 60s. Average decrements from age 53 to 60 were small, and they were only found for number and word fluency abilities. Beyond age 60, greater declines were reported. However, many individual differences existed (i.e., very few people showed a decline across all abilities). In fact, no individuals in their sample showed a universal decline on abilities until approximately age 80.

The results of Schaie's research showed that the level of an older individual's cognitive skills may depend on the selective maintenance of specific abilities. Abilities that are regularly utilized remain fairly constant; however, those that are not routinely utilized tend to decline, particularly in a highly challenging, complex, or stressful situation (Kliegl & Baltes, 1987). As a result, an individual's most competent behavior occurs under familiar circumstances. Thus, it appears that environmental, rather than biological, factors (e.g., stress, structure) are more responsible for decreased competence.

Schaie (1979) also examined the relationship between an individual's level of cognitive skills and the generation during which he or she was born. In his research, generation differences indicated that for many abilities, earlier generations functioned at lower levels than later generations at the same chronological age. Similarly, Flynn (1984) and Willis (1985) reported differences in levels of mental abilities across generations. These generation differences may indicate educational and environmental deficits, rather than biological declines in ability or potential.

Thus, it seems that deficits resulting from external influences (i.e., education and environment) may provide an explanation for the lower performance of older individuals. Higher levels of performance for younger individuals who had increased educational opportunities and improved life-styles indicate an advantage for later generations (Fries & Crapo, 1981). Subsequently, it appears that a biological decrement model of intelligence has been overemphasized, and intelligence is more modifiable than traditionally believed (Jarvik & Cohen, 1973). It is therefore reasonable to assume that many of the generation-related disadvantages can be compensated with suitable educational interventions (Schaie, 1990).

Currently, the literature consists of a few experimental field studies designed to examine educational

interventions in relation to intellectual abilities. One such piece of research was conducted by Caruso, Taylor, and Detterman (1985). They reviewed investigations that reported training effects on crystallized intelligence. Participants in these investigations were primarily preschoolers; however, some primary school, mentally retarded children, and adults were also included. Caruso et al. (1985) focused on a global measure of crystallized intelligence and found that 40-60% of the investigations reported negative findings for training. Those that reported positive results showed an increase only of a few points on the intelligence score.

A limited number of studies examine educational interventions related to intelligence for the adult population. Almost all of these studies focus on interventions designed to enhance fluid intelligence, since it is believed by many researchers to decline through adulthood. In one such investigation (Willis et al., 1981), participants were given extensive training on creative problem solving over a three-year period. Results showed training effectively improved older adults' performance on tasks that required the use of two fluid abilities (i.e., inductive reasoning and figural relations). These effects were maintained for three post-test occasions over a six-month period.

Research by other individuals (e.g., Denney & Heidrich,

1990; Labouvie-Vief, 1976; Willis & Schaie, 1986) also suggests that the relatively poor performance of older adults on some aspects of fluid intelligence can be enhanced with training. Denney and Heidrich (1990) investigated training effects on fluid intelligence, as measured by the Raven's Progressive Matrices. They found that performance on these matrices decreased with increasing age; however, training significantly improved performance. Further, training effects did not differ as a function of age. In sum, through training, performance on the Raven Matrices has been significantly improved.

Blieszner et al. (1981) administered a battery of tests adopted from the Adult Development and Enrichment Project (ADEPT) to older adults to investigate the effects of cognitive training on the performance of induction tasks. They found the largest training effects for fluid intelligence on tests administered one week and one month after training. Large practice effects, indicative of ability-extraneous factors like test-wiseness, were also found for the training and control groups. Blieszner et al. (1981) concluded that intellectual performance can be modified through short-term cognitive interventions, and that such modification is possible across the entire life span. Plemons et al. (1978) arrived at the same conclusions. These findings contribute to the view that middle and older adults continue to have the capacity to

benefit from training efforts (Baltes & Willis, 1982), particularly those related to fluid intelligence. However, specific types of training programs (e.g., general test-taking, cognitive skill test-preparation) have not been fully explored to identify which are most effective for these individuals on tasks requiring fluid or crystallized intelligence.

Present Research Hypotheses

Differences in test performance between younger and older adults were found by some investigators. Three explanations for the poorer test performance of older adults were: 1) a deficit in the biological make-up of older adults caused their cognitive abilities to decrease; 2) their generally high anxiety levels, low motivation levels, and high levels of helplessness led to reduced test scores; and 3) their reduced levels of education and greater elapse of time since formal schooling led to a general deficit in test-taking skills and a reduced use of cognitive skills (i.e., lack of test preparation). The final explanation was explored in the present research.

This explanation was investigated in an effort to minimize test score differences related to the lack of test preparation. Test-preparation training focused on general-test taking skills and test content. A number of strategies were included to develop general test-taking skills. These strategies included time-management techniques, deductive

reasoning strategies, and anxiety reduction methods. Exposure to test content was accomplished by practicing with problems that required fluid and crystallized intelligence to solve. Such exposure and practice was believed to increase the use of cognitive skills. These types of test-preparation materials were adopted to minimize the negative effects of external factors (i.e., lack of test preparation) that may inaccurately indicate an individual's loss in basic test-related abilities.

More specifically, the present research compared the effects of test-preparation training interventions (i.e., general test-taking skills and test-related content skills) on fluid and crystal ability test score composites. A set of experimental tests was administered to participants before (time 1) and after (time 2) the training intervention to measure differential increases across the training interventions and age categories (i.e., under 40, 40 and over). While a variety of age subgroups exist in the literature, under 40 and 40 and over age categories were chosen because of pragmatics, and the recent enactment of the Age Discrimination Law that protects those age 40 and over against discrimination in the employment setting.

Based on the research findings on test-preparation and intellectual functioning, test-preparation training was expected to influence participants' test scores and their motivational and attitudinal dispositions toward test

taking. It was expected that with training, their test dispositions would become more favorable (e.g., increased motivation, decreased anxiety) and test performance would increase. Also, participants' test dispositions were expected to be related to their test performance. For example, a decline in anxiety and an increase in motivation would be related to improved test performance.

Four hypotheses were tested in the present research. The hypotheses and their rationale are as follows:

Hypothesis 1:

Larger increases in test scores from time 1 to time 2 are expected with test-preparation training than with no training.

Corollary: The largest increase in test scores over time is expected for those who receive both types of training (i.e., general test-taking and test-related content skills). The order of the remaining training groups is as follows: test-related content skills, general test-taking skills, and no training.

Larger increases in time 2 test scores are expected after test-preparation training, because the negative effects of external factors that operate in a testing situation should be minimized. Regression analyses will help to demonstrate that individuals' skills will be updated and refreshed, causing them to be more prepared for the test. Consequently, a better estimate of test-related

ability will be obtained.

Training on general test-taking and cognitive skills, rather than on just one of these skills, should lead to larger increases in test scores because each type of training contains different information. Training on general test-taking skills focused on skills that are extraneous to the test content. These skills can be employed in many testing situations. Training on cognitive skills, on the other hand, focused on the review and practice of skills required to solve items on a particular type of test. Thus, those receiving both parts of the training are expected to be the most prepared for subsequent tests.

Of those receiving instruction either on general test-taking skills or cognitive skills, training on the cognitive skills should lead to larger increases in test scores at time 2. This portion of the course is more relevant to the content of the test; therefore, the transfer of learning should be greater from the cognitive skills training to test performance. Thus, those individuals who reviewed and practiced test-related problems exercises are expected to be the most prepared for test-taking.

Hypothesis 2:

While test scores for individuals in both age categories are expected to increase from time 1 to time 2, larger increases in fluid and crystal test scores are

expected for those age 40 and over who receive training. Therefore, test score differences between individuals in the age categories will be reduced over time.

The literature showed that older adults in general have received a lesser amount of education than younger adults. Coupled with a reduced level of education is the greater lapse of time since older adults have been in a formal school environment. As a result, older adults have not had any recent testing experiences. Therefore, the testing situation and test problems are less familiar to those in the 40 and over age category than those in the under age 40 category. The lack of preparation by older adults is likely to cause low levels of motivation and high levels of anxiety, leading to poor test performance.

Test-preparation training is expected to eliminate factors in the testing situation that are unrelated to the older adults' true abilities. Thus, while both younger and older adults are expected to benefit from the test-preparation training, a differential increase in test scores, favoring the older adults, is anticipated. The elimination of extraneous factors that have put older individuals at a disadvantage should lead to test performance at time 2 that is more comparable to that of younger individuals.

Hypothesis 3:

Of those receiving training on cognitive skills,

greater increases in test scores are expected on the fluid composite than the crystal composite.

Research has shown that fluid intelligence can be improved to a greater extent than crystallized intelligence through training interventions. Because fluid abilities are learned through idiosyncratic experience and experimentation with novel situations, whereas crystal abilities are accumulated throughout formal schooling, tests measuring fluid intelligence are expected to be most influenced by short-term training.

Hypothesis 4:

Test-preparation training is expected to lead to more positive changes in test dispositions (e.g., decreases in test anxiety) for those who received training than those who did not.

Because test anxiety has been found to affect performance negatively, methods to reduce anxiety and increase motivation constitute a large portion of training on general-test taking skills. By training individuals to be properly prepared for the testing situation and test content, they will develop more confidence in their ability to succeed than those who receive no training. Consequently, the anxiety and motivation levels for those receiving training are expected to have larger decreases and increases, respectively, than those who did not receive such instruction.

However, the largest changes in test dispositions are expected to occur in those individuals who receive training on both skill areas. They are expected to be the least anxious and most motivated before taking the second set of tests because they also refreshed their cognitive skills and practiced exercises that were relevant to the test content.

II. METHOD

Participants

Participants were 393 non-management employees of a large telecommunications company, located in five metropolitan regions along the East coast. Three hundred thirty-six participants (86 males and 250 females) completed the project, and their data were used in analyses. The ethnic origin of these participants was mixed (i.e., 119 Caucasians, 203 African Americans, 3 Asians, 1 Native American, 8 Hispanics, and 2 unidentified). At the beginning of this research, 193 of the participants were under the age of 40 and 142 of the participants were at least 40 years of age. One person did not disclose age information.

Twenty-six percent (N=88) of the participants reported graduating from high school, 55% (N=185) of the participants reported receiving some college education, and the remaining 19% (N=63) reported either graduating from college or receiving some advanced college education.

At the telecommunications company, the participants held positions from eleven different job families. These job families are: 1) Brief Non-Sales Interaction; 2) Customer Services, Sales, and Collection; 3) Technical Support; 4) Technical Administration; 5) Maintenance

Administration; 6) Clerical and Administrative Support; 7) Warehouse, Transportation, and Coin Collection; 8) Repair Service; 9) Construction Support; 10) Mechanical; and 11) Marketing. The participants had held their job titles for a mean of 6.5 years, and worked for the company for a mean of 13.5 years. Fifty-six percent of the participants (N=187) held job titles in either the second or sixth job families.

Participants were assured that the information obtained during the investigation would be reported only in aggregate form, thereby maintaining their anonymity. Individual test scores also remained confidential, unless after receiving test feedback, they chose to send their scores to the employment office.

Design

The research employed two designs that were formed from the six treatment groups shown in Table 1. The first, a Solomon (1949) Four-Group Design, was used to examine the influence of testing at time 1. For this design, a two (Pre-test) by two (Training) analysis of variance of post-test scores was conducted. Pre-test and Training were between-subject factors. The Pre-test factor represented whether participants took the tests at time 1. The Training factor represented whether participants received test-preparation training.

The Solomon Four-Group Design included only Groups 3-6. The groups differed in two respects: whether a pre-test was

administered before training, and the type of training intervention provided. In Group 3 (TBT), the pre-test was administered at time 1, participants received training for both the general test-taking and cognitive skills, and then a second set of tests was administered. In Group 4 (TXT), a control group, the pre-test was administered, participants received no formal course training, and then a second set of tests was administered. As a manipulation check for practice effects, the pre-test was not administered to Group 5 (XBT), participants did receive training for both the general test-taking and cognitive skills, and then the second set of tests was administered. Finally, in Group 6 (XXT), another control group, participants did not receive the pre-test or training, but the second set of tests was administered.

Tests were administered twice to the XXT group for company-related purposes. However, for this research investigation, only the test and questionnaire information obtained during time 1 was used. This information was treated as if it were time 2 information in the data analyses for the XXT group.

The second design in this research was a 4 (Experimental Training Groups) by 2 (Age) by 2 (Time) by 2 (Prepost Measurement) repeated measures design employed to examine the effects of different types of training. Experimental Training Groups and Age were between-subject

Table 1

Treatment Groups

TREATMENT GROUP	FIRST SET OF TESTS	TRAINING INTERVENTION	SECOND SET OF TESTS
1	Yes	Instruction on General Test-Taking Skills Only (TGT)	Yes
2	Yes	Instruction on Basic Cognitive Skills Only (TCT)	Yes
3	Yes	Instruction on Both General Test-Taking And Basic Cognitive Skills (TBT)	Yes
4	Yes	No Class Instruction (TXT)	Yes
5	No	Instruction on Both General Test-Taking And Basic Cognitive Skills (XBT)	Yes
6	No	No Class Instruction (XXT)	Yes

factors. Time and Prepost Measurement were within-subject factors. Each of these factors are defined as follows. Unlike the first design, this design included Groups 1-4. In Group 1 (TGT), the pre-test was administered, participants received training on general test-taking skills, and then the second set of tests was administered.

In Group 2 (TCT), the pre-test was administered, participants received training on basic cognitive skills, and then the second set of tests was administered. Groups 3 (TBT) and 4 (TXT) were described previously. Also, refer to Table 1.

Information provided on a questionnaire was used to place participants into one of two age categories: under age 40, or 40 years of age and over.

A within-subject factor, Time, was defined as the occasion during which participants completed questionnaires and tests. Specifically, time 1 represented the tests and questionnaires that were administered before training. Time 2 represented the tests and questionnaires that were administered after training.

Another within-subject factor, Prepost, was not included in the design when test score composites were examined. The Prepost factor was, however, included in the design when test dispositions were assessed. The Prepost factor refers to the questionnaires completed before and after test administrations at time 1 and time 2. Specifically, pre-measurement represented participants' questionnaire responses before the tests; whereas, post-measurement represented questionnaire responses after completing the tests.

Each treatment group contained 56 employees. Participants were randomly assigned to the treatment groups.

Three different classes in varied geographical regions were formed for each treatment group. Each class consisted of people from different age categories (i.e., under age 40, and age 40 and over). Also, each class contained people from different job families. An example of a schedule for two treatment groups that met all of the above requirements is given in Table 2.

Questionnaires

Participants were asked to complete several questionnaires throughout the research investigation. Before the first set of experimental tests, they were given a Background Information Sheet that requested them to provide their name, sex, race, age, education level, work site location, and current job title. It also contained questions pertaining to previous occasions on which they may have taken ability tests. See Appendix A for a copy of this questionnaire.

A questionnaire was developed to assess participants' dispositions before and after taking the tests. Before both administrations of the experimental tests, participants were given a Pre-Test Questionnaire (see Appendix B). They were asked to respond to 41 items that measured their motivational and attitudinal dispositions to tests. All of these items were adapted from Arvey, Strickland, Drauden, and Martin's (1990) Test Attitude Survey (TAS). The items were rated on a 5-point agree-disagree response scale, with

Table 2

Schedule for First Class Receiving Training Intervention

TREATMENT GROUP	TRAINING INTERVENTION	METROPOLITAN REGION
1	General Test-Taking Skills Only (TGT)	Region 1
1	General Test-Taking Skills Only (TGT)	Region 2
1	General Test-Taking Skills Only (TGT)	Region 3
2	Basic Cognitive Skills Only (TCT)	Region 4
2	Basic Cognitive Skills Only (TCT)	Region 5
2	Basic Cognitive Skills Only (TCT)	Region 1

1 anchored as strongly disagree and 5 as strongly agree. The items measure nine factors: Motivation, Lack of Concentration, Belief in Tests, Comparative Anxiety, Test Ease, External Attribution, General Need Achievement, Future Effects, and Preparation. According to the test-preparation and anxiety literature, each of these factors contributes to an individual's overall disposition towards test taking, which in turn may influence test performance. Arvey et al.

found the internal consistency reliabilities of these nine factors to be relatively high (i.e., ranging from .56 to .85). In addition to its reliability, this instrument has been found to be sensitive to different variations of employment tests.

Slight modifications were made to the items as they appear on the TAS. The items' verb tense was changed from past to future, since this instrument was completed before each test. Also, items from each factor were interspersed throughout the instrument, instead of listing all of the items from a particular factor in a group. One additional item, developed to gather information on the familiarity of the type of test problems used in the present research, was listed last on the questionnaire. Participants took approximately 25 minutes to complete both the Background Information Sheet and the Pre-Test Questionnaire.

After both administrations of the experimental tests, participants were given a Post-Test Questionnaire (see Appendix C). The items on this instrument are similar in content to those on the Pre-Test Questionnaire, with the exception of one item. This item was added to measure participants' beliefs in tests. All items on the Post-Test Questionnaire were worded in the past tense, like those on the TAS, since they were answered after each administration of the experimental tests. Participants needed approximately 15 minutes to complete this instrument.

The present research also utilized questionnaires that related to past and present educational courses, as well as other types of test-taking preparation. The first questionnaire, the Pre-Course Questionnaire, was distributed to everyone who received a training course intervention (i.e., TGT, TCT, TBT, and XBT). See Appendix D for a copy of this instrument. This questionnaire was distributed to TGT, TCT, and TBT participants after the first experimental tests and Post-Test Questionnaire were completed. Participants in the XBT group, who did not receive the first set of experimental tests, completed this questionnaire during the first session after the Background Information Sheet.

The Pre-Course Questionnaire consisted of 6 items designed to gather information from these participants about continuing education courses that they had taken in the past, both within and outside of the company. Five minutes were needed for completion of this questionnaire.

The equivalent to this instrument for those who did not receive a training course intervention (i.e., TXT and XXT) was the Test-Taking and Preparation Background Questionnaire. See Appendix E for a copy of this instrument. Like the Pre-Course Questionnaire, this instrument was completed after the first tests and Post-Test Questionnaire. It consisted of 5 items designed to gather information from these participants about continuing

education courses that they had taken in the past, both within and outside of the company. Five minutes were needed for completion of this questionnaire.

After everyone completed the second set of experimental tests and Post-Test Questionnaire, those participants who received some type of formal course instruction completed the Post-Course Questionnaire (see Appendix F). This instrument was designed to obtain feedback regarding the course content and delivery. On this instrument, participants were asked to rate 25 statements, using a 5-point agree-disagree scale with 1 anchored as strongly disagree and 5 as strongly agree. There was also a question asking participants to report the number of hours they spent outside of class on test-related preparation. At the end of the instrument, space was provided for any additional comments. This questionnaire took approximately 15 minutes to complete.

Finally, those participants who received no course instruction (i.e., TXT and XXT) completed the Review Questionnaire (see Appendix G). This instrument was completed after they had finished the second set of experimental tests and Post-Test Questionnaire. It consisted of two items, and was designed to obtain information about the amount and type of test-preparation that participants had undertaken on their own since taking the first set of experimental tests. This questionnaire was

completed in approximately 5 minutes.

Experimental Tests

Seven standardized paper and pencil tests in multiple-choice format were used in this research investigation. These tests were extracted from a non-management test battery and an entry-level management test battery designed to reflect cognitive ability factors required for the performance of a variety of jobs within the company.

Non-Management Test Battery

Three of the tests used in this research were selected from a non-management selection test battery composed of 16 tests. The three tests were chosen on the basis of their shared importance to the performance of numerous jobs (i.e., the three tests are included in a number of non-management test batteries for craft, clerical, and customer contact jobs), and the company's subsequent interest in providing education to its employees that is related to these particular tests.

Each test was relatively short, in terms of the number of items and amount of time required for its administration. Two parallel forms of each test, developed by Kehoe (1983), were used in the present research. Participants received one form of the tests during time 1 and the second form of the tests during time 2.

The content of each test was similar to the content of exercises included in the training on basic problem-solving.

The three tests in the non-management test battery are described next.

Test 1-Detail Perception. This test was composed of 56 problems, requiring 6 minutes to complete. The problems were separated into six timed sections, and measured the ability of perceptual/clerical speed. In this test, the examinees were required to make very rapid perceptual discriminations among a series of four pairs of names, addresses, telephone numbers, dollars and cents, letters, combinations of letters and numbers, or geometric symbols arranged in adjacent rows. They were to identify which pair contained a difference or discrepancy in corresponding elements. The other three of the four pairs had no errors or mistakes. This activity resembled tasks such as proofreading or inspecting objects on an assembly line.

Test 2-Computational Facility. This 10-minute test contained 20 problems. The problems were designed to measure an examinee's ability to carry out numerical computations, involving addition, subtraction, multiplication and division with fractions, decimals and percentages. The problems were expressed frequently in time or monetary units.

Test 3-Number Groups. The purpose of this 10-minute test was to measure inductive reasoning skills. Twenty three- or four-digit number sets were presented to the examinee. The number set that was different from the other

three sets in terms of an inferred principle had to be identified.

Kehoe (1984) assembled summary statistics for each of the tests from a number of past reliability and validation studies. Because of the populations' degree of heterogeneity, the reliabilities for the tests were adjusted accordingly. This was accomplished by computing a "standard" reliability for each test-sample combination (Lord & Novick, 1968). The "standard" reliability values were then averaged across samples to yield a single "standard" index of reliability for each test (Kehoe, 1984). The following are the average "standard" reliabilities, corrected for range restriction, for each of the tests described above: Detail Perception (.92), Computational Facility (.80), and Number Groups (.83). Average observed internal consistency reliabilities (i.e., alpha coefficients) were reported as follows: Detail Perception (.72), Computational Facility (.77), and Number Groups (.80).

Entry-Level Management Test Battery

The remaining four tests used in the present research comprise one of the selection batteries that candidates must successfully complete for the company's entry-level managerial positions. Prior to the present research investigation, non-management employees had to be nominated by their supervisors to take this test battery with the

prospect of a possible promotion into the management ranks. Soon before this research investigation began, the company policy changed, allowing non-management employees to nominate themselves to take this test battery. Consequently, the company quickly identified the growing need for a test-preparation course that would help employees refresh their basic cognitive skills necessary for this test battery.

Similar to the tests selected from the non-management test battery, these tests were relatively short, in terms of the number of items and amount of time required for their administration. Two parallel forms of each test, developed through studies conducted by Adams (1983), were used in the present research. Participants received one form of the tests during the first meeting, and received another form of the tests during the last meeting of the investigation.

The content of each entry-level management test was similar to the content of exercises included in the training on basic problem-solving. The four tests in the entry-level management test battery are described next.

Test 1-Quantitative. This 20-minute test measured the ability to solve mathematical computations. Individuals were given 50 problems that contained two quantitative statements. They were requested to determine if one statement was larger than the other, if the two statements were equal, or if not enough information was given to determine the quantitative relationship.

Test 2-Writing Fluency. Individuals were given 10 minutes to complete 20 problems. In this test, the examinee's ability to recognize correct spelling and appropriate grammatical structure was measured. A sentence with three underlined parts was presented. Individuals were asked to indicate which if any of the three underlined parts was in error.

Test 3-Reading Accuracy. This test contained 20 problems, and required 10 minutes to complete. The purpose of this test was to measure an individual's ability to read and comprehend verbal statements. Individuals were presented with a sentence containing an underlined word. The meaning of the word had to be derived from the content of the rest of the sentence in which it was embedded. The individual then had to select the definition of the underlined word from four alternatives.

Test 4-Following Directions. This 10-minute test contained 24 problems designed to measure the ability to follow directions as well as resistance to interference. Individuals were presented with 14 written directions that asked them to locate a number in a matrix. While completing the written problems, a series of 10 recorded spoken directions periodically interrupted the examinees, asking previous answers to be changed.

According to Adams (1982), the internal consistency reliabilities (i.e., alpha coefficients) for each of the

tests are as follows: Quantitative (.91), Writing Fluency (.61), Reading Accuracy (.71), and Following Directions (.85).

Classification of tests

Each test was classified according to whether the problems in that test required more of a participant's fluid or crystal abilities to solve. Seven people served as raters. Each rater was a company employee in the department responsible for the development and administration of selection test batteries; therefore, all raters were very familiar with the tests.

The following procedure was used to classify each test. First, raters were provided with detailed definitions of fluid and crystal abilities (Horn, 1982). They were also given examples of exercises and tests that have been used in the past to measure each type of ability (Horn, Donaldson, & Engstrom, 1981). Second, each rater was given a sample of items from 16 perceptual and cognitive tests in the Basic Skills Tests battery for Business, Industry, and Government (Psychological Services, Inc., 1985). Raters were given time to review the definitions and sample items. They then independently formulated ratings for each sample test. Each rating was based on three choices: the test measured fluid abilities, the test measured crystal abilities, or the test could not be categorized because the rater was undecided as to what ability was being measured. Each item was then

discussed as to whether it required fluid or crystal ability to solve using a consensus meeting format. That is, ratings were presented one rater at a time, rationales were presented when any discrepancies occurred, and ratings were discussed until a consensus rating for each item was reached by the raters.

Next, raters were presented with a description, as well as a sample item, from each test used in the present investigation. Based on definitions and examples given earlier, they were asked to rate each test as to whether it required fluid or crystal ability to solve using the same consensus meeting format.

As a result of this process, the following inter-rater reliabilities for each test were computed using individual ratings: Detail Perception (.86), Computational Facility (1.00), Number Groups (1.00), Quantitative (1.00), Writing Fluency (1.00), Reading Accuracy (1.00), and Following Directions (.71). Consensus ratings were then used to classify each test, producing the following results. For purposes of this research, three tests, Detail Perception, Number Groups, and Following Directions, were classified as requiring more of an individual's fluid intelligence to solve. The test scores on these three tests were combined to form a fluid ability test score composite. The remaining four tests, Computational Facility, Quantitative, Writing Fluency, and Reading Accuracy were classified as requiring

more of an individual's crystal intelligence to solve. The test scores on these four tests were combined to form a crystal ability test score composite. These composites were used for data analyses.

Administration of Tests and Questionnaires

Seven individuals administered the questionnaires and experimental tests during this investigation. Five of these individuals were employed at the company's headquarters in the department responsible for the development and administration of selection tests. The remaining two individuals were company employees in human resources departments located in metropolitan areas. All administrators were familiar with the test materials and testing procedures.

For the test administrators, a one and one-half hour training session was conducted. During training, their function was reviewed and a 25-page training manual was distributed. The training manual included: an outline of necessary supplies (e.g., pencils, tests, answer sheets, questionnaires, stop watch), a list of general testing guidelines (e.g., arrive at the test site early, seat test-takers diagonally from one another), verbatim instructions for administering the questionnaires and tests, time limits for each section, and anticipated questions and answers. Appendix H contains the training material for the first testing session that occurred before participants received

training. Appendix I contains the training material for the second testing session that occurred after participants received training. Because most of the administrators had previously given the tests used in the present research, much of the time in training was spent reviewing directions for administering the questionnaires, and discussing anticipated questions and answers.

Test administrators were randomly assigned to each testing session. Each administrator gave tests throughout the entire project across several metropolitan regions.

Test-Preparation Course

The test-preparation course examined in this research was developed for the telecommunication company as part of a larger company-sponsored continuing education program. This particular test-preparation course was designed to help employees prepare for a company employment test by familiarizing them with test-taking procedures, conditions, content, and materials. The focus of the course was on improving general test-taking skills, refreshing cognitive abilities, and developing cognitive speed through specially designed exercises.

All non-management employees had the opportunity to enroll in the test-preparation course free of charge. The course was scheduled to meet for three hours per session. Like other continuing education courses offered by the company, the course was taught by professional instructors

after work hours at convenient company locations within the most populated metropolitan regions. The number of regional locations for the course was determined by employee demand.

Enrollment in company-sponsored continuing education courses was entirely voluntary. A course could be taken at any point in an employee's career, as often as desired, and for whatever reason (e.g., to qualify for a different or higher rated job, to apply skills to personal life, to keep abreast of technological and other changes). The majority of participants in the continuing education program enrolled to improve job-related skills or knowledge, develop professionally, or qualify for different or higher rated jobs (Kugle, 1991). Yet, the number of people taking an employment test before and after course completion was relatively small (J. Schneider, personal communication, 1991).

Three different versions of a test-preparation course were examined in this research. As suggested by Lykins (1989), this arrangement allowed a more thorough examination of course content, so as to determine the specific types and content of instruction that are effective or ineffective, and why. One version of the course consisted of instruction designed to improve general test-taking skills. A second version consisted of instruction designed to refresh basic cognitive skills and provide practice on related exercises. The third version consisted of both types of instruction.

Each course was highly structured. The designs of the courses are described next.

General Test-Taking Course

The first version of the test-preparation course lasted six hours (i.e., two 3-hour sessions) and included instruction only on general test-taking skills. See Appendix J for an outline of the general test-taking material and specific information provided to the instructors; however, proprietary handouts are not included. This material contained general test-taking information and techniques that are considered important by previous researchers for their effects on test dispositions and performance (e.g., Alford, 1979; Sherman & Wildman, 1982).

As discussed previously, successful test taking is much more than knowledge of material; it involves special skills that people must develop and integrate into their test-taking strategies. The first version of the course was designed to teach such test-taking skills and techniques, and to develop awareness of the advantage of using these strategies to enhance test results (Training and Education Department, 1989).

Several general test-taking skills and techniques were taught throughout the course via discussion, handouts, and exercises designed for skill application. During the first session, participants were provided with general test-taking information. For example, participants were introduced to

the various uses of tests so that they would understand the prevalence of testing. A handout reviewed how tests are used in educational, industrial, counseling, and research settings. Next, various types of tests and the fact that employment tests are primarily objective, rather than subjective, were discussed. This discussion was included to reduce any perceptions of test bias or a lack of fairness in the employment setting. Also, an employment test's relationship to the job was reviewed to ensure participants understood the necessity and importance of taking a test. By discussing this information, as educational researchers like Covington and Omelich (1981) and Morris and Fulmer (1976) suggested, individuals' anxiety levels could decrease and motivation levels could increase in a test-taking situation.

The first session also included course material that focused on the concept of "test-wiseness" and specific types of test-taking skills (Alford, 1979). The purpose of the course was presented to provide an overview of how the course could assist participants. This presentation was then followed by a discussion of participants' own expectations of the course to focus their energy and effort toward accomplishing desired course objectives.

Next, the positive effects of test-preparation in terms of building confidence and reducing test anxiety were presented. For stress management in a testing situation,

participants were instructed on how to manage stress through various physical and mental activities, and numerous timed exercises. For example, physical activities for relaxation before and during a testing situation were discussed and demonstrated. Mental activities for managing test anxieties and pressures, related to Eysenck's (1979) concept of perceived control over task performance, were then reviewed.

Then, the instructor reviewed basic principles important to every test, such as managing time and completing answer sheets (Sherman & Wildman, 1982). For the time management instruction, a handout pertaining to methods of improving speed and accuracy was distributed. These methods were applied through timed exercises.

The next section of the course involved an in-depth examination of multiple-choice tests, since those types of tests are common to employment settings. During this section, instructors reviewed: the structure of multiple-choice items, different types of directions, general strategies (e.g., spotting key words or phrases, selecting the best alternative), and specific deductive reasoning and cue-using strategies (e.g., identifying similar and conflicting options, grammatical cues) discussed by Sherman and Wildman (1982) and Woodley (1978). Based on the general findings in the educational and testing literature, the teaching of each of these strategies was designed to encourage participants to feel unintimidated by an

unfamiliar problem, and to build their confidence for answering a difficult problem. Throughout this section of the course, handouts were distributed and exercises were administered in order for participants to understand and apply the mechanics involved in taking multiple-choice tests. For example, during the instruction on following directions, participants were given exercises that required them to interpret and apply both written and oral directions.

During the second half of the general test-taking skills course, instructors taught the participants tips to remember information (Hook, 1967). Material was designed to increase their awareness of specific memory skills in order to enhance time management and classification techniques. After reviewing these materials, participants completed exercises that required the application of such skills as association and arrangement. Other tips given to the participants in the form of handouts pertained to: scanning the test and item types; general guidance for comparing numbers, names, and addresses; and effective techniques to make guesses, check responses, and change answers.

During the last portion of the general test-taking course, instructors attempted to promote student awareness of the test-taking skills and techniques that had been acquired. Throughout this section, all phases of general test-taking techniques were summarized. In addition,

several practice tests were administered to emphasize certain learning points.

Cognitive Skills Course

The second version of the test-preparation course lasted 30 hours (i.e., ten 3-hour sessions) and included a review and practice of basic cognitive skills. See Appendix K for a detailed outline of each session. In this course, basic cognitive skills were refreshed and practiced to prepare individuals for the tests in the selection test batteries. The instructional methods in this course included inventories, drills, mini-lessons, individual learning labs, and homework exercises that were developed by the company's Education Services Department (1989, 1991).

During the first and second sessions, participants completed mathematical and writing inventories designed to assess individual skill levels. Based on the results of these inventories, the instructor distributed two mathematical workbooks and two writing workbooks that were appropriate for each person's skill level. These workbooks were to be completed individually, at his or her own pace throughout the course, to supplement class instruction. Two additional books, containing general mathematical and vocabulary information, were also distributed to the participants.

During the third session of the course, the instructor gave a brief overview of the material that would be covered

during the session, and then administered a drill to review a specific cognitive skill (e.g., a mathematical drill consisted of problems using whole numbers and fractions). After everyone completed the drill, any errors or difficulties were discussed. The next hour was utilized as a learning lab. During the learning lab, participants could receive additional assistance on the class exercises or complete drills in their workbooks. Also, previous homework assignments were reviewed and new homework exercises were assigned. During the last hour of a session, the instructor provided a mini-lesson to introduce new material (e.g., a mathematical mini-lesson involved information about fractions and decimals). One or two mini-lessons were often introduced per session, depending upon the difficulty of the material for a particular class. For the mini-lesson, exercises were given, problems answered incorrectly were reworked, and then instructors answered any remaining questions.

The following sessions were similarly formatted to provide instruction related to each of the basic cognitive skills (e.g., mathematical, grammar, vocabulary, perceptual speed and accuracy, and inductive reasoning skills), corresponding with the tests utilized in this research.

During the fifth and last sessions of the course, participants completed cumulative mathematical and writing inventories, similar in format to those taken at the

beginning of the course. These inventories were scored by each individual, and errors were discussed. These inventories were administered to allow an individual to monitor his or her own progress on relearning basic cognitive skills. After the final inventory was completed, any time remaining in the session was used to summarize the course material.

General Test-Taking and Cognitive Skills Course

The third version of the course lasted 36 hours (i.e., twelve 3-hour sessions) and included instruction on general test-taking and basic cognitive skills. For a detailed outline of each session, see Appendix L. This course used the same materials and followed the same instructional format as the other two courses, but it was a combination of the two shorter versions. That is, the first, second, and third sessions consisted of most of the general test-taking instruction, as well as some cognitive skills instruction. The next eight sessions consisted only of cognitive skill instruction. The twelfth and final session consisted of the remaining general test-taking skill instruction. The general test-taking instruction was divided among the first three sessions and the last session to ensure that all participants, even those who missed one of the beginning classes, would receive the general test-taking skills instruction. In addition, this sequence allowed for a quick review of both types of instruction during the last session.

Across all three versions of the test-preparation course, a number of commonalities existed. First, participants were introduced and an orientation was given to the course and its contents during the first session. An attendance sheet was then distributed for each person to initial; attendance was monitored at each session. Second, the study guide was reviewed that was mailed to participants prior to the start of the research. Because company procedure dictates that a study guide should be given to everyone who takes the entry-level management test under normal testing conditions, the same procedure was followed for this investigation. This practice also ensured that everyone had equal amounts of exposure to this test, before it was administered.

Another commonality across all versions of the test-preparation course concerned the answer sheets. All instruction with respect to the completion of answer sheets pertained to the use of optically scanned answer sheets. Subsequently, sample tests and exercises included in the course were answered on optically scanned answer sheets. These answer sheets were also utilized during the test administration, since they are regularly utilized by the company in test-taking situations outside of this research. Thus, practice with the answer sheets in the test-preparation course could generalize to the company's other test-taking situations.

Standardization of Test-Preparation Course

A number of steps were taken to ensure standardization of each course's content and delivery. First, the same instructional materials (i.e., workbooks, drills, handouts) were used in all metropolitan regions. Second, each instructor received training on the content and delivery of the course for which he or she was responsible.

These steps were accomplished with a seven-hour training session that was held at a company location for all instructors. Instructors were randomly assigned to teach a version of the test-preparation course that was offered in the region in which he or she normally worked. Each instructor had experience teaching company-sponsored continuing education courses and was familiar with company procedures (e.g., obtaining course materials, gaining access to the buildings). However, because the course materials and format were new, detailed training was given.

During training, the goals and objectives of a test-preparation course were reviewed, and a 100-page training manual was distributed. The training manual contained the following information: notes to the instructors (see Appendix M), detailed outlines of each course, several writing and mathematical inventories, homework assignments, and timed exercises and drills for each cognitive area. Appendix N contains an example of an exercise or drill for each cognitive area; however, specific instructional

material developed by the company's Education Services Department (1989, 1991) is proprietary. For each inventory, exercise, and drill, appropriate time limits and answer keys were supplied. The instructor's copy of the study guide and a sample of each text book and workbook were also distributed during training.

All of the information in the manual was reviewed during the training session. Instructors were told that their function throughout the course was primarily to: ensure participants could understand and apply the material; guide participants through the exercises; and provide examples of the material when necessary. It was suggested that instructors relate the material covered throughout the course to problems encountered in the participants' personal lives. This practice, as discussed in the educational literature, enables the material to be presented in a manner that can be perceived as being more relevant, familiar, and meaningful to the participants (Covington & Omelich, 1981; Morris & Fulmer, 1976). Finally, instructors were told to give each student approximately the same amount of assistance, unless someone was having extreme difficulty with the material. Thus, every participant in this research, regardless of the location at which it was taught, received the same type and amount of test-taking information.

Before the first session of every course, each

instructor was contacted to ensure all course materials and rosters were received. After every course started, the instructors were again contacted periodically to discuss the progress of the class. Finally, the researcher joined a class for at least one session to ensure a smooth and standard delivery of each course.

Procedure

A recruitment advertisement was published in the company's weekly newsletter addressed to those employees who were interested in moving into entry-level management positions. The advertisement asked for volunteers to enroll in a course designed to refresh their test-taking skills, before taking the test battery that had to be completed successfully in order to enter a management development program. In addition to the newsletter, a similar advertisement was circulated as a bulletin.

Over 2,500 employees who wished to volunteer for the test-preparation course mailed their name, work address, and work phone number to the researcher. Volunteers were randomly contacted and scheduled for a course or test class near their work location on a first-come, first-served basis, until all course and test classes were filled. Classes within a particular treatment group were scheduled according to the specifications described in Tables 1 and 2.

Classes receiving course instruction were scheduled to meet in the evening for three hours, twice a week. For

example, classes in the TGT group were scheduled for four sessions within a two-week period (i.e., the first set of experimental tests and questionnaires was completed during the first session, the training intervention was delivered during the second and third sessions, and the second set of questionnaires and experimental tests was completed during the fourth session). The schedules for classes for the remaining three groups that received training followed the same pattern (i.e., all necessary questionnaires and tests were completed during the first session; training was provided during the intermediate sessions; and all necessary questionnaires and tests were completed during the last session). The first session for all course classes began on the same evening.

The classes for those treatment groups that did not receive course training (i.e., XXT and TXT) were scheduled to meet in the evening for two 3-hour sessions, seven weeks apart, to complete the questionnaires and tests. These classes started one week after the course training began.

Everyone scheduled for the research received a confirmation letter and a study guide. When participants arrived at their designated location, they were given a brief overview of the investigation by a test administrator. After the administrator answered any questions, participants completed an Informed Consent Form (see Appendix O for an example) and the Background Information Sheet.

Next, those groups that were administered the experimental tests twice during the research (i.e., TGT, TCT, TBT, TXT) completed the Pre-Test Questionnaire. Then, the first set of experimental tests was administered. Following the completion of the tests, these participants responded to statements on the Post-Test Questionnaire. The remaining two groups (i.e., XBT and XXT) did not complete the questionnaires since they took the tests only once at the end of the investigation.

At the conclusion of the first testing session, those groups receiving some type of course instruction (i.e., TGT, TCT, TBT, XBT) completed the Pre-Course Questionnaire. The remaining two groups (i.e., XXT and TXT) completed the Test-Taking and Preparation Background sheet.

During the second session, the TGT, TCT, TBT, and XBT groups received a version of the test-preparation course (i.e., general test-taking skills, basic cognitive skills, or general test-taking and cognitive skills). Those groups that did not receive training (i.e., XXT and TXT) were instructed to return seven weeks later, when they, like the others who received the longest version of the course, were administered a set of experimental tests. Refer to Table 1 for each group's assignment.

At the session immediately following the conclusion of the training course, each group again completed the Pre-Test Questionnaire, a second set of experimental tests, and the

Post-Test Questionnaire. Finally, those groups that had received training completed the Post-Course Questionnaire. Those groups that did not receive training completed the Review Questionnaire.

Individuals were considered test-qualified for the company's entry-level management positions if the following conditions were satisfied: they met the selection standard on the tests that comprised the entry-level management test battery; and the selection standard was attained on at least one administration of the experimental tests (i.e., time 1 or time 2).

Participants were not told if they passed or failed either set of the experimental tests until after the completion of their participation (i.e., for many, after the completion of the second set of tests). According to company procedures, an individual was required to wait a minimum of six months after failing to meet the selection standard, before taking the tests a second time. However during this research, the company's standard retest period was waived for those who volunteered their services and were required to take the tests twice. To receive this waiver, volunteers were required to attend 80% of the course sessions and take all of the required tests.

Individual feedback on the tests that comprised the entry-level management test battery (i.e., Quantitative, Writing Fluency, Reading Accuracy, and Following Directions

tests) was mailed to each participant. The qualification status on the test battery and relative strengths and weaknesses on each test were indicated.

Analyses

Separate composites for fluid and crystal abilities were formed by aggregating tests that corresponded to the ability. These composites were transformed to z-scores. The z-scores were computed for the collection of scores across time, experimental training groups, and age groups. The data were analyzed by means of multiple univariate analyses of variance, because the research questions pertained to individual outcome variables (Huberty & Morris, 1989). For example, one question was: With respect to the fluid and crystal ability test scores, do the training groups differ?

First, a 2 (Pre-Test) by 2 (Training Intervention) analysis of variance (ANOVA) design was used to examine the effects of the pre-test on the tests completed at time 2. These analyses were conducted with treatment groups 3-6. The sources and their error terms are presented in Table 3.

Second, a 4 (Experimental Training Groups) by 2 (Age) by 2 (Time) repeated measures ANOVA design was used to evaluate the effects of training on fluid and crystal ability test scores. These analyses were conducted with treatment groups 1-4. The sources and their error terms are

Table 3

Summary Table and Error Terms for the Fluid and Crystal Ability Test Score Composites: Testing Effects

Source	Error Term
Pre-Test (P)	S/P X I
Training Intervention (I)	S/P X I
P X I	S/P X I
Subjects/P X I (S/P X I)	

presented in Table 4.

The effects of primary concern in this design were those involving Time. The Time effect indicated whether there were differences between the first and second test scores for fluid and crystal abilities. The Time x Age Categories interaction indicated whether there were differences between the first and second test scores across age categories for fluid and crystal abilities. The Time x Experimental Training Group interaction indicated if there were differences across the training groups on the first and second test scores. The three-way interaction (Time x Age Categories x Experimental Training Group) indicated if there were differences between training groups and age categories on the first and second test scores. Post-hoc analyses were performed on significant results using Tukey's honestly

Table 4

Summary Table and Error Terms for the Fluid and Crystal Ability Test Score Composites: Training Evaluation

Source	Error Term
<u>Between Subjects</u>	
Age (A)	S/A x G
Experimental Training Group (G)	S/A x G
A X G	S/A x G
Subjects/A x G (S/A x G)	
<u>Within Subjects</u>	
Time (T)	T x S/A x G
T x A	T x S/A x G
T x G	T x S/A x G
T x A x G	T x S/A x G
T x S/A x G	

significant difference (HSD) procedure or the Dunn-Bonferroni procedure.

Next, similar analyses were employed to measure several potential moderator variables for their effects on fluid and crystal ability test scores. These moderator variables concerned previous participation in testing and training, and various types of preparation: 1) prior experience of the tests administered in this research;

2) prior experience of any type of ability test (e.g., GRE, SAT, GMAT); 3) previous participation in any of the company-sponsored continuing education programs; 4) previous enrollment in the "Test-Taking and Thinking Skills" course; 5) previous enrollment in courses outside of the company designed to improve general knowledge and skills; 6) enrollment in college courses; and 7) individual preparation (e.g., practicing mathematical problems, reading passages) before the first set of experimental tests was administered.

Analysis of variance was also employed to investigate the effects of the experimental factors on the test dispositions measured by the Pre- and Post-Test Questionnaires. First, a 2 (Pre-Test) by 2 (Training Intervention) repeated measures ANOVA design was used to examine the effects of the pre-test on participants' test dispositions before and after taking the tests at time 2. These analyses were conducted with treatment groups 3-6.

The next analyses employed a 4 (Experimental Training Group) by 2 (Age) by 2 (Time) by 2 (Prepost) repeated measures design to examine training effects on test dispositions. Added to this design were the responses from questionnaires given before and after each set of tests (Pre-post). The sources and their error terms for this design are presented in Table 5.

The effects of primary concern in this design were

Table 5

Summary Table and Error Terms for Test-Taking Dispositions

Source	Error Term
<u>Between Subjects</u>	
Age (A)	S/A x G
Experimental Training Group (G)	S/A x G
A x G	S/A x G
Subjects/A x G (S/A x G)	
<u>Within Subjects</u>	
Time (T)	T x S/A x G
T x A	T x S/A x G
T x G	T x S/A x G
T x A x G	T x S/A x G
T x S/A x G	
Prepost (P)	P x S/A x G
P x A	P x S/A x G
P x G	P x S/A x G
P x A x G	P x S/A x G
P x S/A x G	
P x T	P x T x S/A x G
P x T x A	P x T x S/A x G
P x T x G	P x T x S/A x G
P x T x A x G	P x T x S/A x G
P x T x S/A x G	

those involving the Prepost and Time effects. The Prepost effect indicated whether there were differences in participants' test-taking attitudes and dispositions before and after taking a set of tests. The Prepost x Age Categories interaction indicated whether there were differences in attitudes before and after a test across age categories. The Prepost x Experimental Training Group interaction determined if there were differences in attitudes across the training groups before and after a set of tests. The Prepost x Time interaction indicated whether there were differences in attitudes before and after each set of tests administered during the investigation. The Prepost x Age Categories x Experimental Training Group interaction indicated if there were differences in attitudes between training groups and age categories before and after a set of tests. The Prepost x Time x Age Categories interaction measured any differences in attitudes between age categories before and after the tests administered during the investigation. The Prepost x Time x Experimental Training Group interaction indicated if there were differences in attitudes between training groups before and after the tests administered during the investigation. Finally, the four-way interaction (Prepost x Time x Age Category x Experimental Training Group) assessed whether there were any differences in test-taking attitudes across age categories and experimental training groups before and

after the tests administered here. Post-hoc analyses were performed on significant results using Tukey's HSD procedure for mean differences or the Dunn-Bonferroni procedure.

Correlation analyses were performed to examine the relationship between test dispositions and fluid and crystal ability test score composites. Stepwise regression analyses were also conducted to determine whether participants' test dispositions before each set of tests contributed to the variation in test scores.

Last, a 4 (Experimental Training Group) by 2 (Age) ANOVA design was employed to investigate the effects of these factors on participants' reactions toward training. Responses were analyzed for those individuals who received training to obtain information regarding course content and delivery.

III. RESULTS

Overview

The first section of the results examines whether testing at time 1 influenced testing at time 2 (i.e., whether practice effects existed). This section also examines the effects of the independent variables (i.e., Age, Experimental Training Group, Time) on fluid and crystal ability test score composites. The second section of the results reports the analyses conducted on potential moderator variables, such as preparatory classes taken inside and outside of the company, on fluid and crystal ability test score composites. The third section examines participants' dispositions toward test taking, as measured by the Pre- and Post-Test Questionnaires. The fourth section examines the relationship between participants' dispositions toward test taking and fluid and crystal ability test score composites. The final section presents participants' responses to the course intervention, as measured by the Post-Course Questionnaire.

Test Score Composite Analyses

The design of this research paralleled the Solomon (1949) Four-Group Design, except that two additional experimental groups were added. The Solomon Four-Group Design was represented by Groups 3-6 (i.e., TBT, TXT, XBT,

and XXT). The main effects of testing, training, and the interaction of testing with training were determined by comparing these four groups. Thus, analyses were conducted for these groups to discover whether the first set of tests (i.e., pre-test) had an impact on the second set of test scores (i.e., post-test), and to what extent the testing interacted with the experimental training intervention.

In addition, comparisons related to the hypotheses were made by examining Groups 1-4 (i.e., TGT, TCT, TBT, and TXT). Analyses were conducted with these groups to determine whether training on both of the skills differed from training only on general test-taking or cognitive skills. Also, differential effects of training across age categories (i.e., under age 40, age 40 and over) were examined.

Testing Effects

For Groups 3-6, the effects of testing at time 1 were examined with a two (Pre-test) by two (Training) analysis of variance of post-test scores (Solomon, 1949). The purpose of this analysis was to determine whether the experimental tests given at time 1 sensitized participants to training and whether practice effects were present. The dependent measures were the z-scores of the fluid and crystal ability test score composites at time 2. Variance components (Vaughan & Corballis, 1969) and intraclass correlation coefficients were computed to compare the amounts of rating variance accounted for by the sources of variation.

Fluid Ability Test Scores. The results of the analysis of variance are presented in Table 6. A significant effect for Pre-test was found. This effect accounted for 11% of the composite score variance. Those participants who completed the set of experimental tests at time 1 obtained significantly greater test scores at time 2 ($M=0.249$) than those who did not ($M=-0.249$).

A significant effect was also found for Training. This effect accounted for 3% of the composite score variance. Tukey's HSD indicated that participants who did receive training scored significantly greater on the experimental tests at time 2 ($M=0.132$) than those who did not receive training ($M=-0.132$).

These results indicate that training has a positive effect on test scores, regardless of whether a pre-test is given. Similarly, a pre-test has a positive effect on test scores, regardless of whether training is received. The interaction between Pre-Test and Training was not significant.

Crystal Ability Test Scores. The results of the two (Pre-test) by two (Training) analysis of variance are presented in Table 7. No significant effects or interactions were found. Exposure to training or the pre-test did not lead to greater crystal ability composites at time 2.

Table 6

Summary of the Analysis of Variance for the Testing Effects
Analyses Using Fluid Ability Post-Test Scores

Source	df	MS	F-Ratio	VC	ICC
Pre-Test (PT)	1	13.91	15.00**	.1159	.1079
Training Intervention (I)	1	3.89	4.20*	.0273	.0254
PT X I	1	1.10	1.19	.0031	.0029
Subjects/PT X I	220	0.93		.9277	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$. ** $p < .01$.

Evaluation of Training Intervention Effects

Experimental Groups 1-4 (i.e., TGT, TCT, TBT, TXT) were used in these analyses to examine the effects of different types of training. The dependent measures are the z-scores of the fluid and crystal ability test score composites.

Fluid Ability Test Scores. A summary of the analysis of variance is presented in Table 8. The results indicated

Table 7

Summary of the Analysis of Variance for the Testing Effects
Analyses Using Crystal Ability Post-Test Scores

Source	df	MS	F-Ratio	VC	ICC
Pre-Test (PT)	1	0.14	0.14	-.0077	.0000
Training Intervention (I)	1	0.90	0.90	-.0009	.0000
PT X I	1	1.59	1.59	.0105	.0105
Subjects/PT X I	220	1.00		1.0017	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

a significant effect for Age, showing that participants under age 40 scored greater ($M=0.731$) on the fluid ability composite than those age 40 and over ($M=-1.012$). This effect accounted for 19% of the composite score variance.

Time was also significant, indicating that fluid ability composites after the training intervention ($M=0.418$) were significantly greater than the composites before the training intervention ($M=-0.418$). This effect accounted for

Table 8

Summary of the Analysis of Variance for the Training
Evaluation Analyses Using Fluid Ability Test Scores

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Age (A)	1	77.13	48.61**	.3373	.1941
Experimental Training Group (G)	3	4.05	2.55	.0220	.0127
A X G	3	2.20	1.38	.0109	.0063
Subjects/A X G (S/A X G)	216	1.59		.7934	
<u>Within Subjects</u>					
Time (T)	1	73.08	295.24**	.3252	.1871
T X A	1	0.08	0.32	-.0015	.0000
T X G	3	0.54	2.19	.0053	.0030
T X A X G	3	0.19	0.77	-.0020	.0000
T X S/A X G	216	0.25		.2475	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

** $p < .01$.

19% of the composite score variance.

Crystal Ability Test Scores. A summary of the analysis of variance is shown in Table 9. The results indicated a significant effect for Experimental Training Group, accounting for 4% of the composite score variance. Tukey's HSD showed that the mean score of the crystal composite for TXT (i.e., the group that took the tests before and after training, but did not receive a version of the test-preparation course) was significantly greater than those for the other three groups. See Table 10 for the specific mean values.

The Time effect was also significant, and it accounted for 1% of the composite variance. Those taking the tests after training scored greater ($M=0.084$) on the crystal ability composite than those taking the tests before training ($M=-0.084$).

The interaction between Time and the Experimental Training Group was significant. The mean composite scores shown in Table 11 were examined within an experimental training group across time (e.g., time 1 for TGT vs. time 2 for TGT). Tukey's HSD showed that for the groups TCT and TBT, the time 2 test score was significantly greater than the time 1 test score. These findings indicate that the experimental training groups that received instruction on cognitive skills did increase their crystal ability test scores. On the other hand, the TGT group, which did not

Table 9

Summary of the Analysis of Variance for the Training
Evaluation Analyses Using Crystal Ability Test Scores

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Age (A)	1	1.50	0.79	-.0018	.0000
Experimental Training Group (G)	3	7.59	3.99*	.0507	.0389
A X G	3	5.80	3.04	.0695	.0533
Subjects/A X G (S/A X G)	216	1.90		.9521	
<u>Within Subjects</u>					
Time (T)	1	3.43	16.25**	.0144	.0111
T X A	1	0.50	2.36	.0026	.0020
T X G	3	0.80	3.77*	.0105	.0081
T X A X G	3	0.04	0.17	-.0063	.0000
T X S/A X G	216	0.21		.2114	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$. ** $p < .01$.

Table 10

Means of Crystal Ability Test Composites for Each
Experimental Training Group

TGT	TCT	TBT	TXT
-0.191 (56)	-0.067 (56)	-0.374 (56)	0.633 (56)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .610 was statistically significant ($p < .05$) using Tukey's HSD procedure.

Table 11

Means of Crystal Ability Test Composites for Each
Experimental Training Group by Time

	TGT	TCT	TBT	TXT
Time 1	-0.171 (56)	-0.181 (56)	-0.334 (56)	0.350 (56)
Time 2	-0.021 (56)	0.114 (56)	-0.040 (56)	0.283 (56)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .256 was statistically significant ($p < .05$) using Tukey's HSD procedure.

receive training related to cognitive skills, did not significantly improve their test scores from time 1 to time 2. Further, a significant Time difference was not found for TXT, the group that did not receive any training. This latter finding suggested the lack of a practice effect for crystallized intelligence.

Moderator Variable Analyses

Several variables were investigated as potential moderators to the fluid and crystal test score composites. The variables concerned previous participation in testing and training, and various types of preparation: 1) prior experience with the experimental tests administered in this research; 2) prior experience of any type of ability test (e.g., GRE, SAT, GMAT); 3) previous participation in any of the company-sponsored continuing education programs; 4) previous enrollment in the "Test-Taking and Thinking Skills" course; 5) previous enrollment in courses outside of the company designed to improve general knowledge and skills; 6) enrollment in college courses; and 7) individual preparation (e.g., practicing math problems, reading passages) before the first set of tests was administered.

Testing Effects

For Groups 3-6, the effects of testing at time 1 were examined with a two (Pre-test) by two (Training) by two (Moderator Variable) analysis of variance of post-test scores (Solomon, 1949).

Fluid Ability Test Scores. The only variable that produced significant results ($p < .05$), and therefore moderated the fluid ability test scores, was previous enrollment in college courses. This effect accounted for 2% of the composite score variance, and it indicated that those who did enroll in college courses scored significantly greater ($M = 0.226$) on the fluid ability composite than those who did not enroll ($M = -0.087$). See Table 12 for a summary of the analysis of variance.

Crystal Ability Test Scores. Several moderator variables were found to yield significant effects. One of the moderator variables referred to whether participants had previously participated in any of the company-sponsored continuing education programs. A summary of the results of the analysis of variance is shown in Table 13. The results indicated a significant interaction ($p < .05$) between the Pre-Test factor and previous participation in continuing education programs. This interaction accounted for 6% of the composite score variance.

Tukey's HSD procedure uncovered no significant differences; therefore, Dunn-Bonferroni comparisons were used to examine the interaction of means. See Table 14 for the specific means. Contrasts were formed between the means for those who did participate in previous programs and those who did not. The comparisons indicated a significant

Table 12

Summary of the Analysis of Variance for the Testing Effects
Analyses Using Fluid Ability Post-Test Scores: Enrollment
in College Courses

Source	df	MS	F-Ratio	VC	ICC
Pre-Test (PT)	1	7.10	7.78**	.0552	.0532
Training Intervention (I)	1	3.18	3.49	.0202	.0195
College Courses (C)	1	3.70	4.06*	.0249	.0240
PT X I	1	0.02	0.03	-.0158	.0000
C X PT	1	1.53	1.68	.0111	.0107
C X I	1	0.24	0.26	-.0120	.0000
C X PT X I	1	2.09	2.29	.0420	.0405
Subjects/ C X PT X I	216	0.91		.9119	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$. ** $p < .01$.

Table 13

Summary of the Analysis of Variance for the Testing Effects
Analyses Using Crystal Ability Post-Test Scores:
Participation in Continuing Education Programs

Source	df	MS	F-Ratio	VC	ICC
Pre-Test (PT)	1	0.85	0.87	-.0011	.0000
Training Intervention (I)	1	1.48	1.51	.0045	.0041
Continuing Educ. Programs (C)	1	0.35	0.35	-.0056	.0000
PT X I	1	0.76	0.77	-.0040	.0000
C X PT	1	4.60	4.60*	.0646	.0592
C X I	1	0.94	0.96	-.0007	.0000
C X PT X I	3	2.50	2.55	.0543	.0497
Subjects/ C X PT X I	216	0.98		.9795	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$.

Table 14

Means of Crystal Ability Test Composites for Whether
Participants Enrolled in Company-Sponsored Continuing
Education Programs by Pre-Test

	Did Take The Pre-Test	Did Not Take The Pre-Test
Did Participate in Continuing Education Programs	-0.032 (76)	0.123 (69)
Did Not Participate in Continuing Education Programs	0.145 (36)	-0.262 (43)

Note. Sample sizes are in parentheses. The contrast effect equalled .562. The confidence interval for the contrast did not include zero, and therefore was statistically significant at the .0125 level using Dunn-Bonferroni comparisons.

disordinal interaction. For those who were involved in previous programs, participants who did not take the pre-test obtained significantly greater crystal ability composites than those who took the pre-test. The opposite was found for those who were not involved in previous programs; those participants who took the pre-test scored significantly greater on the crystal ability composite than those who did not take the pre-test.

Analyses for whether participants had taken the

company-sponsored "Test-Taking and Thinking Skills" course in the last two years showed that taking this course significantly influenced crystal ability test scores (see Table 15). This effect accounted for 4% of the composite score variance, and indicated that those who had not taken this course scored significantly greater ($M=0.069$) on crystal ability tests than those who had taken the course ($M=-0.316$).

A significant two-way interaction (Company-Sponsored "Test-Taking and Thinking Skills" Course by Pre-Test) was also found that accounted for 10% of the composite score variance. Tukey's HSD indicated that there was a difference between groups that completed the first set of experimental tests. Of those who took the first set of experimental tests, participants who did not enroll in the company-sponsored "Test-Taking and Thinking Skills" course scored significantly greater on the crystal ability composite than those who did enroll in the course. Refer to Table 16 for specific means.

Evaluation of Training Intervention Effects

Treatment Groups 1-4 (i.e., TGT, TCT, TBT, TXT) were used in these analyses to examine the effects of different types of training.

Crystal Ability Test Scores. None of the moderator variables significantly influenced fluid ability test scores. However, one variable did significantly affect

Table 15

Summary of the Analysis of Variance for the Testing Effects
Analyses Using Crystal Ability Post-Test Scores:
Participation in "Test-Taking and Thinking Skills" Course

Source	df	MS	F-Ratio	VC	ICC
Pre-Test (PT)	1	2.65	2.77	.0151	.0134
Training Intervention (I)	1	2.48	2.60	.0136	.0120
Participation in Course (C)	1	5.76	6.04*	.0429	.0379
PT X I	1	0.25	0.26	-.0126	.0000
C X PT	1	7.12	7.47*	.1102	.0975
C X I	1	1.76	1.84	.0143	.0126
C X PT X I	1	0.76	0.80	-.0069	.0000
Subjects/ C X PT X I	216	0.95		.9541	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$.

Table 16

Means of Crystal Ability Test Composites for Whether
Participants Had Taken the "Test-Taking and Thinking Skills"
Course by Pre-Test

	Did Take The Pre-Test	Did Not Take The Pre-Test
Did Take "Test-Taking and Thinking Skills" Course	-0.723 (17)	-0.014 (23)
Did Not Take "Test-Taking and Thinking Skills" Course	0.159 (95)	-0.027 (89)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .702 was statistically significant ($p < .05$) using Tukey's HSD procedure.

crystal ability test scores. As shown in Table 17, a main effect was obtained for participation in the course. Those participants who did not take the course scored significantly greater on the crystal ability composite ($M = 0.137$) than those who did take the course ($M = -0.888$).

Results also showed two significant interactions of experimental training groups with the moderator of whether participants had previously taken the company-sponsored "Test-Taking and Thinking Skills" course. The nature of these interactions are described below. However, the statistical reliability of these interactions must be

Table 17

Summary of the Analysis of Variance for the Training
Evaluation Analyses Using Crystal Ability Test Scores:
Participation in "Test-Taking and Thinking Skills" Course

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Age (A)	1	0.03	0.02	-.0071	.0000
Experimental Training Group (G)	3	2.76	1.69	.0101	.0072
Participation in Course (C)	1	48.31	29.66**	.2084	.1488
A X G	3	3.09	1.89	.0260	.0186
A X C	1	0.55	0.34	-.0096	.0000
G X C	3	1.77	1.09	.0025	.0018
A X G X C	3	4.66	2.86*	.1081	.0772
Subjects/ A X G X C (S/A X G X C)	208	1.63		.8143	
<u>Within Subjects</u>					
Time (T)	1	1.08	5.40*	.0039	.0028
T X A	1	0.30	1.50	.0009	.0006
T X G	3	0.05	0.28	-.0026	.0000
T X C	1	0.07	0.33	-.0012	.0000

Table 17 (concluded)

Source	df	MS	F-Ratio	VC	ICC
T X A X G	3	0.40	1.99	.0070	.0050
T X A X C	1	0.00	0.01	-.0035	.0000
T X G X C	3	0.64	3.20*	.0156	.0111
T X A X G X C	3	0.60	3.01*	.0286	.0204
T X S/A X G X C	208	0.20		.1989	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$. ** $p < .01$.

questioned due to the sample sizes for some of the treatment cells (e.g., only 5 participants in the TCT group took the course).

The first interaction, Company-Sponsored "Test-Taking and Thinking Skills" Course by Experimental Training Groups by Time, accounted for 1% of the composite score variance. Tukey's HSD comparisons across Time holding the Course and Experimental Training Groups constant revealed no significant differences. When comparisons were made across the Experimental Training Groups holding the Course and Time

constant, nine significant differences were found. For those who did take the course previously, time 1 crystal ability composites were significantly greater for participants in the TGT, TBT, and TXT groups than participants in the TCT group. At time 2, participants in the TXT group obtained significantly greater crystal ability composites than participants in the TGT, TCT, and TBT groups. For those who did not take the course previously, time 1 crystal ability test score composites were significantly greater for those in the TXT group than those in the TGT, TCT, and TBT groups. At time 2, no significant differences were found. Interestingly, all comparisons across Course holding Experimental Training Groups and Time constant were significantly different. Each pairwise comparison showed that participants who had not taken the course obtained significantly greater crystal test score composites than those who had taken the course. Refer to Table 18 for the specific means.

The analysis also showed a significant four-way interaction (Company-Sponsored "Test-Taking and Thinking Skills" Course by Experimental Training Groups by Time by Age) that accounted for 2% of the composite score variance. Tukey's HSD showed that there were no significant differences for participants age 40 and over in all experimental training groups from time 1 to time 2. In addition, no significant differences were found for

Table 18

Means of Crystal Ability Test Composites for Whether
Participants Took the "Test-Taking and Thinking Skills"
Course by Experimental Training Group and Time

Did Take "Test-Taking and Thinking Skills" Course Previously

	TGT	TCT	TBT	TXT
Time 1	-0.994 (8)	-1.434 (5)	-0.691 (8)	-0.820 (9)
Time 2	-0.898 (8)	-1.243 (5)	-0.954 (8)	-0.466 (9)

Did Not Take "Test-Taking and Thinking Skills" Course
Previously

	TGT	TCT	TBT	TXT
Time 1	-0.034 (48)	-0.058 (51)	-0.275 (48)	0.574 (47)
Time 2	0.126 (48)	0.247 (51)	0.112 (48)	0.426 (47)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .409 was statistically significant ($p < .05$) using Tukey's HSD procedure.

participants under age 40 who had not taken the course previously in all experimental training groups from time 1 to time 2. For those who had taken the "Test-Taking and Thinking Skills" course and were under age 40, participants in the TBT group obtained significantly lower test scores at time 2. In contrast, participants in the TXT group obtained significantly higher test scores at time 2. For those who had taken the "Test-Taking and Thinking Skills" course and were in the TGT group, participants age 40 and over obtained significantly greater crystal test score composites than those under the age of 40 at time 1 and time 2. Yet, for those who had taken the course but were in the TXT group, participants under the age of 40 obtained significantly greater crystal test score composites than those age 40 and over at time 2. Finally, for those who had not taken the course and were in the TBT group, participants under the age of 40 obtained significantly greater crystal composites than those age 40 and over at time 1 and time 2. See Table 19 for the specific means.

Analyses Involving Test Disposition Factors

The first portion of this section will review the factor analyses conducted to identify test-related attitudinal factors on the Pre- and Post-Test Questionnaires. Then, the results of analyses of variance for four independent variables (i.e., Age, Experimental Training Group, Time, Prepost) on the test-related

Table 19

Means of Crystal Ability Test Composites for Whether
Participants Took the "Test-Taking and Thinking Skills"
Course by Experimental Training Group, Time and Age

Under Age 40:
 Did Take "Test-Taking and Thinking Skills" Course Previously

	TGT	TCT	TBT	TXT
Time 1	-1.294 (5)	-1.313 (2)	-0.668 (5)	-0.579 (5)
Time 2	-1.511 (5)	-1.313 (2)	-1.909 (5)	0.174 (5)

Under Age 40:
 Did Not Take "Test-Taking and Thinking Skills" Course
 Previously

	TGT	TCT	TBT	TXT
Time 1	-0.035 (27)	-0.071 (26)	0.040 (33)	0.508 (27)
Time 2	0.059 (27)	0.197 (26)	0.402 (33)	0.239 (27)

Table 19 (concluded)

Age 40 and Over:
Did Take "Test-Taking and Thinking Skills" Course Previously

	TGT	TCT	TBT	TXT
Time 1	-0.494 (3)	-1.515 (3)	-0.728 (3)	-1.122 (4)
Time 2	0.123 (3)	-1.196 (3)	-0.728 (3)	-1.265 (4)

Age 40 and Over:
Did Not Take "Test-Taking and Thinking Skills" Course
Previously

	TGT	TCT	TBT	TXT
Time 1	-0.032 (21)	-0.045 (25)	-0.966 (15)	0.662 (20)
Time 2	0.211 (21)	0.299 (25)	-0.524 (15)	0.678 (20)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .632 was statistically significant ($p < .05$) using Tukey's HSD procedure.

attitudinal factors will be discussed.

Factor Analyses to Identify Factors

Four factor analyses were conducted for the items on the Questionnaires administered before and after (Prepost) the first and second set of tests (Time). Analyses included the TGT, TCT, TBT, and TXT groups because the experimental

tests were administered to them twice, resulting in four sets of questionnaire responses. A principal factor analysis was conducted by means of a SAS promax rotation method which produces an oblique and varimax rotation. Comparisons of the oblique and varimax rotations indicated more interpretable factor structures with the oblique rotation method. Based on the eigenvalues and scree plot, six factors were identified. For this investigation, items with a factor loading at least equal to .40 were retained to define factors. Refer to the Pre-Test Questionnaire in Appendix B for the question corresponding to the item number in each factor.

Even though there was considerable overlap across the four factor patterns, the patterns did not correspond exactly. One factor, Future Effects, had items that consistently defined that factor across the four analyses. The Future Effects factor related to future employment decisions based on participants' test scores. Three items defined the Future Effects factor: 7, 21, and 36.

The second factor, Preparation, also had items that consistently defined that factor across the four analyses. The Preparation factor related to participants' preparation for taking the tests. Two items defined the Preparation factor: 27 and 40.

The remaining four factors did not have similar items defining them across the analyses. The item loadings across

each analysis were examined to develop an item composite for these factors. Those items that loaded mostly on the same factor across the analyses were used to define that factor.

The Test Ease factor pertained to participants' perceived ease or difficulty of the tests' questions. Three items defined the Test Ease factor: 10, 16 and 38.

Motivation, the next factor, related to participants' motivation level to perform well on the tests. Ten items defined this factor: 2, 4, 5, 8, 11, 18, 23, 25, 28, and 35. Across the four analyses, this factor accounted for the most variance.

Comparative Anxiety pertained to participants' general feelings and anxiety toward test taking. Seven items defined this factor: 3, 6, 9, 12, 13, 15, and 37.

The sixth factor, Test Focus, related to participants' concentration while taking the tests and attributions related to test performance. Three items defined this factor: 19, 26, and 34.

Testing Effects for Test Disposition Factors

The analyses conducted for the test disposition factors are similar to those conducted for the test score composites. That is, Groups 3-6 were first examined to identify the effects of testing at time 1 with a two (Pre-test) by two (Training) repeated measures analysis of variance of dispositions at time 2 (i.e., before and after the tests completed at time 2). The dependent measures were

the attitudinal composites identified from the above factor analyses. The scores for a factor were computed by summing the scores of the items that defined that factor.

Comparative Anxiety. Table 20 presents the analysis of variance for the Comparative Anxiety factor. A significant interaction was found for Training and the Prepost measure, accounting for 1% of the response variance. Tukey's HSD comparisons showed that after taking the tests at time 2, participants who received training reported being significantly more anxious than those who did not receive training. See Table 21 for the specific mean values.

Test Focus. The analysis of variance summary for the Test Focus factor is presented in Table 22. A significant effect was found for Training, accounting for 3% of the response variance. Participants who received training reported having significantly more difficulty focusing on the test content ($M=2.506$) than those who did not receive training ($M=2.277$).

A significant interaction was also found for Training and the Prepost measure, accounting for 1% of the response variance. Tukey's HSD comparisons showed that after taking the tests at time 2, participants who received training reported having significantly more difficulty focusing on the test content than those who did not receive training. The specific mean values are presented in Table 23.

Table 20

Summary of the Analysis of Variance for the Testing EffectsAnalyses Using Disposition Factors: Comparative Anxiety

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Pre-Test (PT)	1	0.04	0.00	-.2008	.0000
Training Intervention (I)	1	45.01	1.00	-.0001	.0000
PT X I	1	70.72	1.57	.2294	.0085
Subjects/PT X I (S/PT X I)	220	45.03		22.5150	
<u>Within Subjects</u>					
Prepost (P)	1	4.72	1.16	.0029	.0001
P X PT	1	0.08	0.02	-.0357	.0000
P X I	1	18.89	4.63*	.1322	.0049
P X PT X I	1	0.14	0.03	-.0704	.0000
P X S/PT X I	220	4.08		4.0825	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$.

Table 21

Means for Comparative Anxiety Before and After Taking the Tests at Time 2 by Training

	Before Taking The Tests At Time 2	After Taking The Tests At Time 2
Did Receive Training	3.008 (112)	3.037 (112)
Did Not Receive Training	2.976 (112)	2.888 (112)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .099 was statistically significant ($p < .05$) using Tukey's HSD procedure.

Evaluation of Training Intervention Effects

Treatment Groups 1-4 (i.e., TGT, TCT, TBT, TXT) were used to examine the effects of different types of training on test dispositions. A four (Experimental Training Group) by two (Age) by two (Time) by two (Prepost) repeated measures analysis of variance was used.

Future Effects. The results for the Future Effects factor are presented in Table 24. A significant effect was found for Prepost, accounting for 1% of the response variance. Participants perceived that their test scores had significantly more future effects before taking the tests ($M=3.432$) than after ($M=3.310$) taking the tests.

A significant interaction between Prepost and Age was

Table 22

Summary of the Analysis of Variance for the Testing EffectsAnalyses Using the Test Disposition Factors: Test Focus

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Pre-Test (PT)	1	6.04	0.64	-.0149	.0000
Training Intervention (I)	1	52.94	5.64*	.1945	.0288
PT X I	1	0.00	0.00	-.0837	.0000
Subjects/PT X I (S/PT X I)	220	9.38		4.6897	
<u>Within Subjects</u>					
Prepost (P)	1	1.51	0.85	-.0012	.0000
P X PT	1	0.00	0.00	-.0158	.0000
P X I	1	10.94	6.18*	.0819	.0121
P X PT X I	1	2.29	1.29	.0092	.0014
P X S/PT X I	220	1.77		1.7694	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$.

Table 23

Means for Test Focus Before and After Taking the Tests at Time 2 by Training

	Before Taking The Tests At Time 2	After Taking The Tests At Time 2
Did Receive Training	2.473 (112)	2.539 (112)
Did Not Receive Training	2.348 (112)	2.205 (112)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .152 was statistically significant ($p < .05$) using Tukey's HSD procedure.

found, accounting for 1% of the response variance. Tukey's (HSD) comparisons showed that participants age 40 and over perceived their test scores to have significantly more future effects before taking the tests than after taking the tests. In contrast, participants under age 40 perceived their test scores to have similar future effects before and after taking the tests. Table 25 presents the specific mean values.

Preparation. Table 26 presents the analysis of variance for the Preparation factor. A significant effect was found for Experimental Training Group, accounting for 4% of the response variance. Tukey's HSD indicated that TBT

Table 24

Summary of the Analysis of Variance for the Training
Evaluation Analyses Using the Test Disposition Factors:
Future Effects

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Age (A)	1	82.17	3.24	.1268	.0119
Experimental Training Group (G)	3	46.55	1.83	.0945	.0088
A X G	3	26.74	1.05	.0122	.0011
Subjects/A X G (S/A X G)	214	25.38		6.3446	
<u>Within Subjects</u>					
Time (T)	1	5.26	1.68	.0048	.0004
T X A	1	0.26	0.08	-.0128	.0000
T X G	3	2.18	0.70	-.0085	.0000
T X A X G	3	4.13	1.32	.0179	.0017
T X S/A X G	214	3.13		1.5655	
Prepost (P)	1	35.64	21.54**	.0759	.0071
P X A	1	10.19	6.16*	.0381	.0036
P X G	3	2.49	1.50	.0074	.0007
P X A X G	3	1.53	0.92	-.0023	.0000
P X S/A X G	214	1.65		.8274	

Table 24 (concluded)

Source	df	MS	F-Ratio	VC	ICC
T X P	1	0.08	0.05	-.0071	.0000
T X P X A	1	0.11	0.06	-.0139	.0000
T X P X G	3	2.79	1.68	.0202	.0019
T X P X A X G	3	0.75	0.45	-.0327	.0000
T X P X S/A X G	214	1.66		1.6604	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$. ** $p < .01$.

and TCT participants felt they were significantly more prepared for the tests than did TGT and TXT participants. Refer to Table 27 for specific means.

A significant effect was found for Time. This effect accounted for 20% of the response variance. Participants perceived themselves as being significantly more prepared for the second set of tests ($M=3.489$), than they did for the first set of tests ($M=2.591$).

Also, a significant effect for Prepost was found, accounting for less than 1% of the response variance.

Table 25

Means for Future Effects Before and After Taking the Tests
by Age

	Before Taking the Tests	After Taking the Tests
Under Age 40	3.474 (258)	3.426 (258)
Age 40 and Over	3.374 (188)	3.151 (188)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .095 was statistically significant ($p < .05$) using Tukey's HSD procedure.

Participants perceived themselves as being significantly more prepared before taking the tests ($M=3.103$) than they did after taking the tests ($M=2.979$).

The interaction between Time and Experimental Training Group was significant, accounting for 19% of the response variance. Tukey's HSD comparisons showed that participants who received training (i.e., TGT, TCT, TBT) perceived themselves as significantly more prepared at time 2 than at time 1, while participants who did not receive training (i.e., TXT) perceived no difference in preparation from time 1 to time 2. See Table 28 for the specific means.

Finally, the interaction between Time and Prepost was significant, accounting for less than 1% of the response

Table 26

Summary of the Analysis of Variance for the Training
Evaluation Analyses Using the Test Disposition Factors:
Preparation

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Age (A)	1	14.38	1.82	.0145	.0019
Experimental Training Group (G)	3	75.71	9.59**	.3027	.0399
A X G	3	5.67	0.72	-.0199	.0000
Subjects/A X G (S/A X G)	214	7.89		1.9735	
<u>Within Subjects</u>					
Time (T)	1	681.32	225.94**	1.5141	.1994
T X A	1	0.18	0.06	-.0127	.0000
T X G	3	164.41	54.52**	1.4415	.1898
T X A X G	3	3.13	1.04	.0021	.0003
T X S/A X G	214	3.02		1.5078	
Prepost (P)	1	12.41	23.72**	.0265	.0035
P X A	1	0.11	0.20	-.0019	.0000
P X G	3	0.57	1.09	.0004	.0001
P X A X G	3	0.26	0.51	-.0046	.0000
P X S/A X G	214	0.52		.2616	

Table 26 (concluded)

Source	df	MS	F-Ratio	VC	ICC
T X P	1	7.36	12.96*	.0303	.0040
T X P X A	1	0.07	0.12	-.0044	.0000
T X P X G	3	0.24	0.43	-.0058	.0000
T X P X A X G	3	0.53	0.93	-.0014	.0000
T X P X S/A X G	214	0.57		.5676	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$. ** $p < .01$.

variance. Tukey's HSD comparisons showed that at time 1, participants perceived themselves as being significantly more prepared before the tests than after the tests. At time 2, no significant differences were found across pre-and post-measures. Table 29 presents specific mean values.

Test Ease. The results for the Test Ease factor are presented in Table 30. The overall mean of Test Ease responses ($M=1.700$) suggested that all experimental groups agreed that the tests were not easy. A significant effect was found for Experimental Training Group, accounting for 2%

Table 27

Means for Preparation by Experimental Training Group

TGT	TCT	TBT	TXT
2.848 (224)	3.326 (224)	3.262 (224)	2.728 (224)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .311 was statistically significant ($p < .05$) using Tukey's HSD procedure.

Table 28

Means for Preparation by Experimental Training Group and Time

	TGT	TCT	TBT	TXT
Time 1	2.577 (112)	2.477 (112)	2.482 (112)	2.826 (112)
Time 2	3.116 (112)	4.174 (112)	4.036 (112)	2.630 (112)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .342 was statistically significant ($p < .05$) using Tukey's HSD procedure.

of the response variance. Tukey's HSD indicated that TBT and TXT participants felt the tests were significantly easier than did TCT participants. No significant differences were found for TGT participants. See Table 31

Table 29

Means for Preparation Before and After Taking The Tests by Time

	Before Taking the Tests	After Taking the Tests
Time 1	2.702 (223)	2.480 (223)
Time 2	3.502 (224)	3.475 (224)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .083 was statistically significant ($p < .05$) using Tukey's HSD procedure.

for the specific mean values.

A significant interaction was found between Time and Age. This interaction accounted for 1% of the composite variance. Tukey's HSD procedure uncovered no significant differences; therefore, Dunn-Bonferroni comparisons were used to examine the interaction of means. See Table 32 for the specific means. Contrasts were formed between the means for participants who were under age 40 and participants who were age 40 and over. The comparisons did not find a significant disordinal interaction indicating that the interaction was of an ordinal nature. That is, the lines deviated from parallelism but did not cross (Marascuilo & Levin, 1983). Participants under age 40

Table 30

Summary of the Analysis of Variance for the Training
Evaluation Analyses Using Test Disposition Factors: Test
Ease

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Age (A)	1	8.19	1.35	.0048	.0011
Experimental Training Group (G)	3	29.95	4.95*	.1067	.0242
A X G	3	1.90	0.31	-.0371	.0000
Subjects/A X G (S/A X G)	215	6.05		1.5126	
<u>Within Subjects</u>					
Time (T)	1	2.00	0.99	-.0001	.0000
T X A	1	8.52	4.20*	.0290	.0066
T X G	3	2.79	1.37	.0068	.0015
T X A X G	3	2.51	1.24	.0086	.0019
T X S/A X G	215	2.03		1.0197	
Prepost (P)	1	1.54	1.21	.0006	.0001
P X A	1	1.38	1.08	.0004	.0001
P X G	3	3.08	2.41	.0161	.0036
P X A X G	3	1.94	1.52	.0119	.0027
P X S/A X G	215	1.28		.6389	

Table 30 (concluded)

Source	df	MS	F-Ratio	VC	ICC
T X P	1	0.04	0.03	-.0048	.0000
T X P X A	1	0.05	0.05	-.0095	.0000
T X P X G	3	1.40	1.26	.0051	.0012
T X P X A X G	3	0.96	0.87	-.0053	.0000
T X P X S/A X G	215	1.12		1.1188	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$.

perceived the tests to become more difficult from time 1 to time 2. However, participants age 40 and over did not perceive a difference in the tests' difficulty from time 1 to time 2.

Motivation. Table 33 presents the analysis of variance for the Motivation factor. A significant effect found was for Age, and it accounted for 4% of the response variance. Those under the age of 40 had a significantly greater levels of motivation ($M=4.541$) to perform well on the tests, than those age 40 and over ($M=4.424$).

Table 31

Means for Test Ease by Experimental Training Group

TGT	TCT	TBT	TXT
1.702 (224)	1.535 (224)	1.852 (224)	1.738 (224)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .181 was statistically significant ($p < .05$) using Tukey's HSD procedure.

Table 32

Means for Test Ease by Age and Time

	Under Age 40	Age 40 and Over
Time 1	1.742 (258)	1.748 (260)
Time 2	1.642 (189)	1.741 (188)

Note. Sample sizes are in parentheses. The contrast effect equalled .093. The confidence interval for the contrast did include zero, indicating a non-significant disordinal interaction at the .05 level using Dunn-Bonferroni comparisons.

A significant effect was found for Experimental Training Group, and it accounted for 3% of the response variance. Tukey's HSD showed that TCT participants were significantly more motivated to do well on the tests than TGT and TXT participants. No significant differences were found for TBT participants. Means are given in Table 34.

Time was found to be significant, accounting for less than 1% of the response variance. Participants were more motivated to perform well on the first set of tests ($M=4.520$), than they were on the second set of tests ($M=4.464$).

Prepost was found to be significant and accounted for 3% of the response variance. Participants had a greater level of motivation to perform well on the tests before actually taking the tests ($M=4.557$), than they did after taking the tests ($M=4.426$).

The interaction between Prepost and Age was significant, accounting for less than 1% of the response variance. Tukey's HSD procedure uncovered no significant differences; therefore, Dunn-Bonferroni comparisons were used to examine the interaction of means. See Table 35 for the specific means. Contrasts were formed between the means for participants before and after taking the tests. The comparisons did not find a significant disordinal interaction indicating that the interaction was of an ordinal nature. Those age 40 and over had significantly

Table 33

Summary of the Analysis of Variance for the Training
Evaluation Analyses Using Test Disposition Factors:
Motivation

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Age (A)	1	479.17	9.21*	.9534	.0357
Experimental Training Group (G)	3	256.46	4.93*	.9126	.0342
A X G	3	42.20	0.81	-.0879	.0000
Subjects/A X G (S/A X G)	215	52.04		13.0102	
<u>Within Subjects</u>					
Time (T)	1	59.50	6.11*	.1111	.0042
T X A	1	2.83	0.29	-.0308	.0000
T X G	3	9.21	0.95	-.0047	.0000
T X A X G	3	1.64	0.17	-.1447	.0000
T X S/A X G	215	9.74		4.8718	
Prepost (P)	1	373.04	76.29**	.8218	.0308
P X A	1	19.83	4.06*	.0667	.0025
P X G	3	4.48	0.92	-.0036	.0000
P X A X G	3	8.21	1.68	.0593	.0022
P X S/A X G	215	4.89		2.4447	

Table 33 (concluded)

Source	df	MS	F-Ratio	VC	ICC
T X P	1	16.68	4.91*	.0593	.0022
T X P X A	1	0.02	0.01	-.0301	.0000
T X P X G	3	11.58	3.41*	.1462	.0055
T X P X A X G	3	7.16	2.11	.1346	.0050
T X P X S/A X G	215	3.34		3.3436	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$. ** $p < .01$.

greater decreases in motivation after taking the tests than did those under age 40.

The interaction between Time and Prepost was also significant. This interaction accounted for less than 1% of the response variance. Tukey's HSD comparisons showed that participants were significantly more motivated before taking the tests at time 1 than they were before taking the tests at time 2. No differences in motivation levels were found across time after taking the tests. See Table 36 for the specific means.

Table 34

Means for Motivation by Experimental Training Group

TGT	TCT	TBT	TXT
4.404 (224)	4.636 (224)	4.483 (224)	4.444 (224)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .160 was statistically significant ($p < .05$) using Tukey's HSD procedure.

Table 35

Means for Motivation Before and After Taking The Tests by Age

	Before Taking the Tests	After Taking the Tests
Under Age 40	4.593 (259)	4.488 (259)
Age 40 and Over	4.508 (189)	4.340 (188)

Note. Sample sizes are in parentheses. The contrast effect equalled .063. The confidence interval for the contrast did include zero, indicating a non-significant disordinal interaction at the .05 level using Dunn-Bonferroni comparisons.

The last significant finding for the Motivation factor was a 3-way interaction involving Time, Prepost, and Experimental Training Group. At time 1, Tukey's HSD indicated that participants in all groups showed a significant decline in motivation after taking the tests. In contrast, at time 2, only participants in the TCT group showed a significant decline in motivation after taking the tests. The participants in the remaining groups at time 2 maintained their motivation across time. The specific means are given in Table 37.

Comparative Anxiety. The analysis of variance summary for the Comparative Anxiety factor is presented in Table 38. Time was significant, accounting for less than 1% of the response variance. Participants had significantly greater anxiety levels at time 1 ($M=3.027$) than at time 2 ($M=2.952$).

A significant interaction was found between Time and Prepost, accounting for less than 1% of the response variance. Tukey's HSD comparisons showed that before taking the tests, there were no differences in anxiety at time 1 and time 2. When comparisons were made after taking the tests, participants were significantly more anxious at time 1 than at time 2. An additional significant difference across Time and Prepost indicated that participants were more anxious before taking the tests at time 1 than after taking the tests at time 2. Means are presented in Table 39.

Table 36

Means for Motivation Before and After Taking The Tests by Time

	Before Taking the Tests	After Taking the Tests
Time 1	4.600 (224)	4.439 (223)
Time 2	4.515 (224)	4.413 (223)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .041 was statistically significant ($p < .05$) using Tukey's HSD procedure.

Test Focus. The results of the Test Focus factor are shown in Table 40. Several significant interactions were found. The first interaction between Time and Experimental Training Group accounted for 1% of the response variance. Tukey's HSD comparisons showed no significant differences between experimental training groups at time 1. At time 2, participants in the TBT group had significantly more difficulty focusing on the test content than did those in the TGT, TCT, and TXT groups. Specific means are presented in Table 41.

The second interaction between Prepost and Experimental Training Group accounted for 1% of the response variance. Tukey's HSD comparisons showed no significant differences

Table 37

Means for Motivation Before and After The Tests by
Experimental Training Group and Time

Time 1				
	TGT	TCT	TBT	TXT
Before The Tests	4.543 (56)	4.704 (55)	4.588 (56)	4.564 (56)
After The Tests	4.321 (56)	4.580 (56)	4.425 (56)	4.432 (56)
Time 2				
	TGT	TCT	TBT	TXT
Before The Tests	4.416 (56)	4.723 (56)	4.491 (56)	4.430 (56)
After The Tests	4.337 (56)	4.536 (56)	4.429 (56)	4.350 (56)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .118 was statistically significant ($p < .05$) using Tukey's HSD procedure.

Table 38

Summary of the Analysis of Variance for the Training
Evaluation Analyses Using Test Disposition Factors:
Comparative Anxiety

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Age (A)	1	349.03	3.79	.5733	.0202
Experimental Training Group (G)	3	77.21	0.84	-.0669	.0000
A X G	3	23.18	0.25	-.6162	.0000
Subjects/A X G (S/A X G)	212	92.20		23.0500	
<u>Within Subjects</u>					
Time (T)	1	65.39	9.97*	.1313	.0046
T X A	1	1.37	0.21	-.0231	.0000
T X G	3	15.77	2.41	.0823	.0029
T X A X G	3	4.96	0.76	-.0285	.0000
T X S/A X G	212	6.56		3.2780	
Prepost (P)	1	3.96	1.06	.0053	.0002
P X A	1	8.10	2.18	.0196	.0007
P X G	3	5.01	1.35	.0116	.0004
P X A X G	3	7.48	2.01	.0671	.0024
P X S/A X G	212	3.72		1.8592	

Table 38 (concluded)

Source	df	MS	F-Ratio	VC	ICC
T X P	1	18.18	4.96*	.0648	.0023
T X P X A	1	2.00	0.55	-.0149	.0000
T X P X G	3	1.01	0.28	-.0474	.0000
T X P X A X G	3	3.61	0.99	-.0019	.0000
T X P X S/A X G	212	3.66		3.6648	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$.

between experimental training groups before taking the tests. However, after taking the tests, participants in the TBT group reported greater difficulty focusing on the test content than did participants in the TGT, TCT, and TXT groups. Table 42 shows the mean values.

The third interaction between Prepost, Experimental Training Groups, and Age accounted for 2% of the response variance. Tukey's HSD showed no significant differences between experimental training groups for participants under age 40 before and after the tests. Further, no significant

Table 39

Means for Comparative Anxiety Before and After Taking The Tests by Time

	Before Taking the Tests	After Taking the Tests
Time 1	3.015 (222)	3.038 (222)
Time 2	2.978 (224)	2.925 (223)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .060 was statistically significant ($p < .05$) using Tukey's HSD procedure.

differences were found between experimental training groups for participants age 40 and over before taking the tests. However, participants age 40 and over in the TBT group reported having significantly more difficulty focusing after taking the tests than participants in the remaining experimental groups. Refer to Table 43 for the means.

Regression Analyses between Test Dispositions and Scores

This section will review the stepwise regression analyses conducted to examine the relationship between participants' test dispositions and fluid and crystal ability test score composites. Separate analyses were performed for participants' dispositions before taking the tests at time 1 and time 2. These dispositions were

Table 40

Summary of the Analysis of Variance for the Training
Evaluation Analyses Using Test Disposition Factors: Test
Focus

Source	df	MS	F-Ratio	VC	ICC
<u>Between Subjects</u>					
Age (A)	1	23.76	1.43	.0159	.0019
Experimental Training Group (G)	3	22.40	1.35	.0257	.0030
A X G	3	8.74	0.53	-.0706	.0000
Subjects/A X G (S/A X G)	215	16.65		4.1617	
<u>Within Subjects</u>					
Time (T)	1	0.91	0.36	-.0037	.0000
T X A	1	0.38	0.15	-.0097	.0000
T X G	3	11.17	4.37*	.0769	.0090
T X A X G	3	1.84	0.72	-.0128	.0000
T X S/A X G	215	2.56		1.2784	
Prepost (P)	1	0.41	0.16	-.0048	.0000
P X A	1	0.39	0.15	-.0097	.0000
P X G	3	8.43	3.30*	.0524	.0061
P X A X G	3	12.53	4.90*	.1781	.0208
P X S/A X G	215	2.56		1.2777	

Table 40 (concluded)

Source	df	MS	F-Ratio	VC	ICC
T X P	1	4.13	2.80	.0119	.0014
T X P X A	1	0.36	0.24	-.0100	.0000
T X P X G	3	2.35	1.59	.0156	.0018
T X P X A X G	3	0.51	0.34	-.0346	.0000
T X P X S/A X G	215	1.48		1.4757	

Note. Negative variance components were assigned an intraclass correlation of zero. However, negative variance components were included in the denominator (i.e., sum of all variance components) to compute intraclass correlation coefficients for the nonnegative variance components. VC, Variance Component; ICC, Intraclass correlation coefficient.

* $p < .05$.

regressed on the test score composites for participants in Groups 1-4 (i.e., TGT, TCT, TBT, TXT) by age and experimental training group. A p -value of .05 was used as the criterion for entry into the regression equation.

Analyses at Time 1

When the test dispositional factors at time 1 were regressed on the fluid ability composite, only the Comparative Anxiety factor was found to be a predictor of fluid test scores. This factor accounted for 9% of the fluid composite score variance. The negative beta

Table 41

Means for Test Focus by Experimental Training Group and Time

	TGT	TCT	TBT	TXT
Time 1	2.354 (112)	2.318 (111)	2.396 (112)	2.357 (112)
Time 2	2.167 (112)	2.274 (112)	2.545 (112)	2.315 (112)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .210 was statistically significant ($p < .05$) using Tukey's HSD procedure.

Table 42

Means for Test Focus by Experimental Training Group Before and After Taking The Tests

	TGT	TCT	TBT	TXT
Before The Tests	2.298 (112)	2.315 (112)	2.396 (112)	2.360 (112)
After The Tests	2.223 (112)	2.276 (111)	2.545 (112)	2.313 (112)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .210 was statistically significant ($p < .05$) using Tukey's HSD procedure.

Table 43

Means Test Focus Before and After Taking The Tests by
Experimental Training Group and Age

Under the Age of 40

	TGT	TCT	TBT	TXT
Before The Tests	2.255 (64)	2.137 (56)	2.369 (74)	2.441 (65)
After The Tests	2.224 (64)	2.274 (56)	2.410 (74)	2.318 (65)

Age 40 and Over

	TGT	TCT	TBT	TXT
Before The Tests	2.354 (48)	2.494 (56)	2.447 (38)	2.248 (47)
After The Tests	2.222 (48)	2.279 (55)	2.807 (38)	2.305 (47)

Note. Sample sizes are in parentheses. Any pairwise difference greater than .342 was statistically significant ($p < .05$) using Tukey's HSD procedure.

coefficient reported in Table 44 indicates that as participants' anxiety levels increased, their fluid ability test score composites decreased.

Equations were computed for each of the age categories

for participants at time 1. Comparative Anxiety was forced to enter the equations as the first predictor and other dispositions were allowed to enter if they met the stepwise criterion. For participants under the age of 40, Comparative Anxiety accounted for 4% of the fluid composite score variance. No other dispositions entered the equation. Again, the negative beta coefficient for Comparative Anxiety suggested that as participants' anxiety levels increased, their fluid score composite decreased. For participants age 40 and over, Comparative Anxiety accounted for 12% of the composite score variance. No other dispositional factors entered the equation. Like those under the age of 40, participants age 40 and over who were more anxious tended to score lower on the fluid ability composite. See Table 45 for a summary of these regression analyses.

Next, Comparative Anxiety at time 1 was regressed on the fluid ability composite by Experimental Training Group. For the TGT group, Comparative Anxiety accounted for 13% of the composite variance. For the TCT group, Comparative Anxiety accounted for 7% of the composite variance. Additional factors that explained the variance beyond Comparative Anxiety in the fluid composite score were Test Ease and Motivation, accounting for 4% and 6% of the composite variance, respectively. While Comparative Anxiety had a negative beta coefficient, Test Ease and Motivation both had positive beta coefficients; therefore, participants

Table 44

Stepwise Regressions: Test Dispositions with Fluid
Composite at Time 1

Factor	r	R	R ²	R ² Change	Beta
CA	-.3051**	.2988**	.0893	.0893**	-.4544**

Note. CA, Comparative anxiety factor.

** p < .01.

Table 45

Stepwise Regressions: Test Dispositions with Fluid
Composite at Time 1 by Age

Factor	r	R	R ²	R ² Change	Beta
Under Age 40					
CA	-.2158*	.2100*	.0441	.0441*	-.2903*
Age 40 and Over					
CA	-.3459*	.3421*	.1170	.1170*	-.4343*

Note. CA, Comparative anxiety factor.

* p < .05.

who were expecting the tests to be easy or were motivated to perform well, tended to score greater on the fluid ability composite. While Comparative Anxiety did not account for significant variance in the fluid composite for the TBT

group, this factor did enter into the equation for the TXT group and accounted for 11% of the composite variance (see Table 46).

When the test dispositional factors at time 1 were regressed on the crystal ability composite, two factors entered into the equation. As shown in Table 47, Comparative Anxiety was the strongest predictor of crystal test scores. This factor accounted for 7% of the crystal composite score variance. Test Focus accounted for 4% of the composite score variance.

Equations were computed for each of the age categories for participants' Comparative Anxiety and Test Focus dispositions at time 1 on the crystal ability composite. Other dispositions were allowed to enter if they accounted for a significant amount of variance beyond that accounted for by the Comparative Anxiety and Test Focus dispositions. For participants under the age of 40, Comparative Anxiety and Test Focus accounted for 4% and 2% of the composite score variance, respectively. The proportion of variance contributed by the Test Focus factor was not significant. In addition, Test Ease accounted for 3% of the crystal composite score variance (see Table 48). The positive beta coefficient for the Test Ease factor suggests that those participants who perceived the tests as being easy tended to score greater on the crystal score composite.

Table 46

Stepwise Regressions: Test Dispositions with Fluid
Composite at Time 1 by Experimental Training Group

Factor	r	R	R ²	R ² Change	Beta
TGT Group					
CA	-.3653*	.3654*	.1335	.1335*	-.5439*
TCT Group					
CA	-.2671	.2672*	.0714	.0714*	-.1998
TE	.2843*	.3407*	.1161	.0447*	.6957*
MO	.1235	.4146*	.1719	.0558*	.8838*
TBT Group					
CA	-.2239	.1817	.0330	.0330	-.2842
TXT Group					
CA	-.3287*	.3288*	.1081	.1081*	-.4436*

Note. CA, Comparative anxiety factor; TE, Test ease factor; MO, Motivation factor.

* $p < .05$.

In contrast, for participants age 40 and over, Comparative Anxiety accounted for 12% of the composite variance. Test Focus, Motivation, and Preparation accounted for an additional 8%, 3%, and 3% of the composite variance, respectively (see Table 48). The negative beta coefficient for Comparative Anxiety suggests that as participants in the age 40 and over category became more anxious, they tended to

Table 47

Stepwise Regressions: Test Dispositions with Crystal Composite at Time 1

Factor	r	R	R ²	R ² Change	Beta
CA	-.2713*	.2648*	.0701	.0701*	-.6203*
TF	-.0521	.3245*	.1053	.0351*	.3409*

Note. CA, Comparative anxiety factor; TF, Test focus factor.

* $p < .05$.

score lower on the crystal ability composite. On the other hand, the positive beta coefficient for Test Focus and its negative correlation with the crystal composite (i.e., $-.07$) suggests that the Test Focus factor served as a suppressor variable in this analysis.

Next, the Comparative Anxiety and Test Focus factors at time 1 were regressed on the crystal ability composite by Experimental Training Group. Comparative Anxiety contributed a significant amount of variance for the TGT (19%) and TXT (13%) groups. This factor did not contribute a significant amount of variance to the crystal composite for the TCT and TBT groups. Test Focus contributed a significant amount of variance for the TBT (4%) and TXT (6%) groups, but did not do so for the TGT and TCT groups. The only factor that accounted for a significant amount of

Table 48

Stepwise Regressions: Test Dispositions with Crystal Composite at Time 1 by Age

Factor	r	R	R ²	R ² Change	Beta
Under Age 40					
CA	-.1928*	.1954*	.0382	.0382*	-.3054
TF	-.0299	.2326	.0541	.0159	.1943
TE	.2213*	.2825*	.0798	.0257*	.3288
Age 40 and Over					
CA	-.3542*	.3403*	.1158	.1158*	-.9341*
TF	-.0704*	.4423*	.1956	.0798*	.5643*
MO	.1414	.4756*	.2262	.0306*	.5460*
PR	-.1467	.5053*	.2553	.0291*	-.2013

Note. CA, Comparative anxiety factor; TF, Test focus factor; TE, Test ease factor; MO, Motivation factor; PR, Preparation factor.

* $p < .05$.

variance beyond those mentioned above was the Test Ease factor. For the TXT group, Test Ease accounted for 5% of the crystal composite variance. Table 49 presents a summary of the regression analyses.

Analyses at Time 2

Across all participants, the Comparative Anxiety factor was found to be a strong predictor of fluid test scores.

This result is similar to that found at time 1. The factor accounted for 6% of the fluid composite variance at time 2, as shown in Table 50.

Equations were computed for each of the age categories. For both age categories, the Comparative Anxiety factor accounted for the same amount (i.e., 4%) of variance (see Table 51). Further, the negative beta coefficients showed that as participants' anxiety levels increased, their fluid score composite decreased.

Next, the test dispositional factors at time 2 were regressed on the fluid ability composite by Experimental Training Group. Comparative Anxiety contributed a significant amount of variance only for the TBT (9%) group. This factor did not contribute a significant amount of variance to the fluid composite for the remaining groups. Beyond the variance accounted for by the Comparative Anxiety factor, Test Focus contributed a significant amount of variance for the TCT (11%) and TXT (5%) groups, but not for the TGT and TBT groups. Another factor that accounted for a significant amount of variance beyond those mentioned above was the Future Effects factor. For both the TCT and TBT groups, Future Effects accounted for 4% of the crystal composite variance. Additional factors that entered into the equation for specific treatment groups and their variance were: Test Ease for the TBT group (5%); and Preparation for the TXT group (5%). See Table 52 for a

Table 49

Stepwise Regressions: Test Dispositions with Crystal
Composite at Time 1 by Experimental Training Group

Factor	r	R	R ²	R ² Change	Beta
TGT Group					
CA	-.4307*	.4307*	.1855	.1855*	-.8011*
TF	-.2365	.4461	.1990	.0135	.2307
TCT Group					
CA	-.1168	.1166	.0136	.0136	-.3203
TF	.0328	.1895	.0359	.0223	.2062
TBT Group					
CA	-.1915	.1700	.0289	.0289	-.4711
TF	.0297	.2704*	.0731	.0448*	.3038
TXT Group					
CA	-.3641*	.3641*	.1326	.1326*	-.6111*
TF	-.0794	.4440	.1971	.0645*	.3685
TE	.3651*	.4967*	.2467	.0496*	.5210

Note. CA, Comparative anxiety factor; TF, Test focus factor; TE, Test ease factor.

* $p < .05$.

Table 50

Stepwise Regressions: Test Dispositions with FluidComposite at Time 2

Factor	r	R	R ²	R ² Change	Beta
CA	-.2456*	.2433*	.0592	.0592*	-.3233*

Note. CA, Comparative anxiety factor.

* $p < .05$.

Table 51

Stepwise Regressions: Test Dispositions with FluidComposite at Time 2 by Age

Factor	r	R	R ²	R ² Change	Beta
Under Age 40					
CA	-.1870*	.1962*	.0385	.0385*	-.2396*
Age 40 and Over					
CA	-.2244*	.2117*	.0448	.0448*	-.2617*

Note. CA, Comparative anxiety factor.

* $p < .05$.

summary of the regression analyses.

When the test dispositional factors at time 2 were regressed on the crystal ability composite, one factor entered into the equation. Like the findings at time 1, the

Comparative Anxiety factor was found to be a strong predictor of crystal test scores. This factor accounted for 11% of the crystal composite score variance. See Table 53 for a summary of the regression analyses.

Equations were computed for each of the age categories for participants' dispositions towards the tests at time 2 on the crystal ability composite. For participants under the age of 40, Comparative Anxiety accounted for 5% of the composite score variance. In contrast, for participants age 40 and over, Comparative Anxiety accounted for 23% of the composite score variance (see Table 54). With the Fisher Z transformation for two independent groups, the difference in the proportion of variance accounted for by this factor across age was significant ($z=2.70$, $p<.05$). Two additional factors accounted for a significant amount of variance beyond that accounted for by the Comparative Anxiety disposition for participants age 40 and over. Test Focus and Motivation accounted for 5% and 4% of the composite score variance, respectively.

Next, the equations at time 2 were computed for the crystal ability composite by Experimental Training Group. Comparative Anxiety contributed a significant amount of variance for the TGT (8%), TBT (9%), and TXT (25%) groups. This factor did not contribute a significant amount of variance to the fluid composite for the TCT group. Beyond the variance accounted for by the Comparative Anxiety

Table 52

Stepwise Regressions: Test Dispositions with Fluid
Composite at Time 2 by Experimental Training Group

Factor	r	R	R ²	R ² Change	Beta
TGT Group					
CA	-.1698	.2335	.0545	.0545	-.3305
TCT Group					
CA	-.2384	.1386	.0192	.0192	-.4341*
TF	.0152	.3552*	.1262	.1070*	.3813*
FE	.0938	.4116*	.1694	.0432*	.4032
TBT Group					
CA	-.2802*	.2960*	.0876	.0876*	-.5697*
TE	.1647	.3666*	.1344	.0468*	-.4210
FE	.1039	.4130*	.1706	.0362*	.5648
TXT Group					
CA	-.2446	.2468	.0609	.0609	-.6684*
TF	-.1905	.3403*	.1158	.0549*	.3976
PR	-.0928	.4034*	.1627	.0469*	-.2413

Note. CA, Comparative anxiety factor; TF, Test focus factor; TE, Test ease factor; FE, Future Effects factor; PR, Preparation factor.

* $p < .05$.

Table 53

Stepwise Regressions: Test Dispositions with Crystal
Composite at Time 2

Factor	r	R	R ²	R ² Change	Beta
CA	-.2278*	.3280*	.1076	.1076*	-.6174*

Note. CA, Comparative anxiety factor.

* $p < .05$.

Table 54

Stepwise Regressions: Test Dispositions with Crystal
Composite at Time 2 by Age

Factor	r	R	R ²	R ² Change	Beta
Under Age 40					
CA	-.2278*	.2263*	.0512	.0512*	-.1997
Age 40 and Over					
CA	-.4900*	.4763*	.2269	.2269*	-.9940*
TF	-.2168*	.5228*	.2733	.0464*	.4453*
MO	.1893	.5575*	.3108	.0375*	.4995*

Note. CA, Comparative anxiety factor; TF, Test focus factor; MO, Motivation factor.

* $p < .05$.

factor, Test Focus contributed a significant amount of variance for the TCT (11%) and TXT (8%) groups. An additional factor that entered into the equation for the TCT group was the Future Effects factor, accounting for 4% of the crystal composite variance. See Table 55 for a summary of the regression analyses.

Summary of Disposition and Test Score Relationships

In summary, the following results for the relationship between test scores and test dispositions were found. Across Time, Age Categories, and Experimental Training Groups, the Comparative Anxiety factor accounted for the most variance in fluid and crystal ability test score composites. These findings showed that Comparative Anxiety had a strong, negative influence on the fluid and crystal ability test score composites, such that those participants who had greater levels of anxiety tended to score lower on the fluid and crystal ability composites.

When examining the fluid ability composite, the amount of variance in the test scores that was accounted for by Comparative Anxiety decreased from time 1 (9%) to time 2 (6%). Thus, the relationship between this factor and the fluid ability composite declined over time.

In contrast, the amount of variance in the crystal ability composite accounted for by Comparative Anxiety increased from time 1 (7%) to time 2 (11%). Therefore, the relationship between this factor and the crystal ability

Table 55

Stepwise Regressions: Test Dispositions with Crystal
Composite at Time 2 by Experimental Training Group

Factor	r	R	R ²	R ² Change	Beta
TGT Group					
CA	-.2899*	.2900*	.0841	.0841*	-.7517*
TCT Group					
CA	-.2563	.2272	.0516	.0516	-.6063*
TF	-.2198	.4071*	.1657	.1141*	.4453*
FE	.0539	.4522*	.2045	.0388*	.4302
TBT Group					
CA	-.3256*	.2919*	.0852	.0852*	-.4509*
TXT Group					
CA	-.5000*	.5001*	.2501	.2501*	-.9787*
TF	-.1642	.5770*	.3329	.0828*	.5056*

Note. CA, Comparative anxiety factor; TF, Test focus factor; FE, Future Effects factor.

* $p < .05$.

composite grew stronger over time.

When test dispositions were compared across age categories, differences in the predictability of the fluid composite were found. The amount of variance accounted for by Comparative Anxiety did not change from time 1 (4%) to time 2 (4%) for participants less than age 40. In contrast,

the amount of variance accounted for by Comparative Anxiety decreased from time 1 (12%) to time 2 (5%) for participants age 40 and over; however, this decrease was not significant ($z=-1.09$, $p>.05$).

When test dispositions were compared across age categories on the crystal composite, Comparative Anxiety accounted for the same amount of variance (5%) at time 1 and time 2 for participants under age 40. Thus, it appears that the relationship between the Comparative Anxiety factor and the crystal composite remained significant, but did not change over time for this age group. For participants age 40 and over, Comparative Anxiety variance in the crystal composite increased from time 1 (12%) to time 2 (23%). However, this increase was not significant ($z=1.21$, $p>.05$). This finding suggests that for this age group, participants' feelings of anxiety increased to a level that was detrimental to their test performance.

When the amount of variance accounted for by each factor was compared across the experimental training groups, decreases in participants' anxiety levels were noted for the fluid composite. In the TGT, TCT and TXT groups, Comparative Anxiety decreased over time. In the TBT group, however, the amount of variance accounted for by Comparative Anxiety increased from time 1 (3%) to time 2 (9%). This finding may be explained by the lower test scores obtained by participants in the TBT group at time 1. Their low

performance on the first set of tests, coupled with any anxious feelings raised throughout training, may have increased their anxiety to a level that was detrimental to the participants' test performance.

For the crystal composites, similar results were found for the TGT group and TBT groups. However, for the TCT group, the amount of variance accounted for by Comparative Anxiety increased from time 1 (1%) to time 2 (5%), although not to a significant level ($z=1.25$, $p>.05$). Finally, for the TXT group, the amount of variance accounted for by Comparative Anxiety increased from time 1 (13%) to time 2 (25%). This increase was not significant ($z=1.22$, $p>.05$), but suggests that participants who did not receive any training and were exposed to the pre-test raised their feelings of anxiety to a level that detracted from test performance.

Analyses for Participants' Reactions to Training Courses

The first portion of this section will review the factor analyses conducted to summarize participants' reactions to the training course interventions as measured by the Post-Course Questionnaire. Then, the results of analyses of variance on reactions to training will be discussed.

Factor Analyses to Identify Factors

A factor analysis included Groups 1, 2, 3, and 5 (i.e., TGT, TCT, TBT, and XBT), because participants from these

groups received some form of training. A principal factor analysis was conducted with a SAS promax rotation method which produces an oblique and varimax rotation. Comparisons of the oblique and varimax rotations indicated more interpretable factor structures with the oblique rotation method. Based on the eigenvalues and scree plot, six factors were identified. For this investigation, items with a factor loading of at least .40 were used to define factors. Refer to the Post-Course Questionnaire in Appendix E for the question corresponding to the item number in each factor.

The first factor, Application to Life and Job, related to the applicability of the training content to participants' personal lives and job in the company. Seven items defined the Application to Life and Job factor: 1, 2, 3, 7, 9, 12, and 14.

The second factor, Assistance, pertained to the clarity of course materials (e.g., course workbook) and the availability of the instructor to answer participants' questions. Five items defined the Assistance factor: 17, 18, 19, 21, and 22.

The third factor, Practice, related to the extent that course exercises and homework helped participants learn or relearn the material. Three items defined the Practice factor: 13, 15, and 25.

The fourth factor, Course Value, pertained to

participants' perceived value of the course for preparing to take tests. Four items defined the Course Value factor: 4, 5, 10, and 11.

The fifth factor, Relearning, pertained to the adequacy of the course length and difficulty level for relearning material. Three items defined the Relearning factor: 6, 8, and 16.

The sixth factor, Convenience, related to the convenience of course locations and times. Two items defined the Convenience factor: 20 and 24.

Analyses of Variance For Course Reaction Factors

Participants' reactions to the course were examined by means of a four (Experimental Training Groups) by two (Age) analysis of variance. The purpose of this analysis was to assess course reactions as a function of the two independent variables. The dependent measures were the reaction composites identified from the above factor analysis. The scores for a factor were computed by summing the scores of the items that defined that factor.

The analysis of variance for the Application to Life and Job factor indicated a significant effect for Experimental Training Group ($F=8.60$, $p<.05$). This effect accounted for 12% of the reaction variance. Tukey's HSD comparisons showed that participants in the TCT ($M=3.603$), TBT ($M=3.408$), and XBT ($M=3.668$) groups felt that the course material was significantly more meaningful and applicable to

their personal life and job, than participants in the TGT group ($M=3.034$).

The analysis of variance for the Assistance factor showed a significant effect for Experimental Training Group ($F=11.25$, $p<.05$). This effect accounted for 16% of the reaction variance. Tukey's HSD comparisons indicated that participants in the TCT ($M=4.353$) and XBT ($M=4.286$) groups perceived the materials to be significantly more helpful and the instructor to be more available to answer questions, than participants in the TGT group ($M=4.050$).

For the Practice factor, a significant effect was found for Experimental Training Group ($F=27.31$, $p<.05$), accounting for 33% of the reaction variance. The results of Tukey's HSD showed that the exercises and homework distributed to the TCT ($M=4.155$), TBT ($M=4.024$), and XBT ($M=4.167$) groups were perceived as being significantly more helpful to the participants for relearning the material, than the exercises and homework distributed to the TGT group ($M=3.218$).

For the Course Value factor, a significant effect was found for Experimental Training Group ($F=6.57$, $p<.05$), accounting for 9% of the reaction variance. With Tukey's HSD, the results showed that participants in the XBT ($M=4.223$) and TCT ($M=4.304$) groups thought that the training received was significantly more valuable to their test-taking preparation, than participants in the TGT ($M=3.845$) group.

The analysis of variance for the Relearning factor resulted in two significant findings. The Age effect was significant ($F=6.10$, $p<.05$) and accounted for 4% of the reaction variance. Participants under the age of 40 reported that the course length and difficulty level was significantly more suitable for them ($M=3.660$) to relearn the material, than did those age 40 and over ($M=3.453$).

The Experimental Training Group effect was also significant ($F=2.97$, $p<.05$) for the Relearning factor. This effect accounted for 3% of the reaction variance. Results of Tukey's HSD indicated that participants in the TCT group ($M=3.721$) thought that the course length and difficulty level was significantly more suitable for them to relearn the material, than did participants in the XBT group ($M=3.429$).

The analysis of variance for the last factor, Convenience, did not produce any significant effects. Thus, participants across age and experimental training groups did not significantly differ in their reactions to the convenience of the course location or time.

IV. DISCUSSION

Overview

The purpose of this investigation was to examine the influence of test-preparation training (i.e., general test-taking skills and test-related content skills) on fluid and crystallized intelligence, and participants' attitudinal dispositions toward test taking. It was hypothesized that larger increases in test scores would result after test-preparation training than after no training. Such increases were expected for individuals of all ages. Further, it was hypothesized that test scores for those receiving training on test-related content skills would increase over time for both fluid and crystallized intelligence, with greater increases for fluid intelligence. Finally, it was expected that test-preparation training would lead to greater changes in test dispositions (e.g., decreased anxiety, increased motivation).

Fluid Test Score Composite

Examination of testing effects showed that the presence of a pre-test influenced fluid intelligence at time 2. Participants who had exposure to a pre-test scored significantly greater on the fluid tests than those who had no exposure. This result suggests that the administration of the pre-test improved participants' test-taking skills.

The testing effects analysis also showed that training influenced fluid intelligence at time 2. Participants who received training scored significantly greater on the fluid tests than those who did not receive training.

The pre-test and training findings indicate that either a pre-test or training aids in the improvement of fluid test scores. The administration of both a pre-test and training does not significantly increase fluid test scores beyond the administration of either alone.

Training evaluation analyses showed two significant findings. First, participants under the age of 40 achieved significantly greater fluid test scores than those age 40 and over. Second, a significant increase in fluid test scores was found from time 1 to time 2. Comparisons of the experimental training groups resulted in no significant differences. This finding, coupled with the finding for Time, indicates that improvements in test scores were due to exposure to the pre-test, rather than to a particular form of training.

The results for Time were most likely due to the practice effect of the pre-test. Apparently, exposure to the first set of tests made the participants aware of their skill problems and allowed them to refresh and improve those skills. In sum, the pre-test served as a test-taking intervention that raised test scores.

The practice effects found for the fluid composite in

this research were similar in magnitude to those reported by Blieszner et al. (1981) and Sarnacki (1979). Blieszner et al. (1981) found practice effects, in addition to training effects, on tests administered one week and one month after training. Like this research, the practice effect suggested to Blieszner et al. that exposure to a test may improve fluid ability at a later test date. This effect may explain the finding that participants who enrolled in college courses scored significantly greater than those who did not. Perhaps exposure to testing in a college environment provides practice with test items that are related to fluid intelligence.

Although different tests were used at time 1 and time 2 in this investigation, the forms of the tests were parallel and contained similar content. Blieszner et al. (1981) suggested that fluid test items may be particularly susceptible to practice effects due to their relative novelty. Exposure to previous fluid tests may be an ability-extraneous factor that needs to be taken into account. That is, training on test-taking skills (e.g., general strategies for testing) and the application of cognitive skills (e.g., general instruction for fluid test items) may not positively affect fluid test scores as much as the repeated exposure to a particular test. Practice effects, due to test exposure, provide additional support for the modifiability of intellectual performance, since the

effects occur as a function of a very limited, no-feedback retest condition. The magnitude of these practice effects, however, indicates that researchers should use considerable caution in interpreting fluid intelligence assessment over repeated trials of test-naive populations, such as older adults. Simple exposure to the tests could account for a large portion of the effects.

The practice effects found for the fluid composite, coupled with the moderate decline in Comparative Anxiety over time, coincides with the findings of Kooken and Hayslip (1984). Kooken and Hayslip suggested that decreases in anxiety occur with simple exposure to test materials. Participants' exposure to the tests at time 1 may have enabled them to generate cognitions at time 2 that allowed them to focus on the tests. Such exposure led to improved test scores. However, participants still expressed significant levels of anxiety at time 2.

The training effect result agreed with the training literature (e.g., Denney & Heidrich, 1990; Labouvie-Vief & Gonda, 1976; Willis et al., 1981). Previous research reported improvements in fluid abilities due to training. Similar results were found, despite differences in the length of training and measures of fluid intelligence. For example, Willis et al. (1981) trained research participants over a 3-year period, which is a much longer period of time than that employed in the present investigation. The

training program schedule in the present investigation was intense, requiring participants to meet twice per week over a 7-week period. However, the breadth and depth of information reviewed in seven weeks cannot equal the material presented over a 3-year period. Nevertheless, this training program was sufficient in length in order for participants to learn skills related to fluid intelligence. Because fluid intelligence is believed to be learned in part through idiosyncrasy and casual experience, a shorter and more intense training program may be adequate.

Previous research has employed different types of test items to measure and improve adults' fluid intelligence. For example, Denney and Heidrich (1990) used items from Raven's Progressive Matrices. The present investigation employed different test items to measure fluid intelligence. Since both investigations were successful in improving fluid test scores, it appears that training programs can be utilized to improve performance on a wide variety of tests requiring fluid intelligence. Several types of fluid tests may be similar in susceptibility to training and require similar intervention strategies (e.g., reinforcement, direct instruction, self-instruction, or repeated practice).

Reasons for the lack of differences in fluid test scores between particular experimental training groups are numerous. Previous researchers (e.g., Callenbach, 1973; Samson, 1985) stated that training on test-taking skills

would improve test scores; however, they did not examine improvements for particular types of intelligence (i.e., fluid or crystallized). Past research has not examined the separate effects of training general test-taking skills and test-related content skills on fluid intelligence.

Training only on general test-taking skills may not have led to significantly greater scores on the fluid tests for several reasons. First, six hours of general test-taking information may not have been sufficient to maintain performance on the fluid tests. Second, participants' disposition towards the tests' future effects as well as written comments indicated that the content in the general test-taking skills course was not perceived as being directly relevant to the employment tests. Subsequently, participants may not have put forth much effort to learn general test-taking skills, and instead, they practiced skills that were perceived as being more relevant to the test (e.g., mathematical, grammar, vocabulary) outside of the training class. Third, test-wiseness or general test-taking skills may have been implicitly taught in all of the training courses. It is difficult, if not impossible, to train individuals on test-related content skills, which requires them to practice solving problems, without reviewing test-taking skills. This suggests that all participants received, explicitly or implicitly, some form of training on test-taking skills (Diamond & Evans, 1972).

Another possible reason for the lack of differences between all experimental training groups is the absence of control that the researcher had on restricting course materials and information. Although participants were asked not to share the information that they received in class with others, participants in one training group may have shared the course instructions and materials with participants in other training groups. By sharing this information, training differences across experimental groups on the fluid ability composite may have been reduced.

Finally, differences across particular training groups may not have been found because of participants' preparation and motivation levels before the test at time 1. Participants who did not receive training knew that course instruction would not be available to them throughout the investigation. These participants subsequently reported being significantly more prepared and motivated than the other groups. Further, they engaged in activities (e.g., reviewing exercises in high school or college textbooks) that led to their higher test scores at time 1. The training completed by the other groups raised their preparation levels and test scores at time 2. However, these increases did not surpass the scores of the control group.

Differences in Comparative Anxiety over time were found between experimental training groups. Participants in the

group that received training on both types of skills became more anxious and motivated at time 2, because they may have thought they did not perform well on the first set of tests. However, this increase in anxiety did not adversely affect their test scores. Participants in this group reacted to their thoughts by preparing for the tests at time 2, and consequently felt more motivated to perform successfully.

The group that received training only on test-related content skills became less motivated at time 2. This decline in motivation can be explained by their questionnaire responses after the first set of tests. Their responses indicated that the tests at time 1 were very difficult. Consequently, they may have felt prematurely defeated, helpless, and unprepared for the second set of tests. Such feelings may have been exacerbated throughout training as a large amount of information was presented. The intense training program conducted over a short period of time may have overwhelmed them with information.

The groups that received training on general test-taking skills or no training became less anxious over time. Because participants in these groups received little or no training, this finding can be explained by Kooken and Hayslip's (1984) suggestion that decreases in anxiety often occur with simple exposure to test materials. Both of these groups were exposed to the pre-test at time 1. Thus, this pre-test apparently decreased their test-taking anxiety.

Conclusions on the test-taking dispositions suggested that negative changes (i.e., declines in Motivation and increases in Comparative Anxiety) for particular training groups did not adversely affect fluid test scores. On the other hand, positive changes in dispositions did lead to increases in fluid test scores from time 1 to time 2; however, there were no differences across training groups.

Fluid Test Score Composite by Age

Across age categories, participants under age 40 scored significantly higher on the fluid composite than those age 40 and over. This difference was particularly strong, accounting for 19% of the composite variance. The Time effect was significant, which indicated overall improvement in fluid test scores. Further, results showed no significant interactions between Age and the Experimental Training Groups. This finding indicated no differential effect between the age categories across training conditions over time. Thus, the fluid composite for participants in both age categories improved over time, but even after training, those under the age of 40 continued to score significantly higher on the fluid composite than those age 40 and over.

Reasons for the results on the fluid composite between age categories may not be due to differences in Comparative Anxiety, since Comparative Anxiety significantly affected test scores for participants of all ages at all times.

However, Comparative Anxiety decreased for both age groups over time, particularly for the group of participants age 40 and over. The older participants who were anxious at time 1 may have fallen into Culler and Holahan's (1980) self-defeating loop. That is, participants age 40 and over may have perceived that they did not perform well on the first set of tests. Consequently, they may have thought that the tests at time 2 would be more difficult, and because they did not have confidence in succeeding, they did not prepare for the tests at time 2. However, through retesting, the older participants adapted to and gained control of the testing situation. Subsequently, their anxiety levels were reduced. Thus, these results support Cornelius' (1984) contention that practice conditions may facilitate performance on fluid measures of intelligence, particularly for older adults. The findings also suggest that moderate decreases in anxiety lead to increases in fluid test scores.

Based on these findings, test anxiety may not detrimentally affect fluid intelligence as greatly as had been thought. Recent studies (e.g., Mueller, Kausler, & Faherty, 1980) suggested that test anxiety may not influence older adults a great deal more than younger persons. Consequently, dispositional factors may not play as great a role in intellectual performance as Hayslip and Kennelly (1984) contended.

If differences between age groups on the fluid ability

composite are not due to differences in anxiety levels, then perhaps age differences are due to the older adults' loss in concentration. Horn (1986) and Stankov (1988) postulated that losses in concentration may lead to declines in their short-term memory and cognitive processing speed. Tomer (1989) reported that older adults have a somewhat reduced speed of cognitive processing and thus a somewhat lower level of fluid intelligence, as a result of being inactively involved in studying, taking exams, etc. His observation supports the hypothesis that a decline in fluid intelligence for older adults may not be a biological phenomenon, but rather a social and cultural phenomenon. That is, because of a lack of recent test-taking experiences, the initial performance of older persons on a task requiring fluid intelligence is likely to fall below the level of their capabilities.

Another social phenomenon that may contribute to older persons' lower performance on fluid intelligence tasks may be their job. The job may not require the use of fluid intelligence. If the job itself fails to stimulate fluid intelligence, more rapid declines with age may follow. On the other hand, in more stimulating job environments, declines in cognitive functioning may not occur. Younger individuals may hold the same job titles as older individuals in this sample, but because the younger persons had more recent test-taking experiences, their fluid

intelligence remains superior to those of older persons.

The results indicated that the fluid test score composite did increase across time for individuals of all ages. However, those under age 40 continued to score significantly higher on the tests at time 2 than those age 40 and over. While training and exposure to testing may have affected participants in both age categories equally, differences still remained. It appears that exposure and training are not sufficient for those age 40 and over. In addition to the training and practice provided, older individuals may require more intensive training and exposure to specific instructions, drills, etc. to provide them with sufficient experience with the fluid tests. Participants' responses on the Post-Course Questionnaire confirmed the need for varying amounts of training instruction and practice across age groups.

Crystal Test Score Composite

Examination of the testing effects showed that the presence of a pre-test did not influence crystallized intelligence at time 2. In contrast to the findings for the fluid composite, participants who were exposed to a pre-test did not score significantly greater on the crystal ability tests than those who were not exposed.

The testing effects analysis also showed that, unlike fluid intelligence, training did not influence crystallized intelligence at time 2. Participants who received training

scored no differently than those who did not receive training. These findings suggest that neither a pre-test or training improved crystal test scores.

In contrast, the training evaluation analyses showed three significant effects and interactions. First, a significant increase in crystal test scores was found from time 1 to time 2. Second, comparisons of the experimental training groups showed that the control group (i.e., TXT) obtained significantly greater crystal test scores than the other training groups. Third, the Time x Experimental Training Group interaction indicated that participants' crystal test scores in the TCT and TBT groups significantly improved from time 1 to time 2.

Although all participants were randomly selected for each of the experimental training groups, the TXT group obtained significantly greater test scores at time 1. The TXT group achieved greater test scores at time 2 also, without training. At time 2, the groups that received training improved their test scores, but not to the magnitude of those obtained by the TXT group.

Comparisons across time for the crystal composite showed a significant increase from time 1 to time 2. This effect may be due to greater test scores for the TCT and TBT groups across time. The results support the hypothesis that increases in test scores would occur over time for the groups that received training on test-related content

skills.

Research with student populations also obtained increases in crystal test scores resulting from training. For example, Callenbach (1973) found that students achieved higher test scores on a reading test after training. Bookman and Iwanicki (1983) reported similar results for a mathematical achievement test. Messick and Jungeblut (1981) found that students could be trained to improve their scores on the Scholastic Aptitude Test (SAT), which consists of mathematical and verbal subscales. The present research expands upon these findings related to training and crystallized intelligence; it demonstrates the utility of training in an adult population.

One reason for the differential effects of training on crystallized intelligence may be the relevancy of training to the test content. For the groups that did not receive any training related to test content (i.e., TGT and TXT), crystal composite test scores did not significantly increase from time 1 to time 2. In contrast, significant increases in the crystal composite were achieved by participants who received training on test-related content and basic cognitive skills (i.e., TCT and TBT). These findings indicate that such training led to larger increases on the crystal test score composite than training on test-taking skills alone. This finding was expected, since training for the TCT and TBT groups included practice on mathematical,

grammar, and vocabulary exercises. Those exercises resembled tests that measured crystallized intelligence.

Other reasons for the crystal composite results may be due to participants' dispositions toward test taking. Participants' levels of Comparative Anxiety increased from time 1 to time 2. The increase in Comparative Anxiety from time 1 to time 2 is interesting. First, this finding suggests that a certain level of anxiety may be beneficial to test taking, and supports the inverted U relationship between anxiety and performance (Mandler & Sarason, 1952). Second, comparisons between the fluid and crystal test score results indicate that levels of beneficial anxiety may vary depending on the type of intelligence being measured. For example, participants may perform better with higher levels of anxiety on tests that require crystallized intelligence than on those that require fluid intelligence. Although test items requiring crystallized intelligence were found to induce anxiety, such items (e.g., mathematical, grammar) were also relatively more familiar. Thus, higher levels of familiarity may compensate for some anxiety when performing particular test items.

An explanation for the increase in Comparative Anxiety over time for the crystal ability composite is related to participants' previous testing experiences. According to Sieber (1980), test items that measure crystallized intelligence (e.g., mathematics, grammar, and vocabulary)

have been associated with individuals' testing experiences in the past. If a person was not able to perform successfully on a mathematical or writing test while in school, that individual may not view himself or herself as having the capability to complete such tests successfully in the future. Thus, the anxiety reported by participants may have been due to their expectations of being unable to perform successfully on the test.

Differences were found between experimental training groups in Comparative Anxiety over time. The anxiety level of the TGT group did not change over time. Because this group received instruction on skills that were not perceived as being directly relevant to the test, they may not have felt completely prepared for the tests at time 2. However, because of their previous exposure to the tests at time 1, their anxiety levels did not change. The TCT group did not report being anxious at time 1 or time 2. This group received formal instruction on skills that they perceived as being directly relevant to the test; therefore, they reported feeling prepared to take the tests at time 2. The TBT group became more anxious at time 2 because, similar to the fluid composite findings, they may have thought they did not perform well on the first tests. Finally, several test dispositions changed over time for the TXT group. Results showed that this group became more anxious and had greater difficulty focusing on the tests over time. It appears that

participants in this group, unlike the others, were unsure of their capabilities to perform successfully on the tests without training.

Although anxiety levels increased over time for most participants, an overall increase in the crystal test score composite was found. The increase in Comparative Anxiety over time, coupled with the training effect found for the TCT and TBT groups, can be explained as follows. Unused cognitive skills decline as a function of disuse and practice (Denney, 1982). When such skills are required for test taking, both trait and state anxiety increase (Schwarzer, 1984), corresponding to Comparative Anxiety and Test Focus in the present research. The present results indicate that anxiety may have risen to an optimum level (i.e., inverted U shape). At this optimal level, the worry component of anxiety, considered by Schwarzer (1984) to be the most predominant source of test-taking interference, was reduced via training. Training may have produced two simultaneous effects: 1) the person attended to task-relevant thoughts during the tests, rather than negative or self-defeating thoughts (Cornelius, 1984); and 2) items were perceived as being less difficult and requiring less effort, and therefore promoted less anxiety.

Crystal Test Score Composite by Age

Across age categories and Groups 1-4 (i.e., TGT, TCT, TBT, and TXT), there were no differences on the crystal

composite between participants of each age category. The Time effect was significant, however, suggesting that the crystal composite for participants in both age categories improved over time.

The similarities in the crystal composite between age categories coincide with the recent theory of intelligence. Crystallized intelligence is presumed to reflect knowledge acquired through formal means, such as schooling, and has been equated by Horn (1982) to individuals' general wisdom, judgment, and breadth of knowledge. Based on its origin and development, Horn (1986) and Stankov (1988) suggested that crystallized intelligence remains relatively stable after age 20. The findings in the present investigation support their contention, since the crystal composite test scores did not significantly differ between the younger and older participants, even after training.

Reasons for the similarity in the crystal composite between participants of each age category are probably not due to the Comparative Anxiety disposition, since anxiety levels differed for all participants. For example, participants under age 40 were not anxious at time 1, but were anxious at time 2. In contrast, participants age 40 and over were anxious throughout the investigation, and became even more anxious at time 2. This finding coincides with Whitbourne's (1976) research, in which older individuals were found to be more anxious than younger

individuals.

A possible explanation for the positive relationship between anxiety and the crystal composite is related to participants' confidence in performing successfully on the tests. Qualification on the management test battery was of sufficient importance to participants. Therefore, regardless of their high levels of anxiety in the testing situation, participants invested more effort while taking the tests. As participants strived harder to achieve high scores on the tests, they perceived more control over the situation. In turn, their increased effort compensated for any detrimental effects on test performance due to anxiety (Eysenck, 1979).

Whether participants had previously taken the company-sponsored "Test-Taking and Thinking Skills" course moderated the crystal ability composite. Across age, participants who did not take the course scored significantly greater on the crystal ability composite than those who had taken the course. This finding suggests that previous instruction negatively interacted with the training provided. Perhaps participants tried to remember and assimilate information from the past training course with the information provided from the current training program, and became overwhelmed with testing information. As a result, their test performance was negatively affected.

Differences were also found in the crystal composite

between age categories in relation to whether participants took the "Test-Taking and Thinking Skills" course. Participants under the age of 40 in the TXT group who had taken the course scored significantly higher on the crystal ability composite than those age 40 and over. One explanation for this finding may coincide with Avolio and Waldman (1987)'s contention that increasing age is correlated with fewer or less recent years of formal education. According to Blum and Jarvik (1974), individuals who are removed from educational experiences for a longer period of time perceive the test content to be unfamiliar. Subsequently, they tend to become undermotivated and do not prepare for the test to the extent necessary. Therefore, these individuals do not perform to their highest ability levels, even after preparing. On the other hand, younger participants who had more recent educational experiences are familiar with the test content, and are subsequently more motivated to maintain their cognitive skills. As a result, younger individuals put more effort into preparing for a test. Thus, even though participants in both age categories enrolled in the "Test-Taking and Thinking Skills" course prior to the present research, it is not surprising that the crystal ability composite for the younger age group was significantly higher.

Dispositions Toward Test Taking

Future Effects

Comparisons between participants' perceptions of the future effects of their test scores before and after taking the tests revealed a clear difference. Participants perceived their test scores to have significantly more future effects before taking the tests than after taking the tests. One possible explanation for this difference is that the match between the skills assessed by the tests and those used on the job was not obvious to the test-takers. That is, even though the construct validity of the tests was statistically high, the face validity of the tests was low. Therefore, participants did not perceive their test scores as valuable to their placement into an entry-level managerial position.

Across Age categories, participants under age 40 perceived their test scores to have significantly more effects on their future than did participants age 40 and over. This finding suggests that participants who have worked in the same job title or within the same company for an extended period of time perceive test taking as less relevant to their eligibility for transfer or promotion. Perhaps, their perceptions are related to the stages of a career (Hall, 1976). According to Hall (1976), younger individuals are more likely to try different jobs before becoming established. Once they become established in a

career, they plateau and maintain the career that already has been achieved. Older individuals have plateaued, and therefore have been removed from formal educational experiences for a longer period of time. While they may have applied basic skills to their job, they come to view on-the-job experiences acquired over the years as more indicative of future success in higher level positions than selection tests. Therefore, older participants are less likely to perceive the tests as having effects on their future, than their younger counterparts.

Another explanation for this finding is related to recent changes in organizational testing. The administration of tests to select individuals for organizational positions is more common today, than it has been in the past (Gordon & Terrell, 1981). Thus, younger individuals are more likely to expect to take tests, than older individuals, in order to secure a position.

Preparation

Comparisons between treatment groups revealed a clear difference in participants' levels of test preparation. Across treatment groups, participants who received cognitive skills training (i.e., TCT and TBT) felt that they were significantly more prepared for the tests, than those who received either general test-taking skills training or no training (i.e., TGT and TXT). One obvious reason for this difference was the additional classroom time that the TCT

and TBT groups received. Another possible reason for their feeling of increased preparation is the face validity of the tests to training. The match between constructs assessed by the tests and those in the cognitive skills training course was obvious to the test-takers; therefore, participants felt more prepared.

Participants' reactions to the cognitive skills training confirmed these explanations. For example, participants reported that the course was very meaningful and applicable to job skills. In addition, participants in the TCT and TBT groups reported that the course did assist them with their preparation for the tests. In contrast, those groups which did not receive training on cognitive skills (i.e., TGT and TXT) did not feel adequately prepared. Participants in the TGT group commented that the relevancy of the general test-taking skills training to the experimental tests or the applicability of that type of training to their jobs was not understood.

Across time, participants reported spending significantly more time preparing for the tests at time 2, than they did for the tests at time 1. This finding is obviously due to their participation in training, including exposure to the tests at time 1 and training exercises. The class time contributed a large number of hours to their preparation. Also, after taking the tests at time 1, participants formed expectations for the tests at time 2.

As a result, those who did not receive training spent more time preparing on their own, in anticipation of qualifying for an entry-level managerial position.

Comparisons before and after the tests revealed a difference in participants' perceptions of their preparation levels. In general, participants perceived themselves as more prepared before taking the tests than after taking the tests. It seems that participants may have, in retrospect, felt that the tests were not easy and subsequently thought that they had not achieved high test scores. Perhaps, test items required the use of skills that they did not refresh or never had the ability to use. Such negative thoughts may have caused participants to reflect on the types and amount of preparation that they could have undertaken.

A difference in preparation was also found across treatment groups and time. At time 1, the TXT group indicated that they were more prepared for the tests than the TCT and TBT groups. One possible explanation for this finding is that participants in the TXT group knew that they were not going to receive training, and consequently they may have spent more time preparing for the tests at time 1. In contrast, participants who knew they were going to receive training did not spend as much time preparing for the first set of tests, because they knew that they would be trained before taking the second set of tests.

At time 2, however, the TCT and TBT groups perceived

themselves as being significantly more prepared for the tests than did the TGT or TXT groups. It appears that training on cognitive skills, rather than general test-taking skills, was viewed as adequate preparation for the selection tests. The courses that included cognitive skills instruction were face valid, longer in length, and required participants to practice numerous exercises and drills. Such characteristics must have influenced participants' perceptions of their test preparation.

Test Ease

Across the treatment groups, all participants indicated that the tests were not easy. However, comparisons showed that the TBT and TXT groups reported the tests to be easier than did the TGT and TCT groups. Participants who received training on both general test-taking and cognitive skills (i.e., TBT) were aware that they received a relatively larger amount of preparatory materials than the other groups in the present research. Such knowledge may have led to the development of a self-fulfilling prophecy (i.e., their knowledge of receiving the most training may have caused them to think that the tests would be easier for them to complete). On the other hand, participants who did not receive training spent more time preparing on their own. Such preparation may have caused the TXT group to feel less anxious and more motivated; therefore, they perceived the tests to be less difficult.

A comparison between time and age categories revealed that at time 1, participants age 40 and over perceived the tests as significantly easier than did participants under age 40 at time 2. A possible explanation for the change in perceptions for the older participants over time is that they expected the tests to be an extension of the mathematic, grammar, and vocabulary skills that they use everyday on their job. Subsequently, older participants believed that their skill levels were fairly high and therefore the tests would be relatively easy. Yet, many of these individuals did not apply their skills in a testing environment since schooling. The lack of test-taking experience, coupled with their beliefs that the tests would not affect their future, caused participants age 40 and over to perceive the tests at time 2 as more difficult than at time 1.

On the other hand, participants under age 40 had more recent testing experiences. Because of their recent experiences, they had more realistic expectations of the tests' difficulty at time 1. After taking the first set of tests, the younger participants altered their expectations. They then perceived the second set of tests as more difficult than they had originally anticipated.

Motivation

In general, participants' motivation levels were high. Across treatment groups, the TCT and TBT groups were

significantly more motivated to perform well on the tests, than the TGT and TXT groups. One explanation for this finding is similar to that given for differences in preparation across treatment groups. It appears that individuals who refreshed their cognitive skills and practiced test-related exercises were able to rebuild their skill repertoire. Their increased level of preparation caused them to feel more able, and subsequently more motivated to attempt problems on the tests.

Across time, motivation levels decreased. Such decreases appear to correspond with changes in two dispositions: participants' increased perceptions of test difficulty, and the reduction in perceptions of the tests' future effects. When participants viewed the tests as being difficult and having no affect on their future, their motivation to perform well on the tests declined.

Across age categories, participants under age 40 were significantly more motivated to perform well on the tests than those age 40 and over. A possible explanation for this finding may again relate to the lack of recent testing experiences for participants age 40 and over. Their lack of testing experience may have induced feelings of fear, anxiety, and perhaps even helplessness in a testing situation. Such feelings would be expected, particularly if they did not perceive the direct relevancy of the test to the managerial job. On the other hand, participants under

age 40 who had more recent testing experiences reported higher motivation levels. High motivation may be a result of their increased familiarity with test taking techniques and their use of similar cognitive skills in a number of test-taking environments (e.g., SAT or GRE tests for advanced schooling).

Comparative Anxiety

Testing effects analyses revealed that participants who had training were significantly more anxious after taking the tests at time 2 than those who did not have training. An explanation for this finding may be that participants who completed training and then thought that they did not perform well on the tests felt disgruntled. In contrast, the group that did not complete training had not invested as much time into their test preparation. Subsequently, the anxiety levels for this group did not increase as high as those for the groups which did complete training.

For the training evaluation analyses, no differences were detected between treatment groups or age categories for participants' anxiety levels. However, there were differences in anxiety, depending on the time that the tests were taken. Participants reported being more anxious for the tests at time 1 than the tests at time 2. These findings may have been due to participants' unfamiliarity with the tests and the testing situation at time 1. Exposure to the tests and training helped reduce

participants' anxiety levels at time 2.

Test Focus

Testing effects analyses revealed that participants who received training (i.e., TGT, TCT, and TBT) had significantly more difficulty focusing on the tests than those who did not have training (i.e., TXT). Perhaps, participants in the TGT, TCT, and TBT groups tried to recall many pieces of information from their pre-test and training experiences. As a result, they may have become overwhelmed with the information, and became distracted from the test content at time 2. In contrast, the TXT group was not exposed to such an abundant amount of information, and subsequently did not have difficulty focusing on the tests at hand.

The training evaluation analyses indicated that there were differences in participants' ability to focus on the tests between treatment groups across time. In general, the TBT group had more difficulty focusing on the tests at time 2 than the remaining groups. Perhaps participants in the TBT group had higher anxiety levels, because they were trying to apply both types of skills while taking the tests. As a result, they became distracted and had difficulty focusing on the test content.

In general, participants age 40 and over had more difficulty focusing on the tests than those under the age of 40. A possible explanation for this finding may be that

because of their lack of recent testing experiences, the older participants were very anxious. Their feelings of anxiety in turn led them to think about failure more often. Consequently, they were distracted during the tests.

Limitations

While conducting the present research investigation, some limitations were realized. First, a shortage of advanced mathematical workbooks may have limited the achievement level of some participants. Because the supply of workbooks that reviewed advanced algebra and geometry was exhausted and could not be replenished during the research investigation, some participants were not able to review advanced mathematical exercises outside of class. Although mathematics is only a portion of the crystal composite and advanced algebra and geometry were reviewed in class, some adults preferred to review this material at home.

The second limitation was the administration of the experimental tests after work hours. The experimental tests were administered during the evening because company policy prohibited employees to leave their work shift to participate in the present research investigation. Because the tests were administered after participants worked eight hours, fatigue may have influenced participants' test performance.

Another characteristic of the present research that may have influenced participants' test scores is the weekly

schedule. All training courses were delivered twice per week. This schedule may have caused fatigue for some participants, which in turn may have influenced their ability to learn and practice test-preparation skills. Nevertheless, the course schedule in the present research was similar to that of other company-sponsored courses.

A third limitation to this research relates to lack of control that the researcher had on restricting course materials and information. Participants were asked not to share the information that they received in class with others in the investigation. However, some participants may have shared the course instructions and materials with others. By doing so, differences in training effects on the composites may have been reduced.

A fourth limitation pertains to the amount of involvement participants displayed throughout training. The amount of homework participants completed outside of class ranged from 0 to 30 hours per week. Similarly, participants varied in their involvement levels during class. For example, some participants asked many questions and requested assistance from the instructor. In contrast, some participants did not ask any questions and requested to leave class early. So, while some individuals were passive participants in the course, others were very active learners. This wide range of involvement created within-group variance and may have led to differential training

effects. As Turkington (1992) stated, students must actively participate, find answers to their own questions, and tutor each other in order to learn and retain skills over time. In order to obtain a more precise measure of training effects, more stringent controls on participation may be necessary.

The last limitation is related to the fact that all participants were given an opportunity to review the study guide for the management test battery before taking the tests or receiving training. The study guide contained information about the specific tests that comprised the management test battery. Because participants were made aware of the tests on the management test battery, they may have concentrated only on these tests during training and testing. As a result, performance on the tests that were extracted from the non-management test battery may not be completely accurate.

Future Research

One area in need of further research is the development of a more comprehensive and detailed classification scheme of tests that require fluid and crystallized intelligence. For the present research, the tests were rated as measuring a type of intelligence through a consensus meeting procedure. Previous research has identified specific tests that measure fluid and crystallized intelligence (e.g., Horn, 1982), and when the same test is used, the same

classification is used across investigations. The problem lies in identifying those tests that have not been previously classified in the literature. The classification of a test as measuring either fluid or crystallized intelligence is usually determined through theory and educated guessing. Yet, many researchers do not even agree on the origin of these types of intelligence or their stability over time.

Varying definitions of fluid and crystallized intelligence are provided throughout the cognition literature. However, if tests used in each investigation are not similar in content and structure to those classified in the literature, tremendous cognitive demands are placed on the raters. There is not a list of specific tests or even guidelines for types of tests that measure fluid or crystallized intelligence. These decisions are not minor in the areas of intellectual functioning and trainability research. The classification of tests lays the foundation of theories of intellectual functioning and their trainability. In order to improve the likelihood of utilizing the appropriate training strategy, a classification scheme for identifying tests as measures of fluid and crystallized intelligence must be developed. In addition, research needs to be conducted that can help identify tests measuring each type of intelligence across different age groups.

Another research idea is related to the timing of tests. The selection batteries utilized in this research involved timed tests administered under standardized conditions. The slower response speed of older adults (Tomer, 1989) may limit the range of training effects demonstrated when they are assessed under timed testing conditions. Research should be conducted that examines training assessment under both speed and power testing conditions. If differences between these conditions are found, appropriate educational interventions could be built into the training program.

Throughout the training literature, researchers often suggest that pre-test effects contaminate post-training assessment. The present research should be replicated to monitor training effects on the fluid and crystal composites over several post-tests. By doing so, pre-test and maintenance effects due to training could be more carefully examined. Such research could provide information not on how quickly skills are learned, but rather on how individuals retain test-preparation knowledge and apply it to future testing situations.

Another issue warranting future research is theoretical, and pertains to the need for a comprehensive view of the factors that modify cognitive abilities in adults. Before individuals arrive at the testing situation, many factors may have influenced their cognitive

functioning, such as genetics, environment, job, education, fatigue, motivation, etc. For example, Avolio and Waldman (1987) contend that there may be a link between specific job experiences and the influence that the content domain of a selection test has on test performance. Further, basic skills may have been taught in schools differently to various generations, and these techniques may influence test performance. Thus, it is imperative to conduct longitudinal studies to examine the antecedent conditions that may contribute to the maintenance or decline of cognitive functioning that are pertinent to test performance. The understanding of how individuals come to operate at their current levels of functioning can lead to the designing of more suitable and effective training programs.

Implications

Since this research was one of the few field investigations that evaluated training interventions to prepare adults for test taking, the results warrant attention. This research showed that the lack of recent test-taking experiences is a major contributor to lower test score performance. Exposure to the test-taking situation benefited future test performance. A reduction in an extraneous factor (i.e., length of time away from test-taking experiences) and exposure to a testing situation helped individuals increase their test scores. Furthermore, test anxiety appeared to be an influential moderator of test

scores. For crystal abilities, moderate increases in anxiety tended to result in increases in test performance. In contrast, similar increases in anxiety negatively affected performance on tasks requiring fluid abilities. Therefore, educational programs must treat anxiety differently, depending on the skills being trained.

Training on fluid abilities did not eliminate test score differences between older and younger participants. Perhaps training cannot compensate for biological factors or extended periods of time in which fluid abilities were not needed. However, exposing individuals to tasks requiring fluid abilities may help maintain or slow their decline. If organizations want to provide employees with such opportunities, interventions that expose individuals to fluid abilities must be provided throughout an employee's career. For example, career planning and development programs should consider the incorporation of various types of skills (i.e., fluid and crystal skills) in an individual's career. Thus, in an effort to reduce skill obsolescence, fluid abilities must be periodically refreshed and maintained. Through such ongoing programs, extraneous test-taking factors are eliminated and fluid test scores are improved.

Training on cognitive skills was found to be effective for improving crystallized intelligence. Cognitive skills training was viewed by participants as desirable and

valuable to their test preparation for both fluid and crystal abilities. Although such training was not effective in improving fluid abilities, favorable reactions to the course are important for participants' acceptance of training information, motivation levels, and active involvement in the course. General test-taking skills training, on the other hand, was viewed by participants as being unnecessary to test preparation. Such training was not effective in improving fluid or crystal ability test scores. Future training programs should not just include general test-taking skills information. It appears that training and practice on cognitive skills is an important and desired aspect of adult education programs. If general test-taking skills instruction is to be included in an educational program, it should be combined with cognitive skills training.

Conclusions

The current investigation offers additional empirical evidence to the limited amount of research on aging, training, and personnel test performance. Four hypotheses were proposed and investigated in the present research. The first hypothesis of greater increases in test scores due to test-taking training was supported. Training effects for the fluid composite indicated that groups receiving training on general test-taking and test-related content skills had greater test scores than groups that did not receive

training. This finding supports earlier research which stated that training can be utilized to improve fluid intelligence.

Training effects for the crystal composite showed that groups receiving cognitive skills training significantly increased their test scores from time 1 to time 2. The instructional methods of practice, exercises, and drills employed during the cognitive skills training may be appropriate for refreshing crystal skills. In order to improve fluid or crystallized intelligence, cognitive skills training should be included as part of the training strategy.

The hypothesis of greater increases in test scores for those age 40 and over was not supported. In general, the test scores for older participants increased, but at the same rate as those for younger participants. Test-preparation training influenced the test scores for participants in both age categories equally. On the fluid composite, differences between age categories were found at time 1 and time 2; however, these differences were not present on the crystal composite. While in school, individuals must overlearn crystal abilities (e.g., multiplication tables, spelling bees, historical facts). Tasks requiring crystallized intelligence greatly perpetuate the learning environment, relative to those requiring fluid intelligence. As a result, individuals are more likely to

recall and reuse tasks that were overlearned in a formal environment than those that are learned informally through personal experience. In addition, these results coincide with the literature stating that fluid intelligence is more likely to decline over time than crystallized intelligence.

The hypothesis of greater increases in fluid test scores over time was supported. Regardless of training, simple exposure to the test at time 1 led to increases in the fluid test score composite at time 2. On fluid abilities, exposure to the pretest appeared to be adequate for large improvements in test scores. In order for crystal abilities to improve, training on cognitive skills appeared to be necessary.

The last hypothesis of more positive changes in test dispositions (e.g., decreases in test anxiety) after training was partially supported. Groups that received cognitive skills training felt more prepared for the second test, than those who received general test-taking skills training or no training. However, other differences in dispositions toward test taking (i.e., reductions in motivation and anxiety) appeared to be due to exposure to the first test, rather than training effects.

In summary, this investigation offers support for the effectiveness of educational training programs designed to help adults prepare to take tests. Furthermore, this research provides insight into individuals' dispositions

toward test taking, and how these dispositions relate to test scores.

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Appendix A
Background Information Sheet

BACKGROUND INFORMATION

Please answer the following questions. The questions require you to either print your answer in the space provided, or place a check mark in the blank next to your response. All of your responses will remain strictly confidential.

1. Date: _____

Month
Day
Year
2. Name: _____

First
M.I.
Last
3. Social security number: _____
4. Sex: Male _____ Female _____
5. Race: White _____ Black _____

Asian/Pacific Islander _____
Hispanic _____

American Indian/Alaskan Native _____
Other _____
6. Age: under 40 years _____

40 years and over _____
7. Education level: 8th grade or less _____

Some High School _____

High School graduate _____

Some College _____

College Graduate _____

Some Advanced College _____

Advanced College Graduate _____
8. Company (check one):
Chesapeake & Potomac Co. _____
Chesapeake & Potomac of MD. _____
Chesapeake & Potomac of VA. _____
Chesapeake & Potomac of W.VA. _____
Chief Administrative Organization _____
Diamond State Telephone _____
Network Services Staff _____
New Jersey Bell _____
Other (please specify) _____
9. Work site location (check one):
Delaware _____ Pennsylvania _____
District of Columbia _____ Virginia _____
Maryland _____ West Virginia _____
New Jersey _____ Other (specify): _____

BACKGROUND INFORMATION (CONTINUED)

10. Work phone (yours or your supervisor's):
() _____ - _____

11. Current Job Title: _____

12. Length of time with current job title:
_____ year(s) _____ month(s)

13. Length of time with this company (Include time with
current and past job titles):
_____ year(s) _____ month(s)

14. Length of time in your present field of work: (Include
time with both present and past employers.)
_____ year(s) _____ month(s)

15. If you are taking this test in order to move into
another job, what is the title of the position to which
you want to move? _____

16. In the past 2 years, have you taken the BSAT or TAB
tests?
_____ Yes _____ No

If you've answered yes, what test? _____
when? _____ / _____
Month Year

If you've answered yes, did you take the test to move
into the same job as you wish to move into now?
_____ Yes
_____ No (Specify job title.) _____

17. In the past 2 years, have you taken any type of test
when applying for a job at this or another company or
for advanced schooling (e.g., GRE, SAT, GMAT, Associate
tests.....)?
_____ Yes (Specify name of test(s).) _____
_____ No

If you've answered yes, when was the last time you took
a test?
_____ / _____
Month Year

Why did you take the test? _____

Appendix B
Pre-Test Questionnaire

SS# _____

PRE-TEST QUESTIONNAIRE

Please read the next set of statements carefully. Tell us whether you agree or disagree each of these statements, using the following scale:

1	2	3	4	5
----- ----- ----- -----	----- ----- ----- -----	----- ----- ----- -----	----- ----- ----- -----	----- ----- ----- -----
STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE

Place the number of the scale which corresponds with your response in the space provided. Please answer these questions honestly. All responses will remain strictly confidential.

- ___ 1. I expect this test to be interesting and challenging. (NO FACTOR)
- ___ 2. I am extremely motivated to do well on this Test. (M)
- ___ 3. I usually get very anxious about taking tests. (CA)
- ___ 4. While taking this test, I will concentrate and try to do well. (M)
- ___ 5. I want to be among the top scorers on this test. (M)
- ___ 6. My test scores don't usually reflect my true abilities. (CA)
- ___ 7. This test score will be used in future decisions made about me. (FE)
- ___ 8. Doing well on this test is important to me. (M)
- ___ 9. I am not good at taking tests. (CA)
- ___ 10. This test will be too easy for me. (TE)
- ___ 11. I will try to do the very best I can on this test. (M)
- ___ 12. I usually do pretty well on tests. (CA)
- ___ 13. During tests, I often think about how poorly I am doing. (CA)

PRE-TEST QUESTIONNAIRE (CONTINUED)

- | 1 | 2 | 3 | 4 | 5 |
|----------------------|----------|---|---------|-------------------|
| 1-----1 | 1-----1 | 1-----1 | 1-----1 | 1-----1 |
| STRONGLY
DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY
AGREE |
| ___ | 14. | I just don't care how I do on this test.
(NO FACTOR) | | |
| ___ | 15. | I probably won't do as well as most of the other
people who take the test. (CA) | | |
| ___ | 16. | During the test session, I expect to be bored.
(TE) | | |
| ___ | 17. | I will become fatigued and tired during the
testing. (NO FACTOR) | | |
| ___ | 18. | Once I undertake a task, I usually push myself
to my limits. (M) | | |
| ___ | 19. | During the testing, I will get so nervous I
won't do as well as I should. (TF) | | |
| ___ | 20. | I have not been feeling well lately and this
will affect my performance on the test.
(NO FACTOR) | | |
| ___ | 21. | My performance on this test will not affect my
chances for obtaining a job or gaining a
promotion. (FE) | | |
| ___ | 22. | It will be hard to keep my mind on this test.
(NO FACTOR) | | |
| ___ | 23. | I want to do well on this test. (M) | | |
| ___ | 24. | Questions on tests are usually ambiguous and
unclear. (NO FACTOR) | | |
| ___ | 25. | I will push myself to work hard on this test.
(M) | | |
| ___ | 26. | During the test, I will think of the
consequences of failing. (TF) | | |
| ___ | 27. | I prepared a lot for this test. (P) | | |
| ___ | 28. | I will try my best on this test. (M) | | |

PRE-TEST QUESTIONNAIRE (CONTINUED)

- | 1 | 2 | 3 | 4 | 5 |
|----------------------|----------|---|---------|-------------------|
| 1-----1 | 1-----1 | 1-----1 | 1-----1 | 1-----1 |
| STRONGLY
DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY
AGREE |
| ___ | 29. | I expect to lose interest and not pay attention to the test. (NO FACTOR) | | |
| ___ | 30. | I expect to be among the people who score really well on this test. (NO FACTOR) | | |
| ___ | 31. | I will not put much effort into this test. (NO FACTOR) | | |
| ___ | 32. | I get distracted when taking tests of this type. (NO FACTOR) | | |
| ___ | 33. | I expect to become frustrated because many of the test questions will be too difficult. (NO FACTOR) | | |
| ___ | 34. | While taking the test, I will be preoccupied with how much time I have left. (TF) | | |
| ___ | 35. | I try to do well in everything I undertake. (M) | | |
| ___ | 36. | Scores from this test will probably affect my future. (FE) | | |
| ___ | 37. | I very much dislike taking tests of this type. (CA) | | |
| ___ | 38. | I expect this test will be too simple. (TE) | | |
| ___ | 39. | I feel a lot of time pressure when taking tests. (NO FACTOR) | | |
| ___ | 40. | I spent a large amount of my own time preparing for this test (e.g., reading, computing math problems, etc.). (P) | | |
| ___ | 41. | I expect many of the problems to be unfamiliar to me. (NO FACTOR) | | |

Note. Parenthesized abbreviations indicate the factor reflected by an item. Attitudinal factors are abbreviated as follows: FE, Future effects; P, Preparation; TE, Test ease; M, Motivation; CA, Comparative anxiety; TF, Test focus.

Appendix C
Post-Test Questionnaire

SS# _____

POST-TEST QUESTIONNAIRE

Please read the next set of statements carefully. Tell us whether you agree or disagree each of these statements, using the following scale:

1	2	3	4	5
----- ----- ----- -----	----- ----- ----- -----	----- ----- ----- -----	----- ----- ----- -----	----- ----- ----- -----
STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE

Place the number of the scale which corresponds with your response in the space provided. Please answer these questions honestly. All responses will remain strictly confidential.

- ___ 1. I found this test interesting and challenging.
(NO FACTOR)
- ___ 2. I was extremely motivated to do well on this test. (M)
- ___ 3. I usually get very anxious about taking tests.
(CA)
- ___ 4. While taking this test, I concentrated and tried to do well. (M)
- ___ 5. I want to be among the top scorers on this test.
(M)
- ___ 6. My test scores don't usually reflect my true abilities. (CA)
- ___ 7. This test score will be used in future decisions made about me. (FE)
- ___ 8. Doing well on this test is important to me. (M)
- ___ 9. I am not good at taking tests. (CA)
- ___ 10. This test was too easy for me. (TE)
- ___ 11. I tried to do the very best I could on this test. (M)
- ___ 12. I usually do pretty well on tests. (CA)
- ___ 13. During the testing, I often thought about how poorly I was doing. (CA)

POST-TEST QUESTIONNAIRE (CONTINUED)

- | 1 | 2 | 3 | 4 | 5 |
|----------------------|----------|---|---------|-------------------|
| 1-----1 | 1-----1 | 1-----1 | 1-----1 | 1-----1 |
| STRONGLY
DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY
AGREE |
| ___ | 14. | I just didn't care how I did on this test. (M) | | |
| ___ | 15. | I probably didn't do as well as most of the other people who took this test. (CA) | | |
| ___ | 16. | During the test session, I was bored. (TE) | | |
| ___ | 17. | I became fatigued and tired during the testing. (NO FACTOR) | | |
| ___ | 18. | Once I undertake a task, I usually push myself to my limits. (M) | | |
| ___ | 19. | During the testing, I got so nervous I couldn't do as well as I should have. (TF) | | |
| ___ | 20. | I have not been feeling well lately and this affected my performance on the test. (NO FACTOR) | | |
| ___ | 21. | My performance on this test will not affect my chances for obtaining a job or gaining a promotion. (FE) | | |
| ___ | 22. | It was hard to keep my mind on this test. (NO FACTOR) | | |
| ___ | 23. | I wanted to do well on this test. (M) | | |
| ___ | 24. | Questions on this test were ambiguous and unclear. (NO FACTOR) | | |
| ___ | 25. | I pushed myself to work hard on this test. (M) | | |
| ___ | 26. | During the test, I found myself thinking of the consequences of failing. (TF) | | |
| ___ | 27. | I prepared a lot for this test. (P) | | |
| ___ | 28. | I get distracted when taking tests of this type. (NO FACTOR) | | |
| ___ | 29. | I tried my best on this test. (M) | | |
| ___ | 30. | I found myself losing interest and not paying attention to the test. (NO FACTOR) | | |

POST-TEST QUESTIONNAIRE (CONTINUED)

1	2	3	4	5
1-----1	1-----1	1-----1	1-----1	1-----1
STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE

- ___ 31. I expect to be among the people who score really well on this test. (NO FACTOR)
- ___ 32. I didn't put much effort into this test. (NO FACTOR)
- ___ 33. I felt frustrated because many of the test questions were too difficult. (NO FACTOR)
- ___ 34. While taking the test, I was preoccupied with how much time I had left. (TF)
- ___ 35. I try to do well in everything I undertake. (M)
- ___ 36. Tests are a good way of selecting people into jobs. (NO FACTOR)
- ___ 37. Scores from this test will probably affect my future. (FE)
- ___ 38. I very much dislike taking tests of this type. (CA)
- ___ 39. I found this test to be too simple. (TE)
- ___ 40. I felt a lot of time pressure when taking this test. (NO FACTOR)
- ___ 41. I spent a large amount of my own time preparing for this test (e.g., reading, computing math problems, etc.). (P)
- ___ 42. Many of the problems were unfamiliar to me. (NO FACTOR)

Note. Parenthesized abbreviations indicate the factor reflected by an item. Attitudinal factors are abbreviated as follows: FE, Future effects; P, Preparation; TE, Test ease; M, Motivation; CA, Comparative anxiety; TF, Test focus.

Appendix D
Pre-Course Questionnaire

PRE-COURSE QUESTIONNAIRE (CONTINUED)

5. In the past 2 years, have you taken any type of course for a college degree?

No
 Yes (Specify name of course(s).) _____

If yes, when? _____ / _____
Month Year

Why did you take the course(s)? _____

6. Have you spent time doing any type of preparing on your own (e.g., practicing math problems, reading passages) before taking this selection test?

Yes No

If yes, how long did you spend preparing?
_____ total hours

If yes, how did you prepare? (Explain) _____

Appendix E
Test-Taking and Preparation Background Sheet

SS# _____

TEST-TAKING AND PREPARATION BACKGROUND

Please read each of the following statements carefully. Place a check mark next to your response in the space provided, and write your responses in the space when necessary. Please answer honestly. All of your answers will remain strictly confidential.

1. In the past 2 years, have you participated in any of the continuing education programs offered by the company?
 _____ Yes _____ No

If yes, when? _____ / _____
 Month Year

If yes, check all that apply:

- _____ ATLAS
 _____ Home Study
 _____ Tuition Assistance Plan (TAP)
 _____ P.M. Education
 _____ Program on Noncollegiate Sponsored Instruction

2. In the past 2 years, have you taken the Test Taking and Thinking Skills course taught through the ATLAS program?
 _____ Yes _____ No

If yes, when? _____ / _____
 Month Year

3. In the past 2 years, have you taken any course outside of the company in order to improve your general knowledge and skills (e.g. math, vocabulary, reading, test-taking strategies, etc.)? DO NOT INCLUDE ANY COURSES WHICH WERE TAKEN FOR A COLLEGE DEGREE.

_____ Yes _____ No
 If yes, when? _____ / _____
 Month Year

where? _____

4. In the past 2 years, have you taken any type of course for a college degree?

_____ No
 _____ Yes (Specify name of course(s).) _____

TEST-TAKING AND PREPARATION BACKGROUND (CONTINUED)

If yes, when? _____ / _____
Month Year

Why did you take the course(s)? _____

5. Have you spent time doing any type of preparing on your own (e.g., practicing math problems, reading passages) before taking this selection test?
_____ Yes _____ No

If yes, how long did you spend preparing?
_____ total hours

If yes, how did you prepare? (Explain) _____

Appendix F
Post-Course Questionnaire

SS# _____

POST-COURSE QUESTIONNAIRE

All of these questions refer to the course which you have just completed. Please take the next few minutes to read this set of statements carefully. Tell us whether you agree or disagree each of these statements, using the following scale:

1	2	3	4	5
-----	-----	-----	-----	-----
STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE

Place the number of the scale which corresponds with your response in the space provided. Please answer these questions honestly. All responses will remain strictly confidential. Your responses will provide valuable information.

- ___ 1. I feel the course has helped me qualify for a different or higher rated job(s). (AP)
- ___ 2. I gained skills and knowledge I was able to use on the job. (AP)
- ___ 3. The course has helped me increase my self-confidence and/or self-esteem. (AP)
- ___ 4. I felt serious about my studies throughout the course. (VA)
- ___ 5. I believe my participation was well worth my time. (VA)
- ___ 6. I was able to reapply material I had learned in the past. (R)
- ___ 7. The course met my expectations. (AP)
- ___ 8. I found the course to be too difficult. (R)
- ___ 9. I found the material to be meaningful, both on the job and in my personal life. (AP)
- ___ 10. The course was not very interesting or involving. (VA)
- ___ 11. I thought about dropping out of the course. (VA)

POST-COURSE QUESTIONNAIRE (CONTINUED)

- ___ 12. After completing the course, I feel better prepared to take tests in general. (AP)
- ___ 13. The course gave me an opportunity to relearn material which had become unfamiliar. (PC)
- ___ 14. I can apply what I have learned to my personal life. (AP)
- ___ 15. I spent a considerable amount of time on homework exercises outside of the course classes. (PC)

***Estimate the average number of hours per week that you spent on homework outside of the course classes.

_____ hrs

The next set of questions pertain to the administration of the course itself. Please use the same scale as above to answer these questions:

1	2	3	4	5
1-----1	1-----1	1-----1	1-----1	1-----1
STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE

- ___ 16. The course length was too short. (R)
- ___ 17. Instructions were clear and easy to follow. (AS)
- ___ 18. My questions were answered quickly and thoroughly. (AS)
- ___ 19. I received assistance when necessary. (AS)
- ___ 20. The course was offered at a convenient location. (CN)
- ___ 21. The instructors were polite and helpful. (AS)
- ___ 22. Course materials were well-written and easy to understand. (AS)
- ___ 23. The evening sessions were too long. (NO FACTOR)
- ___ 24. Times for class sessions were not convenient. (CN)
- ___ 25. The exercises helped me learn the material. (P)

Appendix G
Review Questionnaire

SS# _____

REVIEW QUESTIONNAIRE

Think about what you have done since the first time you took the test battery for the test-preparation project. In particular, think about the types of studying or reviewing you did to prepare for the SECOND test, and how much time you spent on each.

DO NOT INCLUDE ANY PREPARATION THAT YOU DID BEFORE THE FIRST TEST BATTERY ADMINISTERED IN EARLY OCTOBER.

1. Estimate the TOTAL NUMBER OF HOURS that you have spent preparing for the second test battery.

_____ hours

2. Describe HOW you have prepared for the test battery. Check all of the following that apply.

_____ Read and reviewed problems in BSAT study guide.

_____ Practiced exercises in child's/friend's/own high school or grade school books (math, vocabulary, grammar).

_____ Reviewed material in SAT book.

_____ Reviewed material in GMAT book.

_____ Practiced exercises in Home Study materials.

_____ Reviewed materials from previous ATLAS/PM Education courses.

_____ Reviewed materials from TAP (college) courses.

_____ Did not prepare for the second test battery.

_____ Other----

Describe _____

Appendix H
Training Information
To Administer Tests and Questionnaires
To Participants Before They Received Training

CHECKLIST FOR TEST ADMINISTRATORS
(FOR THOSE CLASSES RECEIVING TRAINING INSTRUCTION)

- ~ 1 sign-in sheet
- ~ 25 copies of tests:
 1. Portions of non-management test battery-
Form A (#1- #25)
 2. Management test battery-Form B (#1- #25)
- ~ 25 copies of optically scanned test answer sheets for:
 1. Portions of non-management test battery
 2. Management test battery
- ~ 25 copies of questionnaires:
 1. Test-Preparation Study informed consent (2 sheets)
 2. Background Questionnaire
 3. Pre-Test
 4. Post-Test
 5. Pre-Course
- ~ stopwatch or watch with second hand
- ~ tape recorder
- ~ tape for Following Directions (Form B)
- ~ 2 boxes of sharpened pencils with erasers
- ~ 1 tablet scratch paper
- ~ instruction booklet

- Note: Written materials in order of administration:
1. Sign-in sheets
 2. Test-Preparation study handouts (2 sheets)
 3. Background Questionnaire
 4. Pre-Test Questionnaire
 5. Management test battery
 6. Portions of Non-management test battery
 7. Post-Test Questionnaire
 8. Pre-course Questionnaire

GENERAL INFORMATION

- ~ Make sure you have all of the necessary materials.
(Subjects are at a premium; we need everyone's data!!!)
- ~ Dress is casual.
- ~ Bring company identification, since the guard will want to check your identification when entering the building.
- ~ Arrive at the building at least 20 minutes early to:
 1. ensure all students can attain access to the building (e.g., notify guard of incoming students; if some don't know door combination, "stand watch"; direct them to room). Note: We want to make sure everyone scheduled does attend.
 2. find classroom
 3. orient yourself with restroom facilities, so that you can inform others
 4. re-arrange chairs for testing, if necessary
- ~ Although we are going to be out at night, please be cheerful-- we want to foster the students' excitement for learning, encourage any questions they may have, and promote their readiness to come to the next session and participate in the course! We don't want any drop-outs.
- ~ Please read aloud the instructions in this booklet. It is very important that everyone receive the same information about the study, so avoid any deviations from the instructional material.
- ~ Also, under no circumstances should you deviate from the standardized materials and procedures. Give the directions and respond to questions according to standard administration instructions for the questionnaires and test, including the start and stop times. Uniformity is necessary to ensure reliable and accurate results.
Note: THE INSTRUCTIONS THAT YOU SHOULD READ ALOUD ARE MARKED WITH AN ASTERISK THROUGHOUT THIS BOOKLET. THERE ARE INSTANCES WHEN YOU WILL SEE "Read aloud from the handout, or from the top of the page." IN THESE INSTANCES, READ ALOUD DIRECTLY FROM THE HANDOUT.
- ~ Ensure that all testing materials, when not in use, are stored in a secure location.
- ~ Continuously monitor the rooms and observe students when they are completing the questionnaires and taking the tests.

WHEN STUDENTS ARE ARRIVING.....

1. Establish rapport with the students by:
 - a. introducing yourself
 - b. provide means for storing packages, etc.
 - c. ensure students are comfortable (e.g., have adequate lighting, comfortable temperature, adequate work space)
 - d. orient students to location for restrooms, etc.
2. Have each person fill in the sign-in sheet.
3. Students should be seated in every other seat, in alternate rows, or in a checkerboard fashion. Adjustments may be made when space is limited. Seat them comfortably, but allow yourself enough room to move around freely. Close monitoring is essential.
4. Make sure everyone has a writing instrument. Distribute pencils when necessary.
5. Only writing instruments should be on the desk surface. All other materials (e.g., Study Guide) should be removed.

When everyone has arrived, signed in, and is seated, begin the Introduction.

INTRODUCTION

* Hello. For those of you that I haven't met yet, my name is _____ and I work in the Human Resources Services Department of (company). As you know, the Selection Research District and the Continuing Education Department are currently conducting a large project on test-preparation. You have been selected to participate in the ____ (2,6,7) week course that will meet on _____ (day of week) and _____ (day of week). I am here tonight to administer a few questionnaires. In addition, you will take a selection battery which includes an entry-level management test. During your next meeting on _____ (day of week), you will begin receiving the course material from a certified instructor and will continue the course for the next ____ (2,6,7) weeks. Finally, on the last meeting on _____ (date), you will again fill out a few questionnaires and take another form of the test battery.

* Tonight, I'd first like to review with you the project's purpose and what all is involved.

~ distribute HANDOUT: TEST-PREPARATION STUDY (2 SHEETS)

review HANDOUT

~ PURPOSE

(Read aloud from handout.)

* You have identified yourself as a person who would like to take this course to refresh those skills to prepare for one of the employment tests. We are pleased to offer you an opportunity to do just that. Before we begin, I'd like to read with you what we expect from you and vice versa throughout this project.

~ PARTICIPATION CRITERIA

(Read aloud from handout.)

~ PLEASE READ THE FOLLOWING

(Read aloud from handout.)

* Are there any questions at this time?

Note: Do NOT give out any more information than what is written in the instruction booklet. They will be told all of the specifics AFTER their completion of the project.

Note: If you have questions, here are appropriate answers. If there is not an answer here, and you don't feel comfortable with supplying a standard answer, refer their question to me. I may be reached on (703) 974-3608. I'll try to return their call as soon as possible.

ANSWERS TO POSSIBLE QUESTIONS:

1. (TAKING TESTS AND HAVING THEM COUNT)

You must complete all of the required questionnaires and tests AND attend at least 80% of the course classes, in order for your test scores to count. Because the questionnaires and tests will be administered during the first and last sessions, you must attend BOTH the first and last sessions.

(NO MAKE-UP TESTS OR COURSE CLASSES WILL BE GIVEN) under ANY circumstances.

2. (TEST SCORES) If you take all of the required tests, and you pass either administration of the test (It doesn't matter whether you fail the 1st test and pass the 2nd test or vice versa), your score will count. You will not have to take the management test again at the employment office to be eligible for the Development Program.

3. (MY CONSENT) at the end of the project, when you are notified of your test scores, we will ask you if you want your results forwarded to the employment office. If you respond yes, we will give them the information to record. If you respond no, then they will not be given your test score(s); they will only record the fact that you have taken the management test at that time.

4. (IF I DON'T QUALIFY) If you do not qualify on the test, you may request that your scores not be sent to the employment office. In this case, they will not record your actual test score(s); only the fact that you have taken the management test at that time. Upon the completion of the study, normal retest intervals apply; that is, you must wait 6 months to retake the test as you would if you would have taken the management test in the employment office.

5. (WILL I BE TOLD MY FIRST TEST SCORE) You will NOT be told your test score after your first test. You will be notified of your qualification status on BOTH of the management tests AFTER the second administration via mail.

6. (FEEDBACK) Via class exercises, instructors will provide feedback to you throughout the course. In this manner, you can monitor your own progress in a skill area.

7. (WILL I TAKE THE OTHER MANAGEMENT TEST) The other Human Resource Assessment test is NOT part of this project. It is not possible to prepare for the other management test with educational material because it measures applied skills, rather than aptitude or learning skills. Preparation for this test stems more so from past experience, rather than educational means.

(WHAT IS THE other management test?) It is a 30-question paper-and-pencil test in which various situations in industry are presented. For each situation you are asked to tell how you are most likely and least likely to respond.

(WHAT IS THE MANAGEMENT DEVELOPMENT PROGRAM?) The Human Resource Assessment Center no longer exists. It has been replaced with the Management Development Program. Your supervisor can give you information about this new program.

Briefly, to become eligible for this program, you must qualify on BOTH management tests. If you qualify on the management test administered during this project and want to take the other test after the project's completion, you may do so by submitting the proper form to the employment office. This form was included in the packet of information about the Program that was mailed to all of the supervisors. Ask your Supervisor for the form and address to which it should be sent, in order to be scheduled to take the other management test not administered here.

8. (CONFIDENTIALITY) All information obtained from the questionnaires and tests will be kept confidential. Supervisors and coworkers will NOT have access to ANY data.

9. (RESULTS) No individuals will be identified. Results will be summarized and reported on a group basis only.

Note: They may also have a question regarding future courses. (WILL I BE ABLE TO TAKE ANOTHER VERSION OF THE COURSE AFTER THIS ONE?) Answer: This is a one-time trial to evaluate the course that you will be taking. Based on the results of the trial, we hope to assemble the most effective course and offer it in the future, but we don't know exactly when this will occur. The course will be offered through the company.

~ review SECOND PAGE OF TEST-PREPARATION STUDY HANDOUT

* Now, turn to page two of the Test-Preparation Handout. Take the next few minutes and complete the 2nd page. Be sure to read the bottom paragraph, which states the following:

(Read aloud the bottom paragraph on page 2.)

* After you have read this paragraph, and if you agree to the conditions of the project, please sign and date the form in the spaces provided.

Note: For your information, in case there are questions, the spaces refer to:

- full name
- social security number
- current job title
- work phone number (or supervisor's)
- complete work address
- location of course, length of course, and days on which they'll meet (for record-keeping purposes)

Note: If an employee does not want to sign the form, tell him/her that's fine. Discuss the project briefly to make sure they have read the material, understand it, and agree to the conditions. Then please fill in his/her name and date. As the Test Administrator, document on the bottom of the form that you discussed the information with the employee and he/she elected not to sign. Write your initials after this documentation.

~ COLLECT SECOND PAGE OF TEST-PREPARATION HANDOUTS; THEY MAY KEEP THE FIRST PAGE THAT LISTS THE PROJECT'S CRITERIA IF THEY WISH.

Next, DISTRIBUTE BACKGROUND QUESTIONNAIRE

* Please take the next few minutes and fill out this Background Information Sheet. This sheet asks you for basic demographic and background information. This information will be used to give us an idea of the types of people who are motivated to take charge of their careers and refresh their test-preparation skills.

(Read instructions aloud that are printed on the top of the 1st page.)

* Write directly on this form. Are there any questions?

After questions have been addressed, allow approximately 5-10 minutes for completion. This instrument is not a timed test, so allow enough time for everyone to finish all of the questions.

~ COLLECT COMPLETED BACKGROUND QUESTIONNAIRE

~ DISTRIBUTE PRE-TEST QUESTIONNAIRE

* Now, take the next several minutes to complete the Pre-Test Questionnaire. First, fill in your social security number in the space in the top right-hand corner of the first page.

Note: Look to make sure everyone fills in their social security number; this is VERY important!

(Read instructions aloud that are printed on the top of the 1st page.)

* Write directly on this form. Are there any questions?

After questions have been addressed, allow approximately 10-15 minutes for completion. This instrument is not a timed test, so allow enough time for everyone to finish all of the questions.

~ COLLECT COMPLETED PRE-TEST QUESTIONNAIRE

BEGINNING OF TESTING SECTION

Note: At this point, check to make sure everyone has at least one sharp pencil with an eraser and scratch paper. Distribute materials if necessary.

~ DISTRIBUTE THE MANAGEMENT TEST BOOKLETS AND ANSWER SHEETS

Note: Do not allow them to open booklets before the beginning of the test. Remember to read all instructions within the boxes aloud verbatim to the candidates. All questions during the testing section should be answered by rereading the applicable section of the instructions.

* One of the tests you are going to take tonight is in front of you. Please do not open the booklet until you are told to do so.

* A special answer sheet has been furnished for recording your answers. All your answers should be made on this answer sheet. Do not make any marks on the test itself. Let's take a moment to go over the answer sheet.

* Be careful when filling it out. You must do the following:

- use only a dark leaded (#2) pencil
- make heavy black marks that fill the rectangle completely
- erase cleanly any answer you wish to change
- make no stray marks on the answer sheet

* Now, I would like for you to print your name in the upper left-hand box above the words "last", "first" and "middle". Be sure to write in your full name. Print your last name first, then print your first name, and then your middle name or middle initial.

* Also in the upper left-hand box, please fill in your social security number. Next to that space, fill in today's date which is _____ (month, day).

* Are there any questions on the preparation of this answer sheet?

The Test Administrator should walk around the room to check each person's entries.

* All materials needed for the tests are provided.

* The management test is a series of four tests. They are:

- Part I - Quantitative
- Part II - Writing Fluency
- Part III - Reading Accuracy
- Part IV - Following Directions

* Parts I, II, III, and IV are labeled on the answer sheet to ensure you mark your answers in the proper area. Each test begins with one or more sample problems.

* All answers to the questions on the tests will be made on the answer sheet by darkening the space under the answer you choose. There will be four possible answers to each question. They are lettered A, B, C, and D. There will only be one correct answer for a question. If you mark more than one answer, the question will be counted wrong. If you change your answer, be sure to erase the first answer completely.

* Before we begin the tests, I would like to read four important statements regarding our testing policy. First, all materials are to be returned upon completion of the test, including test booklets, answer sheets, scratch paper, etc.

* Second, test standards are periodically updated to reflect the current skills and abilities required for our jobs. Therefore, it may be necessary to meet new test standards, should they be introduced prior to your placement in the job.

* Third, no calculators or any other mathematical aids are permissible during testing.

* Finally, cheating on this test is an automatic disqualifier. In addition, any attempt to deface, destroy, or remove test materials from this room will result in disqualification and possible prosecution.

* We will now begin the test. For each part of the test, you are to read the directions silently as I read them aloud. I will tell you when to start working and when to stop. If you finish before the time is up, you may check your work on that part of the test only. You are not to look at or work on any other part in the booklet.

* Now, open the test booklet to the first page entitled "General Directions" and read the directions silently to yourself as I read them aloud.

* This is a test of your ability to solve number problems, identify words and standard grammar, and follow directions. Your score will be the total number of correct answers you mark. Wrong answers will not be counted against you.

* Do not spend too much time on any one question. If a question seems to be too difficult, make the most careful guess you can.

* Mark your answers on the separate answer sheet. Do not write in the test booklet. Mark only one answer for each question. If you want to change an answer, erase your first mark completely.

* Are there any questions, thus far?

Answer any questions, then say:

* We will now begin Part I of the test. Turn to page three in the test booklet. The directions for Part I are printed at the top of the page. Read the directions silently to yourself as I read them aloud.

* Each question has two parts; one part in Column A and the second part in Column B. You are to decide if one part is greater than the other, both parts are equal, or not enough information is given to make the decision. Each decision is lettered A, B, C, and D at the top of the page. Solve the parts, then find the row of boxes on your answer sheet which has the same number as the question. In this row of boxes, mark the letter of the decision you have made.

* Now read through the sample problem. Pay particular attention to the "NOTE".

Allow the candidates a few minutes to read through the sample problem and "NOTE". When it appears all candidates have finished reading, say:

* Remember, you are not to make any marks in the test booklet. You should use the scratch paper that has been provided for any calculations.

* Your score will be the number of problems you answer correctly. There is no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* Work as fast as you can while being accurate. You will be allowed 20 minutes for Part I. Do not turn the page until I tell you to begin. Are there any questions?

Answer any questions, then say:

* The questions for Part I are numbered 1 through 50. Your answers for Part I should be in spaces 1 through 50 on your answer sheet under the columns titled "Part I".

Set your timer for 20 minutes and say:

* Remember you will have 20 minutes to complete Part I. If you finish Part I before time is up, you may check your work on Part I only. Do not continue ahead until you are told to do so.

* Turn the page. Ready? Begin!

Start your timing device. After 20 minutes, say:

* Stop working on Part I. Put your pencils down! Do not work any further on this part. Turn to page 7 in your test booklet. This Part II of the test. The directions for Part II are printed at the top of the page. Read the directions silently to yourself as I read them aloud.

* Each of the sentences below has three words or phrases that are underlined. The three underlined parts are lettered A, B, and C. You are to decide if one of the underlined parts would not be accepted in standard written English and, if so, which one. If all underlined parts are acceptable, the sentence contains no error, so the correct answer would be D (No Error). Now read through the sample problem.

Allow candidates a few moments to read through the sample problem. When it appears all candidates have finished reading, say:

* Your score will be the number of problems you answer correctly. There is no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* Work as fast as you can while being accurate. You will be allowed 10 minutes for Part II. Do not turn the page until I tell you to begin. Are there any questions?

Answer any questions, then say:

* The questions for Part II are numbered 51 through 70. Your answers for Part II should be in spaces 51 through 70 on your answer sheet under the column titled "Part II".

Set your timer for 10 minutes and say:

* Remember you will have 10 minutes to complete Part II. If you finish Part II before time is up, you may check your work on Part II only. Do not continue ahead until you are told to do so.

* Turn the page. Ready? Begin!

Start your timing device. After 10 minutes, say:

* Stop working on Part II. Put your pencils down! Do not work any further on this part. Turn to page 11 in your test booklet. This Part III of the test. The directions for Part III are printed at the top of the page. Read the directions silently to yourself as I read them aloud.

* Each of the sentences below contains clues to the meaning of an underlined word in the sentence. You are to complete a statement about the underlined word, choosing the best answer from four suggested answers.

* Now read through the sample problem.

Allow candidates a few moments to read through the sample problem. When it appears all candidates have finished reading, say:

* Remember, your score will be the number of problems you answer correctly. There is no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* Work as fast as you can while being accurate. You will be allowed 10 minutes for Part III. Do not turn the page until I tell you to begin. Are there any questions?

Answer any questions, then say:

* The questions for this part are numbered 71 through 90. Your answers for Part III should be in spaces 71 through 90 on your answer sheet under the column titled "Part III".

Set your timer for 10 minutes and say:

* Remember you will have 10 minutes to complete Part III. If you finish Part III before time is up, you may check your work on Part III only. Do not continue ahead until you are told to do so.

* Turn the page. Ready? Begin!

Start your timing device. After 10 minutes, say:

* Stop working on Part III. Put your pencils down! Do not work any further on this part. Turn to page 17 in your test booklet. This Part IV of the test. The directions for Part IV are printed at the top of the page. Read the directions silently to yourself as I read them aloud.

* Each sentence below is an instruction based on a table of numbers. You are to follow each direction carefully. As you work on following these directions, you will be interrupted from time to time by a tape recording giving you more directions to follow. Mark the answers for the written direction on your answer sheet in spaces 91 to 104. Mark the answers for the spoken directions on your answer sheet in spaces 105 to 114.

* The spoken directions are additional directions of this test. Continue working on the written directions after following the tape recording directions. Now read through the sample problem.

Allow candidates a few moments to read through the sample problem. When it appears all candidates have finished reading, say:

* Remember, your score will be the number of problems you answer correctly. There is no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* Work as fast as you can while being accurate. You will be allowed 10 minutes for Part IV. Do not turn the page until I tell you to begin. Are there any questions?

Answer any questions. Be sure the cassette player is ready. Then say:

* Again, the questions for this part are numbered 91 through 104 for the written directions and 105 through 114 for the spoken directions. Your answers should be in these spaces on your answer sheet. The cassette tape will tell you when you should begin and stop working on the test.

Set your timer for 10 minutes and say:

* Remember you will have 10 minutes to complete Part IV. If you finish Part IV before time is up, you may check your work on Part IV only. Do not work on any other part of the test.

At this point, turn on the cassette player. There is a 15 second lead time before the voice begins. When the recording says "Begin", start your timer (set for 10 minutes).

After the tape says "Stop, even if you...", turn the cassette player off and say:

* Close your test booklets. Place your answer sheet and scratch paper on top of the test booklet. Thank you.

Collect and account for all materials, including scratch paper.

AT THIS POINT IN THE SESSION, TAKE A SHORT (10-15 MINUTES)
BREAK.

~ DISTRIBUTE THE NON-MANAGEMENT TEST BOOKLETS AND ANSWER
SHEETS

Note: Do not allow them to open booklets before the beginning of the test. Remember to read all instructions within the boxes aloud verbatim to the candidates. All questions during the testing section should be answered by rereading the applicable section of the instructions.

* The other test you are going to take tonight is now in front of you. Please do not open the booklet until you are told to do so.

* This test is being administered to gain additional information about your skills and abilities. You will complete only a portion of this test. You will NOT be notified of the results and they will NOT be given to the employment office. The results won't be used for employment purposes, since you already hold an associate position, for which this test is used. However, this information is very valuable to the test-preparation project, so please complete it to the BEST of your ability.

* A special answer sheet has been furnished for recording your answers. All your answers should be made on this answer sheet. Do not make any marks on the test itself. Let's take a moment to go over the answer sheet.

* Be careful when filling it out. You must do the following:
-use only a dark leaded (#2) pencil
-make heavy black marks that fill the rectangle completely
-erase cleanly any answer you wish to change
-make no stray marks on the answer sheet

* Now, I would like for you to print your name in the upper left-hand box beside the words "last", "first" and "middle initial". Be sure to write in your full name. Print your last name first, then print your first name, and then your middle initial.

* In the box below your name, please fill in your social security number.

* In the upper right-hand box labeled "Location", leave this space blank. In the box below it, fill in today's date which is _____ (month, day)." Where it says "Form", leave that space blank.

* Are there any questions on the preparation of this answer sheet?

Note: Walk around the room to check each person's entries.

* All materials needed for the test are provided. The portions of the nonmanagement test that you will take include:

- Part I - Detail Perception
- Part II - Computational Facility
- Part III - Number Groups

* Each of these is labeled on the answer sheet to ensure you mark your answers in the proper area. Each test begins with one or more sample problems.

* All answers to the questions on the tests will be made on the answer sheet by darkening the space under the answer you choose. There will be four possible answers to each question. They are lettered A, B, C, and D. There will only be one correct answer for a question. If you mark more than one answer, the question will be counted wrong. If you change your answer, be sure to erase the first answer completely.

* Now, open the test booklet to the first page entitled "Detail Perception".

* The words "Detail Perception Test" are in the upper right-hand corner of the page.

Mark sure the candidates have turned to the right page and say:

* Please read the directions silently to yourself as I read them aloud. This test will show how fast and accurate you are in making comparisons and finding mistakes. There are six parts to the test. The parts are lettered A to F. Each part has 9 or 10 problems. Each problem shows four pairs of things. Three of the pairs will have parts that are exactly alike, and one pair will have parts that are slightly different. On your answer sheet, mark the letter that is the same as the letter between the pair that has the difference or "error". Now, look at these sample problems and mark the answers in the shaded area on your answer sheet.

As soon as the candidates have finished the sample problems, say:

* For these samples you would notice "mistakes" or differences in C, A, D, and B for the sample problems.

* Your score on the test will be the number of problems you answer correctly. You are not necessarily expected to finish all the problems in each part.

* Work as fast as you can while being accurate. You will be allowed 45 seconds for each of the first four parts and one minute for each of the last two parts.

* Do not turn this page until you are told to do so. The questions for this test are numbered 1 through 56. For Part A of this test, your answers should be in spaces 1 through 9 on the answer sheet, under the column titled "Detail Perception". Are there any question?

Set your timer for 45 seconds and say:

* Remember that you will have 45 seconds for each of the first four parts. If you finish any of the parts before time is up, do not turn the page until you are told to do so. Ready? Turn the page. Begin!

After 45 seconds, say:

* Stop working on Part A.

Reset your timer for 45 seconds and say:

* Turn the page to Part B. Be sure you start with space 10 on your answer sheet. Ready? Begin!

After 45 seconds, say:

* Stop working on Part B.

Reset your timer for 45 seconds and say:

* Turn the page to Part C. Be sure you start with space 20 on your answer sheet. Ready? Begin!

After 45 seconds, say:

* Stop working on Part C.

Reset your timer for 45 seconds and say:

* Turn the page to Part D. Be sure you start with space 29 on your answer sheet. Ready? Begin!

After 45 seconds, say:

* Stop working on Part D. Remember that you will have one minute each for Parts E and F.

Reset your timer for 1 minute and say:

* Turn the page to Part E. Be sure you start with space 38 on your answer sheet. Ready? Begin!

After 1 minute, say:

* Stop working on Part E.

Reset your timer for 1 minute and say:

* Turn the page to Part F. Be sure you start with space 47 on your answer sheet. Ready? Begin!

After 1 minute, say:

* Stop! Do not work any further on this test. Turn to the next page. The words "Computational Facility Test" are in the upper right-hand corner of the page.

Make sure the candidates have turned to the right page and say:

* Please read the directions silently to yourself as I read them aloud. This is a test of your ability to do arithmetic problems accurately. For each problem, three numerical choices lettered A, B, and C are given. If the correct answer is one of these, mark the corresponding space on your answer sheet. If the correct answer is not given, mark the space lettered D. Now try the sample problem below. Mark the answer in the shaded area on your answer sheet.

As soon as the candidates have finished the sample problem, say:

* The correct answer is 393, so you should have marked answer space C. In this test, the conventional arithmetic signs are used for addition, subtraction, multiplication, division, decimals, and percents, as shown. These are noted in your instructions.

* You have a sheet of paper so please do not make unnecessary marks on the answer sheet or test booklet.

* Your score on the test will be the number of problems you answer correctly. There will no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* You will have 9 minutes to work on 20 problems. Do not turn this page until you are told to do so. The questions for this test are numbered 1 through 20 on your answer sheet, under the column titled "Computational Facility". Are there any questions?

Set your time for 9 minutes and say:

* Remember, you have 9 minutes to work on this test. Ready? Turn the page. Begin!

After 9 minutes, say:

* Stop! Do not work any further on this test.

* Turn to the next page. The words "Number Groups Test" are in the upper right-hand corner of the page.

Make sure the candidates have turned to the right page and say:

* Please read the directions silently to yourself as I read them aloud. This is a test of your ability to see how groups of numbers are alike or different. In each problem, you are to look at four groups of numbers. Three of the groups will have something in common, that is, something that makes them alike. The correct answer to each problem is the group that is different from the other three groups. Try the sample problems below. Mark the answers in the shaded area on your answer sheet.

As soon as the examinees have finished the sample problems, say:

* In the first sample, groups A, B, and D are alike because the numbers in all of them are in sequential order. The correct answer is C, because that group is different from the other groups; the numbers in it are not in sequential order.

* In the second sample, the correct answer is D. Groups A, B, and C all have four even numbers, while Group D has both even and odd numbers.

* Your score on the test will be the number of problems you answer correctly. There will be no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* You will have 7 minutes to work on 20 problems.

* Do not turn this page until you are told to do so. The questions for this test are numbered 1 through 20 on the answer sheet, under the column titled "Number Groups". Are there any questions?

Set your timer for 7 minutes and say:

* Remember, you have 7 minutes to work on this test. Ready? Turn the page. Begin!

After 7 minutes, say:

* Stop! Do not work any further on this test.

Collect and account for all testing materials, including scratch paper.

~ DISTRIBUTE POST-TEST QUESTIONNAIRE

* Now, take the next several minutes to complete the Post-Test Questionnaire. First, fill in your social security number in the space in the top right-hand corner of the first page.

Note: Look to make sure everyone fills in their social security number; this is VERY important!

(Read instructions aloud that are printed on the top of the 1st page.)

* Write directly on this form. Are there any questions?

After questions have been addressed, allow approximately 10-15 minutes for completion. This instrument is not a timed test, so allow enough time for everyone to finish all of the questions.

~ COLLECT COMPLETED POST-TEST QUESTIONNAIRE

~ DISTRIBUTE PRE-COURSE QUESTIONNAIRE

* Now, take the next few minutes to complete the Pre-Course Questionnaire. First, fill in your social security number in the space in the top right-hand corner of the first page.

Note: Look to make sure everyone fills in their social security number; this is VERY important!

(Read instructions aloud that are printed on the top of the 1st page.)

* Write directly on this form. Are there any questions?

After questions have been addressed, allow approximately 5-10 minutes for completion. This instrument is not a timed test, so allow enough time for everyone to finish all of the questions.

~ COLLECT COMPLETED PRE-COURSE QUESTIONNAIRE

TO WRAP UP THE SESSION.....

* Thank you for your cooperation tonight. We would appreciate if you would NOT discuss any of the material with your coworkers to which you were exposed at this time. Many others will be participating and we'd like to obtain their honest responses.

* During the next session, you will begin receiving course instruction on _____ (general test-taking skills, cognitive skills, or both). The next session is scheduled to meet on _____ (day of week) at _____ (time of day) at _____ (location).

Note: Encourage attendance at the course sessions that will follow. We need EVERYONE to be there.

* Please be prompt so that the class can begin on time. Also, remember to bring your company identification, pencils and scratch paper, and your study guide. Although it was not necessary to bring the guide for tonight's session, the instructor will review it during the course.

* Again thank you, and I do hope everyone will attend the course classes. The instructors are ready to offer you a course full of information that can help you improve your skills and prepare for the test that you will take again during the last session.

Note: At the end of session, visually inspect (check for missing or marked pages) and account for all testing materials assigned to you.

Dismiss students after test materials have been counted and verified.

Be sure to leave the room as it was.

Appendix I
Training Information
To Administer Tests and Questionnaires
To Participants After They Received Training

CHECKLIST FOR TEST ADMINISTRATORS
(CONCLUDING SESSION FOR THOSE RECEIVING TRAINING)

- ~ 1 sign-in sheet
- ~ 25 copies of tests:
 - 1. Portions of non-management test battery-
Form B (#1- #25)
 - 2. Management test battery-Form A (#1- #25)
- ~ 25 copies of optically scanned test answer sheets for:
 - 1. Portions of non-management test battery
 - 2. Management test battery
- ~ 25 copies of questionnaires:
 - 1. Pre-Test
 - 2. Post-Test
 - 3. Post-Course
- ~ stopwatch or watch with second hand
- ~ tape recorder
- ~ tape for Following Directions (Form A)
- ~ 2 boxes of sharpened pencils with erasers
- ~ 1 tablet scratch paper
- ~ instruction booklet

Note: Written materials in order of administration:

- 1. Sign-in sheets
- 2. Pre-Test Questionnaire
- 3. Management test battery
- 4. Portions of non-management test battery
- 5. Post-Test Questionnaire
- 6. Post-Course Questionnaire

GENERAL INFORMATION

- ~ Make sure you have all of the necessary materials.
(Subjects are at a premium; we need everyone's data!!!)
- ~ Dress is casual.
- ~ Bring company identification, since the guard will want to check your identification when entering the building.
- ~ Arrive at the building at least 20 minutes early to:
 1. ensure all students can attain access to the building (e.g., notify guard of incoming students; if some don't know door combination, "stand watch"; direct them to room). Note: We want to make sure everyone scheduled does attend.
 2. find classroom
 3. orient yourself with restroom facilities, so that you can inform others
 4. re-arrange chairs for testing, if necessary
- ~ Although we are going to be out at night, please be cheerful.
- ~ Please read aloud the instructions in this booklet. It is very important that everyone receive the same information about the study, so avoid any deviations from the instructional material.
- ~ Also, under no circumstances should you deviate from the standardized materials and procedures. Give the directions and respond to questions according to standard administration instructions for the questionnaires and test, including the start and stop times. Uniformity is necessary to ensure reliable and accurate results.
Note: THE INSTRUCTIONS THAT YOU SHOULD READ ALOUD ARE MARKED WITH AN ASTERISK THROUGHOUT THIS BOOKLET. THERE ARE INSTANCES WHEN YOU WILL SEE "Read aloud from the handout, or from the top of the page." IN THESE INSTANCES, READ ALOUD DIRECTLY FROM THE HANDOUT.
- ~ Ensure that all testing materials, when not in use, are stored in a secure location.
- ~ Continuously monitor the rooms and observe students when they are completing the questionnaires and taking the tests.

WHEN STUDENTS ARE ARRIVING.....

1. Establish rapport with the students by:
 - a. introducing yourself
 - b. provide means for storing packages, etc.
 - c. ensure students are comfortable (e.g., have adequate lighting, comfortable temperature, adequate work space)
 - d. orient students to location for restrooms, etc.
2. Have each person fill in the sign-in sheet.
3. Students should be seated in every other seat, in alternate rows, or in a checkerboard fashion. Adjustments may be made when space is limited. Seat them comfortably, but allow yourself enough room to move around freely. Close monitoring is essential.
4. Make sure everyone has a writing instrument. Distribute pencils when necessary.
5. Only writing instruments should be on the desk surface. All other materials (e.g., Study Guide) should be removed.

When everyone has arrived, signed in, and is seated, begin the Introduction.

INTRODUCTION

* Hello. For those of you that I haven't met yet, my name is _____ and I work in the Human Resources Services Department of _____ (company). As you know, the Selection Research District and the Continuing Education Department are currently conducting a large project on test-preparation. You have participated in the ____ (2,6,7) week course. Thank you for all of your cooperation during the project. I am very glad you were able to attend the course classes, and hope you found them to be educational and informative. The instructors seemed to have enjoyed working with all of you.

* I am here tonight to have you complete a few questionnaires. In addition, you will take a test battery which includes another form of the management test. Like the test battery that you took at the beginning of the course, this test battery consists of the same sections (e.g., Math, Vocab), except that it contains different questions.

* Let's get started.

~ DISTRIBUTE PRE-TEST QUESTIONNAIRE

* Take the next several minutes to complete the Pre-Test Questionnaire. First, fill in your social security number in the space in the top right-hand corner of the first page.

Note: Look to make sure everyone fills in their social security number; this is VERY important!

(Read instructions aloud that are printed on the top of the 1st page.)

* Write directly on this form. Are there any questions?

After questions have been addressed, allow approximately 10-15 minutes for completion. This instrument is not a timed test, so allow enough time for everyone to finish all of the questions.

~ COLLECT COMPLETED PRE-TEST QUESTIONNAIRE

BEGINNING OF TESTING SECTION

Note: At this point, check to make sure everyone has at least one sharp pencil with an eraser and scratch paper. Distribute materials if necessary.

~ DISTRIBUTE THE MANAGEMENT TEST BOOKLETS AND ANSWER SHEETS

Note: Do not allow them to open booklets before the beginning of the test. Remember to read all instructions within the boxes aloud verbatim to the candidates. All questions during the testing section should be answered by rereading the applicable section of the instructions.

* One of the tests you are going to take tonight is in front of you. Please do not open the booklet until you are told to do so.

* A special answer sheet has been furnished for recording your answers. All your answers should be made on this answer sheet. Do not make any marks on the test itself. Let's take a moment to go over the answer sheet.

* Be careful when filling it out. You must do the following:
-use only a dark leaded (#2) pencil
-make heavy black marks that fill the rectangle completely
-erase cleanly any answer you wish to change
-make no stray marks on the answer sheet

* Now, I would like for you to print your name in the upper left-hand box above the words "last", "first" and "middle". Be sure to write in your full name. Print your last name first, then print your first name, and then your middle name or middle initial.

* Also in the upper left-hand box, please fill in your social security number. Next to that space, fill in today's date which is _____ (month, day).

* Are there any questions on the preparation of this answer sheet?

- * The Test Administrator should walk around the room to check each person's entries.
- * All materials needed for the tests are provided.
- * The management test is a series of four tests. They are:
 - Part I - Quantitative
 - Part II - Writing Fluency
 - Part III - Reading Accuracy
 - Part IV - Following Directions
- * Parts I, II, III, and IV are labeled on the answer sheet to ensure you mark your answers in the proper area. Each test begins with one or more sample problems.
- * All answers to the questions on the tests will be made on the answer sheet by darkening the space under the answer you choose. There will be four possible answers to each question. They are lettered A, B, C, and D. There will only be one correct answer for a question. If you mark more than one answer, the question will be counted wrong. If you change your answer, be sure to erase the first answer completely.
- * Before we begin the tests, I would like to read four important statements regarding our testing policy. First, all materials are to be returned upon completion of the test, including test booklets, answer sheets, scratch paper, etc.
- * Second, test standards are periodically updated to reflect the current skills and abilities required for our jobs. Therefore, it may be necessary to meet new test standards, should they be introduced prior to your placement in the job.
- * Third, no calculators or any other mathematical aids are permissible during testing.
- * Finally, cheating on this test is an automatic disqualifier. In addition, any attempt to deface, destroy, or remove test materials from this room will result in disqualification and possible prosecution.

* We will now begin the test. For each part of the test, you are to read the directions silently as I read them aloud. I will tell you when to start working and when to stop. If you finish before the time is up, you may check your work on that part of the test only. You are not to look at or work on any other part in the booklet.

* Now, open the test booklet to the first page entitled "General Directions" and read the directions silently to yourself as I read them aloud.

* This is a test of your ability to solve number problems, identify words and standard grammar, and follow directions. Your score will be the total number of correct answers you mark. Wrong answers will not be counted against you.

* Do not spend too much time on any one question. If a question seems to be too difficult, make the most careful guess you can.

* Mark your answers on the separate answer sheet. Do not write in the test booklet. Mark only one answer for each question. If you want to change an answer, erase your first mark completely.

* Are there any questions, thus far?

Answer any questions, then say:

* We will now begin Part I of the test. Turn to page three in the test booklet. The directions for Part I are printed at the top of the page. Read the directions silently to yourself as I read them aloud.

* Each question has two parts; one part in Column A and the second part in Column B. You are to decide if one part is greater than the other, both parts are equal, or not enough information is given to make the decision. Each decision is lettered A, B, C, and D at the top of the page. Solve the parts, then find the row of boxes on your answer sheet which has the same number as the question. In this row of boxes, mark the letter of the decision you have made.

* Now read through the sample problem. Pay particular attention to the "NOTE".

Allow the candidates a few minutes to read through the sample problem and "NOTE". When it appears all candidates have finished reading, say:

- * Remember, you are not to make any marks in the test booklet. You should use the scratch paper that has been provided for any calculations.
- * Your score will be the number of problems you answer correctly. There is no penalty for guessing. Therefore, it will be to your advantage to try every problem.
- * Work as fast as you can while being accurate. You will be allowed 20 minutes for Part I. Do not turn the page until I tell you to begin. Are there any questions?

Answer any questions, then say:

- * The questions for Part I are numbered 1 through 50. Your answers for Part I should be in spaces 1 through 50 on your answer sheet under the columns titled "Part I".

Set your timer for 20 minutes and say:

- * Remember you will have 20 minutes to complete Part I. If you finish Part I before time is up, you may check your work on Part I only. Do not continue ahead until you are told to do so.
- * Turn the page. Ready? Begin!

Start your timing device. After 20 minutes, say:

- * Stop working on Part I. Put your pencils down! Do not work any further on this part. Turn to page 7 in your test booklet. This Part II of the test. The directions for Part II are printed at the top of the page. Read the directions silently to yourself as I read them aloud.

* Each of the sentences below has three words or phrases that are underlined. The three underlined parts are lettered A, B, and C. You are to decide if one of the underlined parts would not be accepted in standard written English and, if so, which one. If all underlined parts are acceptable, the sentence contains no error, so the correct answer would be D (No Error). Now read through the sample problem.

Allow candidates a few moments to read through the sample problem. When it appears all candidates have finished reading, say:

* Your score will be the number of problems you answer correctly. There is no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* Work as fast as you can while being accurate. You will be allowed 10 minutes for Part II. Do not turn the page until I tell you to begin. Are there any questions?

Answer any questions, then say:

* The questions for Part II are numbered 51 through 70. Your answers for Part II should be in spaces 51 through 70 on your answer sheet under the column titled "Part II".

Set your timer for 10 minutes and say:

* Remember you will have 10 minutes to complete Part II. If you finish Part II before time is up, you may check your work on Part II only. Do not continue ahead until you are told to do so.

* Turn the page. Ready? Begin!

Start your timing device. After 10 minutes, say:

* Stop working on Part II. Put your pencils down! Do not work any further on this part. Turn to page 11 in your test booklet. This Part III of the test. The directions for Part III are printed at the top of the page. Read the directions silently to yourself as I read them aloud.

* Each of the sentences below contains clues to the meaning of an underlined word in the sentence. You are to complete a statement about the underlined word, choosing the best answer from four suggested answers.

* Now read through the sample problem.

Allow candidates a few moments to read through the sample problem. When it appears all candidates have finished reading, say:

* Remember, your score will be the number of problems you answer correctly. There is no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* Work as fast as you can while being accurate. You will be allowed 10 minutes for Part III. Do not turn the page until I tell you to begin. Are there any questions?

Answer any questions, then say:

* The questions for this part are numbered 71 through 90. Your answers for Part III should be in spaces 71 through 90 on your answer sheet under the column titled "Part III".

Set your timer for 10 minutes and say:

* Remember you will have 10 minutes to complete Part III. If you finish Part III before time is up, you may check your work on Part III only. Do not continue ahead until you are told to do so.

* Turn the page. Ready? Begin!

Start your timing device. After 10 minutes, say:

* Stop working on Part III. Put your pencils down! Do not work any further on this part. Turn to page 17 in your test booklet. This Part IV of the test. The directions for Part IV are printed at the top of the page. Read the directions silently to yourself as I read them aloud.

* Each sentence below is an instruction based on a table of numbers. You are to follow each direction carefully. As you work on following these directions, you will be interrupted from time to time by a tape recording giving you more directions to follow. Mark the answers for the written direction on your answer sheet in spaces 91 to 104. Mark the answers for the spoken directions on your answer sheet in spaces 105 to 114.

* The spoken directions are additional directions of this test. Continue working on the written directions after following the tape recording directions.

* Now read through the sample problem.

Allow candidates a few moments to read through the sample problem. When it appears all candidates have finished reading, say:

* Remember, your score will be the number of problems you answer correctly. There is no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* Work as fast as you can while being accurate. You will be allowed 10 minutes for Part IV. Do not turn the page until I tell you to begin. Are there any questions?

Answer any questions. Be sure the cassette player is ready. Then say:

* Again, the questions for this part are numbered 91 through 104 for the written directions and 105 through 114 for the spoken directions. Your answers should be in these spaces on your answer sheet. The cassette tape will tell you when you should begin and stop working on the test.

Set your timer for 10 minutes and say:

* Remember you will have 10 minutes to complete Part IV. If you finish Part IV before time is up, you may check your work on Part IV only. Do not work on any other part of the test.

At this point, turn on the cassette player. There is a 15 second lead time before the voice begins. When the recording says "Begin", start your timer (set for 10 minutes).

After the tape says "Stop, even if you...", turn the cassette player off and say:

* Close your test booklets. Place your answer sheet and scratch paper on top of the test booklet. Thank you.

Collect and account for all materials, including scratch paper.

AT THIS POINT IN THE SESSION, TAKE A SHORT (10-15 MINUTES)
BREAK.

~ DISTRIBUTE THE NON-MANAGEMENT TEST BOOKLETS AND ANSWER
SHEETS

Note: Do not allow them to open booklets before the beginning of the test. Remember to read all instructions within the boxes aloud verbatim to the candidates. All questions during the testing section should be answered by rereading the applicable section of the instructions.

* The other test you are going to take tonight is now in front of you. Please do not open the booklet until you are told to do so.

* This test is being administered to gain additional information about your skills and abilities. You will complete only a portion of this test. You will NOT be notified of the results and they will NOT be given to the employment office. The results won't be used for employment purposes, since you already hold an associate position, for which this test is used. However, this information is very valuable to the test-preparation project, so please complete it to the BEST of your ability.

* A special answer sheet has been furnished for recording your answers. All your answers should be made on this answer sheet. Do not make any marks on the test itself. Let's take a moment to go over the answer sheet.

* Be careful when filling it out. You must do the following:

- use only a dark leaded (#2) pencil
- make heavy black marks that fill the rectangle completely
- erase cleanly any answer you wish to change
- make no stray marks on the answer sheet

* Now, I would like for you to print your name in the upper left-hand box beside the words "last", "first" and "middle initial". Be sure to write in your full name. Print your last name first, then print your first name, and then your middle initial.

* In the box below your name, please fill in your social security number.

* In the upper right-hand box labeled "Location", leave this space blank. In the box below it, fill in today's date which is _____ (month, day)." Where it says "Form", leave that space blank.

* Are there any questions on the preparation of this answer sheet?

Note: Walk around the room to check each person's entries.

* All materials needed for the test are provided. The portions of the nonmanagement test that you will take include:

Part I - Detail Perception

Part II - Computational Facility

Part III - Number Groups

* Each of these is labeled on the answer sheet to ensure you mark your answers in the proper area. Each test begins with one or more sample problems.

* All answers to the questions on the tests will be made on the answer sheet by darkening the space under the answer you choose. There will be four possible answers to each question. They are lettered A, B, C, and D. There will only be one correct answer for a question. If you mark more than one answer, the question will be counted wrong. If you change your answer, be sure to erase the first answer completely.

* Now, open the test booklet to the first page entitled "Detail Perception".

* The words "Detail Perception Test" are in the upper right-hand corner of the page.

Mark sure the candidates have turned to the right page and say:

* Please read the directions silently to yourself as I read them aloud. This test will show how fast and accurate you are in making comparisons and finding mistakes. There are six parts to the test. The parts are lettered A to F. Each part has 9 or 10 problems. Each problem shows four pairs of things. Three of the pairs will have parts that are exactly alike, and one pair will have parts that are slightly different. On your answer sheet, mark the letter that is the same as the letter between the pair that has the difference or "error". Now, look at these sample problems and mark the answers in the shaded area on your answer sheet.

As soon as the candidates have finished the sample problems, say:

* For these samples you would notice "mistakes" or differences in C, A, D, and B for the sample problems.

* Your score on the test will be the number of problems you answer correctly. You are not necessarily expected to finish all the problems in each part.

* Work as fast as you can while being accurate. You will be allowed 45 seconds for each of the first four parts and one minute for each of the last two parts.

* Do not turn this page until you are told to do so. The questions for this test are numbered 1 through 56. For Part A of this test, your answers should be in spaces 1 through 9 on the answer sheet, under the column titled "Detail Perception". Are there any question?

Set your timer for 45 seconds and say:

* Remember that you will have 45 seconds for each of the first four parts. If you finish any of the parts before time is up, do not turn the page until you are told to do so. Ready? Turn the page. Begin!

After 45 seconds, say:

* Stop working on Part A.

Reset your timer for 45 seconds and say:

* Turn the page to Part B. Be sure you start with space 10 on your answer sheet. Ready? Begin!

After 45 seconds, say:

* Stop working on Part B.

Reset your timer for 45 seconds and say:

* Turn the page to Part C. Be sure you start with space 20 on your answer sheet. Ready? Begin!

After 45 seconds, say:

* Stop working on Part C.

Reset your timer for 45 seconds and say:

* Turn the page to Part D. Be sure you start with space 29 on your answer sheet. Ready? Begin!

After 45 seconds, say:

* Stop working on Part D. Remember that you will have one minute each for Parts E and F.

Reset your timer for 1 minute and say:

* Turn the page to Part E. Be sure you start with space 38 on your answer sheet. Ready? Begin!

After 1 minute, say:

* Stop working on Part E.

Reset your timer for 1 minute and say:

* Turn the page to Part F. Be sure you start with space 47 on your answer sheet. Ready? Begin!

After 1 minute, say:

* Stop! Do not work any further on this test. Turn to the next page. The words "Computational Facility Test" are in the upper right-hand corner of the page.

Make sure the candidates have turned to the right page and say:

* Please read the directions silently to yourself as I read them aloud. This is a test of your ability to do arithmetic problems accurately. For each problem, three numerical choices lettered A, B, and C are given. If the correct answer is one of these, mark the corresponding space on your answer sheet. If the correct answer is not given, mark the space lettered D. Now try the sample problem below. Mark the answer in the shaded area on your answer sheet.

As soon as the candidates have finished the sample problem, say:

* The correct answer is 393, so you should have marked answer space C. In this test, the conventional arithmetic signs are used for addition, subtraction, multiplication, division, decimals, and percents, as shown. These are noted in your instructions.

* You have a sheet of paper so please do not make unnecessary marks on the answer sheet or test booklet.

* Your score on the test will be the number of problems you answer correctly. There will no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* You will have 9 minutes to work on 20 problems. Do not turn this page until you are told to do so. The questions for this test are numbered 1 through 20 on your answer sheet, under the column titled "Computational Facility". Are there any questions?

Set your time for 9 minutes and say:

* Remember, you have 9 minutes to work on this test. Ready? Turn the page. Begin!

After 9 minutes, say:

* Stop! Do not work any further on this test.

* Turn to the next page. The words "Number Groups Test" are in the upper right-hand corner of the page.

Make sure the candidates have turned to the right page and say:

* Please read the directions silently to yourself as I read them aloud. This is a test of your ability to see how groups of numbers are alike or different. In each problem, you are to look at four groups of numbers. Three of the groups will have something in common, that is, something that makes them alike. The correct answer to each problem is the group that is different from the other three groups. Try the sample problems below. Mark the answers in the shaded area on your answer sheet.

As soon as the examinees have finished the sample problems, say:

* In the first sample, groups A, B, and D are alike because the numbers in all of them are in sequential order. The correct answer is C, because that group is different from the other groups; the numbers in it are not in sequential order.

* In the second sample, the correct answer is D. Groups A, B, and C all have four even numbers, while Group D has both even and odd numbers.

* Your score on the test will be the number of problems you answer correctly. There will be no penalty for guessing. Therefore, it will be to your advantage to try every problem.

* You will have 7 minutes to work on 20 problems.

* Do not turn this page until you are told to do so. The questions for this test are numbered 1 through 20 on the answer sheet, under the column titled "Number Groups". Are there any questions?

Set your timer for 7 minutes and say:

* Remember, you have 7 minutes to work on this test. Ready? Turn the page. Begin!

After 7 minutes, say:

* Stop! Do not work any further on this test.

Collect and account for all testing materials, including scratch paper.

~ DISTRIBUTE POST-TEST QUESTIONNAIRE

* Now, take the next several minutes to complete the Post-Test Questionnaire. First, fill in your social security number in the space in the top right-hand corner of the first page.

Note: Look to make sure everyone fills in their social security number; this is VERY important!

(Read instructions aloud that are printed on the top of the 1st page.)

* Write directly on this form. Are there any questions?

After questions have been addressed, allow approximately 10-15 minutes for completion. This instrument is not a timed test, so allow enough time for everyone to finish all of the questions.

~ COLLECT COMPLETED POST-TEST QUESTIONNAIRE

~ DISTRIBUTE POST-COURSE QUESTIONNAIRE

* Now, take the next few minutes to complete the Post-Course Questionnaire. Please report your honest feelings about the test-preparation course that you have just completed.

* First, fill in your social security number in the space in the top right-hand corner of the first page.

Note: Look to make sure everyone fills in their social security number; this is VERY important!

(Read instructions aloud that are printed on the top of the 1st page.)

* Write directly on this form. Are there any questions?

After questions have been addressed, allow approximately 10-15 minutes for completion. This instrument is not a timed test, so allow enough time for everyone to finish all of the questions.

~ COLLECT COMPLETED POST-COURSE QUESTIONNAIRE

TO WRAP UP THE SESSION.....

* Now that you've completed your participation in the test-preparation course, I'd like to provide a brief overview of the entire project. We received responses from over 2,500 associates in 5 geographic regions who wished to volunteer for this project. Because of the limited availability of instructors and materials for this project, we could only accommodate a certain number of individuals. Including yourselves, a total of 400 people were contacted to participate. Those people were chosen solely on the basis that their volunteer information was the first that we received.

* The purpose of this large-scale project was to evaluate three different versions of a test-preparation course that were recently developed, and examine the effects of preparation, attitudes, and motivations toward test-taking. The three versions included:

1-a 2-week course that focused on refreshing test-taking skills (e.g., test anxiety reduction, time management strategies, and guessing strategies) that can be applied to any test that is taken;

2-a 6-week course that focused on refreshing basic cognitive skills (e.g., math, vocabulary, grammar);

3-a 7-week course that focused on both the general test-taking skills and basic cognitive skills. All participants were randomly placed in to each one of these courses, depending on the course that was offered in their location. These courses are being examined to determine which type of skills (i.e., general test-taking or basic cognitive) need to be refreshed to a greater extent, in order for people like yourselves to be better prepared to take a management employment test. In addition to those who participated in the classes, other associates have volunteered to take the tests twice without receiving any of the course material. From the results of this evaluation, we will revise the test-preparation course and offer it in the future to a larger number of people through the company. PLEASE DO NOT DISCUSS ANY OF THE INFORMATION ABOUT THE PROJECT WITH OTHERS, SINCE MANY PEOPLE ARE STILL TAKING THE COURSES AND TESTS.

* You will be notified of your qualification status on BOTH of the management tests shortly. A letter will be sent to you specifying whether you qualified or not on the first and second administrations of the test. You must complete the bottom portion of the letter upon its receipt, and indicate whether or not you want your test scores given to the employment offices.

* If you DO NOT qualify on either administration of the test, and decide that you do not want your results forwarded to the employment office, please indicate so on the letter. Subsequently, your actual test scores will not be logged into the tracking system. However, the fact that you took the test during this project will be recorded, so you must wait 6 months (i.e., the normal retest interval) to retake the test.

* If you DO pass the test either time it is administered, and want your test score(s) to count and be logged into the management test tracking system, please indicate so on the letter. Subsequently, the information will be reported and recorded in your file. So you will NOT have to retake the test in order to become eligible for the Management Development Program.

* Test scores will be sent to the employment office, ONLY with your consent.

* Does anyone have any questions??

ANSWERS TO POSSIBLE QUESTIONS:

(WHY DIDN'T WE TAKE THE OTHER MANAGEMENT TEST) The other Human Resource Assessment test was NOT part of this project. Relative to the management test administered here, it is more difficult to prepare for the other test with educational material because it measures applied skills, rather than aptitude or learning skills. Preparation for that test stems moreso from past experience, rather than educational means. So the course was developed primarily to help people prepare for the management test administered during the investigation.

(WHAT IS THE OTHER MANAGEMENT TEST) It is a 30-question paper-and-pencil test in which various situations in industry are presented. For each situation you are asked to tell how you are most likely and least likely to respond.

(WHAT IS THE MANAGEMENT DEVELOPMENT PROGRAM?) The Human Resource Assessment Center no longer exists. It has been replaced with the Management Development Program. Your supervisor can give you information about this new program.

Briefly, to become eligible for this program, you must qualify on BOTH management tests. If you qualify on the test administered during this project and want to take the other test after the project's completion, you may do so by submitting the proper form for the Management Development Program. This form was included in the packet of information about the Program that was mailed to all of the supervisors. Ask your Supervisor for the form and address to which it should be sent, in order to be scheduled.

(CONFIDENTIALITY) All information obtained from the questionnaires and tests will be kept confidential. Supervisors and coworkers will NOT have access to ANY data.

(RESULTS) No individuals will be identified. Results will be summarized and reported on a group basis only.

(WILL WE HAVE THE OPPORTUNITY TO TAKE ANOTHER COURSE?) This project was a one-time trial to evaluate the course in which you participated. Because it is an evaluation, we are able to offer only ONE of the courses to each person, due to a limited number of instructors and materials. Based on the results of the trial, we hope to revise the course to improve its effectiveness in helping associates prepare for tests, and offer it to a larger number of people in the future through the company.

* Thank you again for your participation, and I wish everyone the best in reaching your career aspirations.

Note: At the end of session, visually inspect (check for missing or marked pages) and account for all testing materials assigned to you.

Dismiss students after test materials have been counted and verified.

Be sure to leave the room as it was.

Appendix J
Outline and Information for
General Test-Taking Skills Course

COURSE OUTLINE
GENERAL TEST-TAKING SKILLS
2 sessions (3 hours each)

Session 1

- I. Introduction to testing
- II. Concept of test-wiseness
- III. Class expectations and goals
- IV. Preparation to maintain a positive attitude and reduce anxiety
- V. Basic principles important to every test
 - A. Time management
 - B. Scanner answer sheets
- VI. Strategies Specific to multiple choice tests
 - A. Structure of items
 - B. Directions
 - C. General strategies
 - 1. Selecting the best alternative
 - 2. Reading every word
 - 3. Spotting key words or phrases
 - 4. Locating prefixes
 - 5. Gauging items' complexity
 - D. Specific strategies
 - 1. Deductive reasoning strategies
 - a. Absurd options
 - b. Similar/Conflicting options
 - c. Stem-Option resemblance
 - 2. Cue-Using strategies
 - a. Specific detail
 - b. Grammatical cues

Session 2

- VII. Keys to remembering
- VIII. Scanning
- IX. Tips for taking speed and accuracy tests
- X. Summary of action principles
- XI. Guessing
- XII. Checking
- XIII. Changing answers
- XIV. Review using practice tests

GENERAL TEST-TAKING SKILLS COURSE

I. INTRODUCTION TO TESTING

Tests are commonly used to measure differences between individuals. They have been used in educational, industrial, counseling, and research settings for many years. (HANDOUT #1)

These settings often use standardized tests. Standardization means that a test is designed so that everyone who takes it does so under the same conditions: the same instructions and the same time limits. This ensures that the results from tests given at different times and in different places can be meaningfully compared. Standardization also helps to reduce any perceptions of bias or lack of fairness, since everyone receives the same treatment.

The majority of tests used in industry are aptitude tests. These tests are designed to indicate a person's ability to learn how to do the job correctly and his or her likelihood of future success. They do so by measuring knowledge, skills, and abilities that one must have in order to perform the job. In this manner, the content of the test directly matches the content of the job. (Point out relationship of test to job; understand importance and necessity of test.)

Most aptitude tests have been developed so that it is difficult if not impossible to prepare for their content in

advance. Even in these tests, however, it has been shown that scores tend to increase as a function of the amount of experience one has with the type of test and testing strategies in general.

II. TEST-WISENESS

To many people, taking a test is an unpleasant experience, and it is doubtful that anyone really enjoys taking tests. However, there are a number of circumstances (e.g., applying for a new job or a transfer) which require you to take a test. And something important (like a new job or job promotion) may be riding on your test performance. Part of the reason that tests are viewed negatively is that many people do not know how to take tests. Just as people differ in their relative ability and knowledge of material, they may also differ in their ability to communicate or demonstrate their knowledge in a testing situation. Either they were never taught how to properly express themselves in a test situation or have not taken a test for a long time. But receiving instruction on how to take tests helps you learn how to demonstrate your knowledge.

Too many people do not realize that they can learn to take tests. Taking a test is like other skills areas; if you are willing to learn and understand how to take tests, and believe in yourself, you are more likely to do better. In this course, we want to help you learn how to take tests or become test-wise. To be test-wise means to be familiar

with the characteristics of tests, and to understand how to prepare for tests. It also means you are actively involved; read, listen, concentrate, and pay attention. Every second is utilized effectively. By using this set of skills, you can increase your proficiency in taking tests through practice and instruction.

Learning to take tests can be a lot like learning to drive a car. You can learn to drive on your own, but if you were not instructed, it probably would take a long time to learn how to drive safely. Like driving a car, test taking requires practice and skill. There is no guarantee that instruction will make you a superb test taker; however, you will have the basic knowledge and skill to improve your test performance.

III. CLASS EXPECTATIONS (discussion)

0 Explain how the course will assist them in further developing their skills; increase your ability to utilize relevant cues in the test or test situation to obtain a test score which is consistent with your level of proficiency (The American College, 1978).

0 Reaffirm why they are here; focus their energy and effort toward accomplishing their desired objectives.

0 GOAL OF COURSE:

designed to increase test-taking proficiency, provide general suggestions, and introduce specific test-taking strategies. A variety of exercises are included; some

providing practice in applying strategies, and others serving as measures of knowledge of principles. While the skills and techniques taught in this course are not substitutes for knowledge, they should increase the ease with which tests are approached. The major goal is to teach skills that are general and can be applied to most tests, regardless of subject matter or item format, rather than provide practice in the types of items used in specific examinations.

IV. PREPARATION--TO MAINTAIN A POSITIVE ATTITUDE AND REDUCE ANXIETY

0 Positive Attitude (HANDOUT #2)

Test scores are influenced both by attitude toward the test and by the way in which the items are approached. First, we will discuss the importance of your test-taking attitude. Get rid of any negative attitudes toward the test. Instead of viewing the test as a device to trick you or prevent you from achieving your goals, think of it as an opportunity to show how much you know and how capable you are. You must believe in your ability to do well and think positively. Self-confidence is one of the biggest strategic assets you can bring to a testing situation.

Confidence in your ability to do well on tests comes from recognizing what you know and knowing how to use it to your advantage. Your confidence is likely to increase if you believe that you are going to pass the test because you have prepared well for it; and you'll use your knowledge to

answer the questions.

Nevertheless, some people get upset or angry with tests. Anger only slows you down and hinders your thinking, and therefore does not provide an accurate measure of your ability. A certain amount of concern and worry is normal. Everyone worries about tests. In fact, psychologists have concluded that some anxiety is good for motivation. However, too much anxiety often leads to low test scores because it interferes with performance. Excessive worry and stress will only take away your energy and cloud your thinking. Panicking will not help you.

Indicators of too much anxiety:

1. you do not apply test-wiseness skills
2. you feel sick, dizzy, afraid before a test
3. you "freeze up" or your "mind goes blank" right before or during a test

Worry and anxiety can get in the way of believing in yourself, so it must be controlled. The first way to control anxiety is to recognize that everyone worries about tests. While it is not possible or even desirable to eliminate anxiety completely, it is possible to reduce it to a manageable level.

The following are additional suggestions on how to reduce anxiety and develop a positive attitude for test-taking.

- 1.) Find out as much as you can about the test. People

worry because of the fear of the unknown. If you can learn as much as you can about the test that you will take, then you will not fear the unknown. For example, inquire as to what information a test will cover, what types of questions will be asked, and how many. Also inquire as to what do you need to know to do well on the test and when will the test be given?

(discuss study guide)

Although you will never know the exact test questions, you can become familiar with the types of questions that will be on the test. This will allow you to focus on other important issues.

2.) Arrive at the testing location a little early. This will allow you to find the room, get accustomed to the room, and find a seat where you will be most comfortable. Make sure you are located in a position from where you can easily receive instructions that are given. Relax your body muscles, and take a few deep breaths until you are given the test.

0 Activities for Relaxation (HANDOUT #3)

Tension relieving exercises to relax before a test (Alford, 1979):

(Walk students through each of the activities)

a. Roll your head slowly in a large circle; first clockwise and then counter-clockwise.

b. Hunch your shoulders as high as possible and then

let them drop. Repeat several times.

c. Close your eyes and pretend that you are floating on a soft cloud and as you begin to feel comfortable and relaxed, slowly open your eyes trying to maintain those feelings.

d. Stand up on both feet and stretch your arms out over your head and push forward as far as possible.

e. Place both feet together and apply pressure to the floor with your toes as you hold your breath for several seconds, then exhale and quickly take a deep breath.

f. Place your ten fingers against one another and place your hands over your chest as you apply pressure. Inhale and count to twenty, then release your applied finger pressure and exhale.

3.) Go in to the test situation alert, but calm. Relax and do not worry. If you are too nervous, wait a minute or two before beginning to write. Or check your pencils or other materials to take your mind off your nervousness for a moment. Or briefly think about a pleasant event. Tell yourself you are probably one of the best prepared individuals there.

4.) Make sure you understand the test directions. Many people panic when they first hear the directions because they don't understand them. If the directions are confusing, don't sit and waste valuable time. Instead, quickly ask the test administrator to clarify them for you.

5.) Another way to overcome high anxiety in the test situation is to change your approach. Instead of viewing a test as a large evaluation, view it as a series of individual items. Tackling each item, rather than the whole test, will reduce anxiety. This does not mean that too much time should be spent on individual items, but that concentration should be focused on one item at a time.

Other Pointers to help you prepare emotionally:

- 0 Keep fit--observe common-sense rules of fitness. You're more mentally efficient when you are in good physical condition. So get sufficient sleep and rest, eat proper foods, and exercise. When these important factors are lacking, we often become confused and are not very mentally alert. Your body and mind work together. To be as "sharp as a tack", take care of yourself.
- 0 Wear comfortable clothing--For example, don't wear a tight collar or tight shoes because they might bother you or distract you during the test.
- 0 Be sure to bring any necessary supplies (e.g., sharpened pencils, an eraser, watch, identification or other items you were instructed to bring).
- 0 Remove materials that you don't need from your desk so that you will have a clear space to lay out test materials and move freely.
- 0 If there is a problem, such as the room being too dark, warm, or cold, your pencil breaks, or you receive a

defective test booklet, let the test administrator know. The test administrator is not only there to give you the test, but will also answer questions that you may have and assist you when possible.

0 After receiving the test, put everything else out of your mind, except for solving each of the test questions.

0 During a break, do not worry if the test seems difficult to you. Everyone is taking the same test. Remember that tests are designed to measure differences between individuals; the test may be even more difficult for your neighbor. And the next section of the test may be easier than the last.

0 Don't be concerned if you do not finish all of the questions on the test.

0 If the exam is long (two or more hours), rest periodically if you feel you need to do so. Relaxation allows your mind and body to be refreshed. Often you will be notified by the test administrator of rest periods, during which you can leave the room to stretch, etc. If you cannot leave the room, stretch your legs, shift your body, rest your eyes, and take deep breaths. Doing so alleviates fatigue, so that you don't make unnecessary mistakes.

By preparing for a test by taking a test-preparation course like this, you are already reducing stress levels. If you follow these suggestions you will keep calm and do your best.

V. BASIC PRINCIPLES IMPORTANT TO EVERY TEST

A. Time Management

The majority of tests have time limits. When time limits are imposed on tests, it is essential that you spend time on planning in order to use time most efficiently. When planning, your goal is to work as quickly as possible, with the least amount of error. One way to accomplish this goal is by budgeting the time spent on each item. Subsequently, it is extremely important that you bring a watch to the testing situation. That way you can balance your time.

It is suggested that you begin each test by looking it over quickly, if possible, checking its length and estimating how time is available for each item. For exams in which a time limit is set for each section of the test, follow the time instructions carefully. The test has been planned according to the time schedule. If the test booklet bears the instruction "Do not turn the page until you are told to do so" or "until the signal is given", follow the instructions. Otherwise, you may be disqualified. Even if the testing situation does not allow you to open the test booklet before the start of the test, oral directions are usually given before each section that provide information concerning the number of items and time allowed to solve them.

To budget your time, for example, if there is a time

limit of one hour for a 30 item test, divide 60 minutes by 30 items to establish the appropriate rate of 2 minutes for each item. By setting a time limit, you can mentally gauge your progress on the test. If after 30 minutes you've answered only 7 items, then you've spent too much time on each item. If you continue at such a slow pace, you run the risk of not attempting all of the items before time runs out. But also do not rush headlong through questions that must be thought through.

Although it is recommended that you establish a time frame, be flexible and willing to change your plans and your allocation of time and energy, according to the difficulty of items. In a testing situation, some items will be more difficult than others, and therefore require more time. It is a good practice to go through the test the first time, keep moving at a steady pace, and answer the questions that seem easy to you. Attack all questions, regardless of their difficulty, as opportunities to test your test-taking skills. Read each item carefully, and if you cannot come up with a sure answer in a minute or so, follow your first choice and go on to the next item. Don't spend too much time on difficult ones. If all items are worth the same amount of points, then spending too much time on difficult items can slow down your progress and lead to low test scores.

Place a light check mark or a dot next to each item (on

the answer sheet if you can't write in the test booklet) for which the answer is uncertain. Then go back and work out the more difficult items that you were unsure of or could not solve initially. If you do mark those with which you were having difficulty, be sure to erase all stray marks on your answer sheet, particularly if it's machine scored, before the end of the test.

B. Answer Sheets

(HAVE THEM USE COMPUTER ANSWER SHEETS IN COURSE)

It is important that you know how to mark each answer, in order for your test to be scored accurately. Find out whether it is necessary to underline, circle, or fill in a blank or bubble. Most tests, particularly those that are given to a large number of people like in schools or industry, are now mechanically scored. Even though you may have had practice with machine-scored answer sheets, the following are a few pointers.

1. Use a sharp number two pencil. Don't use a ball-point pen or other writing instrument because your answers will not be able to be scored by the machine. Each pencil mark must be heavy and black.

2. Complete a space on machine-scored tests, rather than using a check or an X. Each mark should be in the space between the lines and entirely fill the space.

3. The machine, unfortunately, cannot tell the difference between an intended answer and a stray pencil

mark. If there are two answers or stray marks, the machine will either ignore both of them, count both of them, recognize the darker mark, or subtract points for the double-marked question, depending on the machine. For this reason, the proper spaces must be completely filled in.

4. When you decide to change an answer, be careful to erase the first answer completely. If you leave a pencil mark on the wrong space it will cause the scoring machine to cancel the right answer for that question.

5. Each question must have only one answer indicated. If multiple answers occur, all extraneous marks should be thoroughly erased. Otherwise the machine will give you no credit for your correct answer.

6. Care should be taken that your answers are recorded next to the appropriate numbers on your answer sheet. It is easy, for example, to place the answer for item 5 in the space reserved for item 6. After answering each item, it is therefore a good idea to take the time to check and make sure you have marked the answer you intended to mark. Unless you have marked the answers properly, you will not receive full credit for them.

7. Record your answers on the answer sheet one by one as you answer the questions. It is not a good practice to write your answers first on the test booklet and then transfer them all at one time to the answer sheet.

8. Finally, the identification blanks on the answer

sheet must be filled out exactly as the test administrator directs. If you are reading something else when these directions are given, and intend to complete the blanks after you've finished the test, there is a chance that you either may forget to fill out the identification blanks or forget some important information.

9. Many exams caution test-takers against making any marks on the test booklet itself. Obey that caution even though it may go against your routine of working problems next to the question and answer. If you work neatly with the test booklet, then you will probably do the same with your answer sheet, and that should pay off in high scores.

VI. STRATEGIES SPECIFIC TO MULTIPLE CHOICE TESTS

A. Structure

Standardized tests generally contain multiple choice, true-false, fill-in-the-blank, and one-word-answer questions. The multiple-choice test is probably the most popular and widely used test form in education, as well as in business and industry. Your task with multiple-choice questions seems rather simple. You are given either a question or problem or incomplete statement and then must select one correct answer from several choices.

(Example)

The first statement or question is called the stem. The stem is followed by several possible answers, only one of which is correct. The correct answer is the alternative

that best answers the question presented in the stem. The incorrect options, the ones you try not to select, are called distractors. Despite their apparent simplicity, most of us know that multiple-choice tests can be demanding. Thus, consistently good performance requires both skill and an aggressive and positive attitude.

Multiple-choice questions can be used to measure different skills and abilities. Some may assess your ability to recall facts, others may measure creative problem solving or subtle discriminations. Some people are able to improve their test scores by answering some multiple-choice items correctly--even when they don't have a thorough grasp of the information covered by those items. Students with this ability are said to be test wise. What they are doing are using certain test-taking strategies developed from experience through repetitive test situations. The remainder of this course is designed to introduce you to some of these strategies.

B. Directions

Never begin an examination unless you are absolutely certain of the rules and procedures to follow. One of the most frustrating experiences an examinee can encounter is the loss of points due to the incorrect interpretation of directions or the test item itself. It is very important to follow all instructions carefully. Directions provide the information concerning the what, when, where, and how of

proper responses.

Example--Directions: Each of the questions below is followed by four suggested answers. Select the one that is best in each case and blacken the corresponding space on the answer sheet.

These directions provide all of the necessary information concerning how you should respond. The what is to select the best response; when is after the four suggested answers have been read; the how is to blacken the corresponding space; and where is on the answer sheet. It's a good idea to ask yourself these four questions before beginning each section of a test.

If the directions for the test or part of test are written, read them carefully, at least twice. If the directions are given orally, listen attentively and then follow them precisely. (handout-tips for effective listening) If you fail to hear something important, raise your hand and ask the test administrator to repeat them or read the written directions. If the test directions remain vague or the appropriate method for recording answers is unclear, be sure to ask for assistance to clarify the procedure before you start the test. Usually, sufficient time for questions and answers is allocated prior to the test's beginning.

In the same test, instructions may not be consistent. In one section the questions may call for the best choice

among four or five alternatives; others may ask you to select the one incorrect or the least probable answer. So avoid the temptation to skip the directions and begin working just from reading the model questions and answers. Even though you may be familiar with the particular type of questions, the directions may be different from those which you had followed previously. If the type of question is new to you, work through the sample question until you understand it thoroughly. This will save you time and may earn you a higher test score.

C. General Strategies for taking Multiple-choice tests

Because multiple-choice tests are often difficult to develop, not all alternatives are equally good. As a result, some alternatives may be eliminated, thus improving your chances if guessing becomes necessary. Your goal is to use your existing knowledge to eliminate wrong alternatives and to find the correct option. The best way to do this is to consider each alternative carefully and relate each to the stem and to each other. Do not guess wildly or select an option simply because it looks good.

1. One common direction included in multiple-choice tests is to select the best alternative for each question. For many questions on multiple-choice tests more than one option or alternative may have varying degrees of correctness, but that only one is considered the best. In many cases, an examinee reads the stem of a question,

immediately sees a "good" alternative and then selects that alternative without examining the remaining choices. It is possible to miss an obviously correct and better alternative simply because you failed to even read it because you quickly selected the first good alternative. Therefore, always read every alternative; others may look attractive or good, but only one is correct.

2. As with test directions, it is imperative that each item be read carefully. Misreading of a single word often leads to a distortion of the question. For example, think about the differences of interpretation that might arise from confusing words like: antonym-synonym, heterogeneous-homogeneous, marital-martial.

3. Do not misread or overlook key words or phrases within the test directions or test items. Examples of key words include: not, except, all, always, every, necessary, must, never, no one, may, often, generally, sometimes, seldom, perhaps, none, and only. These key words may be present in the stem, in the options, or both. These words provide specific information regarding the nature of the task, the interpretation of an option, or both. Such words provide intrinsic information. For example, words like all and none should be taken literally. They mean 100 or 0 percent of the time, with no exceptions. So they should be read with care. Such words do not always signal an incorrect option, but should signal caution. Misreading

these key words may cause some items to be answered incorrectly, even when you know the right answer.

Example of a key word in the stem: Which of the statements is not grammatically correct?

- a. He is a man whom we know can be trusted.
- b. Give the package to whoever asks for it first.
- c. Whomever he likes, he rewards well.
- d. I shall ask whoever answers my call to relay the message.

You should answer b, because it is the grammatically wrong sentence.

Example of a key word in the options: At the present time, there are relatively few women in positions of corporate management. One reason for this is:

- a. up until five years ago, no women had completed an MBA program.
- b. research has proven conclusively that women do not possess the skills required for corporate leadership.
- c. women have no interest in pursuing careers in management.
- d. there has been a general lack of formal and informal corporate programs for development of women managers.

Find the key words in each of the three incorrect options, and look to see how their inclusion in the option restricts the validity of the option. As you can see, the correct option contains a qualifier--a general lack of education.

No and not are usually not included in the correct response. In most cases, these words make the response too narrow or restricted to be correct.

4. Another type of negative expression that may be found in test items is prefixes that make a word negative. Some examples are: in-(invariant), un-(unreasonable), im-(impractical), ir-(irreligious), il-(illogical) and sometimes a-(atypical).

Example: A not atypical shape of the desert flower in the East is that of a bottle. In this example, the expression "not atypical" contains two negatives that cancel each other. Thus, the bottle shape of the desert flower is typical.

5. Another element of the test item which has been found to influence performance is the item format's complexity. Some items may be very brief and specific. For these types of items, the only interpretation involved is the determination of which option is the correct answer. However, other items may be more complex, due to length, level of sophistication, or the presence of key words. With these items, be careful when choosing the correct response.

With items that are lengthy, it is often tempting for an examinee to choose the first plausible answer, skipping the other options to save time. However, this answer may not be correct. Be sure to read each option carefully, and select the one that best answers the question posed. If the

question is extremely lengthy and complex, read and reread it, and then simplify it by breaking the item down to its essential elements. By breaking down the item, you will eliminate all extraneous and confusing information and make the item much more manageable.

D. Specific Strategies

This section will introduce you to some of the specific strategies employed by the test-wise person. Thus, these strategies will enable you to utilize relevant cues in the test to obtain a test score that is consistent with one's level of proficiency. In this way, test-wiseness is functioning as a tool or guide to improve your chances of legitimate success on tests.

1. DEDUCTIVE REASONING STRATEGIES

One skill that contributes a great deal to your success on multiple-choice tests is the ability to reason logically. Four reasoning strategies are used by test-wise individuals.

a. Absurd options

-This strategy utilizes the process of elimination. You may be unsure of the correct answer, but by systematically disregarding options you know are incorrect, you can narrow your choice to only one or two options. The absurd-option strategy helps you eliminate options which are obviously ridiculous, unreasonable or unsound. The key here is to improve your chances by changing the question from a four choice task to a two or three choice task. Each option

that you eliminate increases the probability of choosing the correct response.

Example: America's most popular sport is

- a. football
- b. gambling
- c. baseball
- d. miniature golf

It is reasonably obvious that b and d are incorrect because they are not really sports. Eliminating these options reduces the number of alternatives to two, raising the probability of a correct choice to 50 percent.

b. Similar/Conflicting options

Sometimes multiple-choice items may have two or more options that have the same or almost the same meaning. Logically, if two options mean the same, then one can not be correct and the other be incorrect. Either both are correct, or neither is correct. So under the similar-options strategy, all similar options should be treated the same. In these instances, the alternative that encompasses either all or none of the similar options should be the favored choice.

Example:

Fatuous means:

- a. ridiculous
- b. believable
- c. ludicrous
- d. absurd

Likewise, there may be items that include two or more conflicting options--options that contradict each other. Both cannot be correct. The preferred option for such an item is the one encompassing only one or neither, but not both of the conflicting options.

Example: Which of the following arguments did Copernicus use in favor of his system?

- a. it was consistent with good common sense.
- b. it was in keeping with Christian beliefs.
- c. it was more accurate than any existing system.
- d. it did not hold with Christian beliefs.

At least one of the alternatives b or d has to be incorrect, since they contradict each other. Similarly, some items may contain alternatives that include information from other alternatives. Options that have a wider applicability or are fairly flexible tend to be correct.

Example: Which of the following influences contributed to the conflict between James I and Elizabeth II?

- a. religion
- b. politics
- c. a combination of religion and politics
- d. trade conflicts

In this case, options a and b are correct. Since option c contains both, it is probably the best answer.

The principle of selecting the most inclusive alternative is also valuable when questions contain options like "all of the above" or "none of the above". Often these options are used to combine a lot of information to produce a correct answer.

c. Stem-option resemblance

This strategy pertains to an obvious resemblance between a test item stem and any of its options. Such a resemblance may take the form of an exact repetition of one or more words, a repetition of a part of a word, or the use of another word with the same meaning.

Example: The government department responsible for education and welfare on the national level is:

- a. the U.S. Department of Health, Education, and Welfare
- b. the U.S. Department of Foreign Services
- c. the U.S. Supreme Court
- d. the U.S. Department of Agriculture

The direct repetition of key words is an obvious cue to the correct option.

2. CUE-USING STRATEGIES

There is an additional set of test-taking strategies that focus on the identification of cues within a test item itself that may help to isolate the correct answer. A cue is a signal (word or phrase) that provides a hint or a clue. Often certain cues are inadvertently built into a test. By being sensitive to these cues, you may be alerted to a correct response.

a. Specific detail

To use this strategy, be very careful when reading the test items. In either the stem or options, a detailed phrase, descriptive statement, or significant word may have considerable influence in how you interpret an item. Sometimes the definition of the correct answer may be provided in the sentence. Or one option may be considerably longer or more specific than the others. In most cases, it is likely that the longer or more specific option will be the correct answer.

b. Grammatical cues

Sometimes a correct option is given away by grammatical inconsistencies between the stem and other options. For example, there may be differences in verb tense (past, present, future), subject-verb agreement (singular-plural), or modifiers (adjectives, adverbs). The presence of a or an

may tell you whether the best answer starts with a consonant sound or a vowel sound. A verb may show you whether the desired answer is singular or plural. The number of blanks may show how many words, letters, or figures are needed.

In multiple-choice items, each option should agree grammatically with the stem. If an option is not grammatically consistent with its stem, it probably is an incorrect option. Even if you are not an expert on English grammar, a good practice is to repeat each stem-option to yourself and ask yourself if it sounds right. Although you will probably come across test items with only one option that is grammatically inconsistent, each option eliminated increases your probability of your selecting the correct answer.

Example: Each of the poems by Hemingway depends on a _____ for its effect.

- a. cliché
- b. metaphor
- c. imagery
- d. allusion

In this case, only options a and b fit correctly into the stem. Options c and d should be discarded.

Think again and again about what you are to do.

Example: for a number series

Find the next number in the series: 1, 5, 10, 16

You observe that 5 is 4 more than 1, that 10 is 5 more than 5, and that 16 is 6 more than 10. The next number should be $16+7$ or 23.

Example: for grammar

At the age of twelve, my mother took me to New York for the first time.

- a. no change
- b. At twelve,
- c. When I was twelve,
- d. When she was twelve,
- e. At twelve years old,

When you first read this sentence, it may appear that no change is necessary. But if you read it again, the sentence sounds as though mother was twelve, but this is impossible. So option c is correct.

VII. KEYS TO REMEMBERING (HANDOUT #4)

VIII. SCANNING (HANDOUT #5)

IX. TIPS FOR TAKING SPEED AND ACCURACY TESTS (HANDOUT #6)

X. SUMMARY OF ACTION PRINCIPLES FOR TAKING MULTIPLE-CHOICE TESTS

The best approach to arrive at correct answers is to exercise care when responding. To do so:

1. Use smart general test-taking techniques. These are actions that should be used for all tests.

2. Know the specific characteristics of multiple-choice tests. These characteristics can help you figure out the answer, perhaps even when you know something about the material, but are not really sure of the answer.
3. Listen to any verbal directions and carefully read all written directions before attempting to answer any test question.
4. Ask questions immediately if any of the directions are unclear.
5. Define the nature of the problem. Read and reread the stem carefully. Remember, every word has significant in the item context.
6. Try to anticipate the answer or characteristics of the answer, but do not place constraints on the answer that are not inherent or implied in the question.
7. For each question, don't immediately assume the obvious. Be sure to read all options and compare options with each other in order to consider the full problem.
8. Relate each option to the stem to determine whether or not each option is consistent with the stem. Eliminate immediately any absurd alternatives. To decide among the remaining alternatives, use logical skills to reason out the correct answer. Consider: is it logical, accurate, and relevant to the stem? Look for relevant cues which can often be found in the questions themselves. If your answer is no, eliminate that option.

9. After you have eliminated the answer options that you are pretty certain are wrong, choose the most appropriate response.

XI. GUESSING

The procedure for guessing depends on what the directions dictate. If the directions state or if the Test Administrator says that a scoring penalty will be assessed for every wrong answer, it is not wise to guess at an answer unless the choices have been reduced to two or three. However, if there is no penalty for guessing, if the directions say only to avoid wild guessing, or if you're told that the score will be the total of the correct answers, it is wise to put down an answer for each question.

When an item is totally unfamiliar, or you are running out of time and have unanswered items remaining, it is better to guess than to spend time trying to figure out the correct answer or to leave the item blank. Guessing is not recommended for every item. However, guessing is a better practice than leaving difficult or remaining items blank. The most likely way to increase the probability of your getting the answer correct is to guess after you have eliminated one or more of the options on the basis of partial familiarity. Your chance of getting the right answer is improved, and it will be to your advantage to answer such a question rather than to omit it. However, even for those items in which no option can be eliminated,

it is probably better to guess than to leave the item blank. For a 5 option item, guessing blindly affords at least a 20 percent chance of making the correct choice, which is better than 0 percent.

XII. CHECKING

Instead of leaving the test early, use any remaining time to review all of your responses to make sure you have made no careless errors. As a rule of thumb, it is recommended that you reserve one-tenth of the total test time for checking. During that time, reread the directions in order to be sure you answered in the correct manner. You may discover that you somehow overlooked a key word in the instructions. It may not be too late to correct a mistake.

Check all items to be sure that the desired answer has been recorded clearly and correctly on the answer sheet. Also be sure that you placed the answer to item 10 in the space on the answer sheet for item 10. If you don't have time to check all of the items on a test, check every tenth item to make sure you didn't make this kind of mistake. Check too to make sure that any answers that were changed have been thoroughly erased.

Checking is especially important when solving mathematical problems that require computations. To check these types of problems, it is recommended that you:

- a. Read the problem carefully and see exactly what is asked.

- b. Reread the problem and see exactly what information is being given.
- c. See what principles of algebra, geometry, or mathematical computations apply.
- d. Decide what to do first, what to do second, and so on.
- e. Carefully apply the principles and reach the solution.
- f. Check your work.

In some objective tests, you may be instructed not to turn back. If so, no checking is possible once you have turned the page. If you are not behind schedule, you may use a few moments for checking before you turn the page.

XIII. CHANGING ANSWERS

Only change an answer if you are positive or almost positive that your first answer was wrong. If you see that you misread the question or overlooked a relevant or important fact, then change your answer. Otherwise, do not change an answer because of mere doubt. The odds are that you reasoned better about the item when you had more time for it the first time through the test than when you have only a few moments to check it. For mathematical problems, precisely check your answer by reworking the problem. This, of course, can only be done with the less complex problems, due to time limitations. For the more complex problems when a precise check is not possible, all you can do is observe whether your answer seems possible.

XIV. PRACTICE TESTS

Administer practice tests to participants to review general test-taking information.

Reminder: It is important to use real-world examples throughout the course so that participants perceive the material as being familiar and meaningful to them.

- * Class notes from Alford, 1979; Hook, 1967; Sherman & Wildman, 1982; Woodley, 1978.
- * Handouts from company-sponsored "Test-Taking and Thinking Skills" course, Bell Atlantic Education Services, 1989.

Appendix K
Outline for Cognitive Skills Course

COURSE OUTLINE
COGNITIVE SKILLS
10 sessions (3 hours each)

Session 1

- I. Orientation to course
- II. Presentation of instructional approach
 - A. Inventories
 - B. Drills
 - C. Mini-Lessons
 - D. Homework/Self-study
 - E. Learning Labs (1/2 hr.)
- III. Review study guide- go over examples, directions in mathematical section of study guide, pp. 5-7. (1/2 hr.)
- IV. Administer Math Inventory #1, self-score, go over errors, leave with 2 Back to Math texts at their level. By the end of the course, they should complete required exercises in the review book as homework.

Start work in the Back to Math text. (2 hrs.)

Session 2

- I. Review study guide- go over examples, directions in all other sections: Writing Fluency, Reading Accuracy, and Following Directions. (3/4 hr.)
- II. Administer Writing Inventory #1, self-score, go over errors, leave with Write Right text. As homework, they should review sections and chapters covered in class. (1 1/2 hr.)
- III. Math Mini-Lesson: Introduction to operations with fractions in Book II - Back to Math. (3/4 hr.)

Session 3

- I. Math Drill #1: Problems involving whole numbers and fractions.

- II. Math Mini-Lesson: More about operations with fractions in Book II - Back to Math. (3/4 hr.)
- III. Writing Mini-Lesson: Grammatical Guidelines in Write Right, pp. 63-77.
Includes: Agreement of subject and verb
Agreement of subject and pronoun
Parallel construction
Misplaced Modifiers
Dangling Modifiers (1 hr.)
- IV. Reading Accuracy (Vocabulary in Context):
Participants take "Wordbook Preliminary Vocabulary Test" as placement test, self-score, discuss errors, and are introduced to the Wordbook series and to the objectives of this part of the course. Instructor explains that students should complete at least two Wordbook texts at their level as homework by the end of the course.

Discuss "Common Prefixes" and "Common Suffixes", pp. 81-84, in any Workbook.

Discuss "Tips in Making Use of Contextual Cues" (Handout)

Also, as a group review Exercises 1-3 on Contextual Cues (1 1/4 hr.)

Session 4

- I. Math Drill #2: Problems involving whole numbers and fractions.

Complete Math Mini-Lesson: Operations with decimals in Book III - Back to Math (1 hr.)
- II. Writing Drill #1: Problems involving "Grammatical Guidelines" in Write Right, pp. 63-64.

Complete Writing Mini-Lesson: More about "Grammatical Guidelines" in Write Right, pp. 65-76. (1 hr.)
- III. Introduction to Number Groups (1 hr.)

Session 5

- I. Math Drill #3: Problems with whole numbers, fractions, and decimals.
- Complete Math Mini-Lesson: Percents in Book IV - Back to Math (1 1/4 hr.)
- II. Writing Drill #2: Problems involving "Grammatical Guidelines"
- Complete Writing Mini-Lesson: "Style" in Write Right, pp. 79-92. (1 1/4 hr.)
- III. Introduction to Detail Perception (1/2 hr.)

Session 6

- I. Math Drill #4: Problems with whole numbers, fractions, decimals, and percents.
- Administer Math Inventory #2, self-score, review errors, and discuss problems. (1 1/4 hr.)
- II. Writing Drill #3: Problems with style
- Administer Writing Inventory #2, self-score, review errors, and discuss problems. (1 1/4 hr.)
- III. Administer drill on Detail Perception and Number Groups (1/4 hr.)
- IV. Conduct progress check: Discuss course and give participants the opportunity to provide feedback (1/4 hr.)

Session 7

- I. Math Drill #5: Problems with whole numbers, fractions, decimals, and percents.
- Math Mini-Lesson: Discuss number, letters and process of solving for unknowns to simplify algebra in Book V - Back to Math. (1 1/4 hr.)

- II. Writing Drill #4: Problems with punctuation and capitalization.

Writing Mini-Lesson: "Punctuation Pointers" in Write Right, pp. 6-38, and "Capitalization" in Write Right, pp. 44-48.

(1 hr.)

- III. Introduction to Following Directions Exercises

(3/4 hr.)

Session 8

- I. Math Drill #6: Problems with whole numbers, fractions, decimals, percents, and introductory algebra.

Math Mini-Lesson: Introduction to basic geometry including measurements, angles, area, perimeter in Book VI - Back to Math (1 hr.)

- II. Learning Lab: Time for participants to work with the instructor on any area covered to date.

(1 hr.)

- III. Writing Drill #5: All types of problems including grammar, style, punctuation, and capitalization.

Writing Mini-Lesson: "Confused and Abused Words" in Write Right, pp. 93-110. Also, distribute handout "Using the Right Word."

(1 hr.)

Session 9

- I. Math Drill #7: Math Comparisons (1 hr.)

- II. Learning Lab: Time for participants to work with the instructor on any area covered to date.

(1 hr.)

- III. Writing Drill #6: All types of problems including grammar, style, punctuation, and capitalization.

(1 hr.)

Session 10

- I. Administer Math Inventory #3 (1 hr.)
- II. Learning Lab: Time for participants to work with the instructor on any area covered to date. (1/2 hr.)
- III. Administer Writing Inventory #3 (1 hr.)
- IV. Conclusion (1/2 hr.)

References:

Bell Atlantic Corporation. (1989). Back to Math: A quick, thorough mastery of the essentials.
USA: Bell Atlantic Education Services Department.

Bowker, R. (1988). Wordbook. New York, NY: Johnson O'Connor Research Foundation, Inc.

Venolia, J. (1988). Write right! A desktop digest of punctuation, grammar, and style. Berkeley, CA: Ten Speed Press.

Appendix L
Outline for General Test-Taking and
Basic Cognitive Skills Course

COURSE OUTLINE
GENERAL TEST-TAKING AND COGNITIVE SKILLS
12 sessions (3 hours each)

Session 1

- I. Orientation to course
- II. Presentation of instructional approach
 - A. Inventories
 - B. Drills
 - C. Mini-Lessons
 - D. Homework/Self-study
 - E. Learning Labs (1/2 hr.)
- III. Review study guide- go over examples and directions in study guide. (1/2 hr.)
- IV. Begin reviewing information on general test-taking skills. (2 hr.)

Session 2

- I. Continue reviewing general test-taking skills and techniques. (2 hr.)
- II. Administer Math Inventory #1, self-score, go over errors, leave with 2 Back to Math texts at their level. By the end of the course, they should complete required exercises in review book as homework. (1 hr.)

Session 3

- I. Continuation of test-taking skills and techniques. (1 hr.)
- II. Administer Writing Inventory #1, self-score, go over errors, leave with Write Right text. As homework, they should review sections and chapters covered in class. (1 1/4 hr.)
- III. Math Mini-Lesson: Introduction to operations with fractions in Book II - Back to Math. (3/4 hr.)

Session 4

- I. Math Drill #1: Problems involving whole numbers and fractions.
- II. Math Mini-Lesson: More about operations with fractions in Book II - Back to Math. (3/4 hr.)
- III. Writing Mini-Lesson: Grammatical Guidelines in Write Right, pp. 63-77.
- Includes: Agreement of subject and verb
 Agreement of subject and pronoun
 Parallel construction
 Misplaced Modifiers
 Dangling Modifiers (1 hr.)
- IV. Reading Accuracy (Vocabulary in Context): Participants take "Wordbook Preliminary Vocabulary Test" as placement test, self-score, discuss errors, and are introduced to the Wordbook series and to the objectives of this part of the course. Instructor explains that students should complete at least two Wordbook texts at their level as homework by the end of the course.
- Discuss "Common Prefixes" and "Common Suffixes", pp. 81-84, in any Workbook.
- Discuss "Tips in Making Use of Contextual Cues" (Handout)
- Also, as a group review Exercises 1-3 on Contextual Cues. Contextual Clues Exercises 4-7 can be completed as homework or in Learning Labs. (1 1/4 hr.)

Session 5

- I. Math Drill #2: Problems involving whole numbers and fractions.
- Complete Math Mini-Lesson: Operations with decimals in Book III - Back to Math (1 hr.)

- II. Writing Drill #1: Problems involving "Grammatical Guidelines" in Write Right, pp. 63-64.

Complete Writing Mini-Lesson: More about "Grammatical Guidelines" in Write Right, pp. 65-76. (1 hr.)

- III. Introduction to Number Groups (1 hr.)

Session 6

- I. Math Drill #3: Problems with whole numbers, fractions, and decimals.

Complete Math Mini-Lesson: Percents in Book IV - Back to Math (1 1/4 hr.)

- II. Writing Drill #2: Problems involving "Grammatical Guidelines"

Complete Writing Mini-Lesson: "Style" in Write Right, pp. 79-92. (1 1/4 hr.)

- III. Introduction to Detail Perception (1/2 hr.)

Session 7

- I. Administer Math Inventory #2, self-score, review errors, and discuss problems. (1 1/4 hr.)

- II. Administer Writing Inventory #2, self-score, review errors, and discuss problems. (1 1/4 hr.)

- III. Administer drill on Detail Perception and Number Groups (1/4 hr.)

- IV. Conduct progress check: Discuss course and give participants the opportunity to provide feedback (1/4 hr.)

Session 8

- I. Math Drill #4: Problems with whole numbers, fractions, decimals, and percents.

Math Mini-Lesson: Discuss number, letters and process of solving for unknowns to simplify algebra in Book V - Back to Math. (1 1/4 hr.)

- II. Writing Drill #3: Problems with style
 Writing Mini-Lesson: "Punctuation Pointers" in Write Right, pp. 6-38, and "Capitalization" in Write Right, pp. 44-48. (1 hr.)
- III. Introduction to Following Directions Exercises (3/4 hr.)

Session 9

- I. Math Drill #5: Problems with whole numbers, fractions, decimals, percents, and introductory algebra.
 Math Mini-Lesson: Introduction to basic geometry including measurements, angles, area, perimeter in Book VI - Back to Math (1 hr.)
- II. Learning Lab: Time for participants to work with the instructor on any area covered to date. (1 hr.)
- III. Writing Drill #4: Problems with punctuation and capitalization.
 Writing Mini-Lesson: "Confused and Abused Words" in Write Right, pp. 93-110. Also, distribute handout "Using the Right Word." (1 hr.)

Session 10

- I. Math Drill #6: Problems with whole numbers, fractions, decimals, percents, and introductory algebra. (3/4 hr.)
- II. Learning Lab: Time for participants to work with the instructor on any area covered to date. Also, instructors will distribute the Back to Math review book for participants to study and practice exercises. (1 1/2 hr.)
- III. Writing Drill #5: All types of problems including grammar, style, punctuation, and capitalization. (3/4 hr.)

Session 11

- I. Math Drill #7: "Math Comparisons" worksheet
(1/2 hr.)
- II. Learning Lab: Time for participants to work with
the instructor on any area covered to date.
(1 1/2 hr.)
- III. Writing Drill #6: All types of problems covered
to date. (1/2 hr.)

Session 12

- I. Administer Math Inventory #3 (1 hr.)
- II. Administer Writing Inventory #3 (1 hr.)
- III. Conclusion: Review general test-taking
and thinking skills (1 hr.)

References:

- Bell Atlantic Corporation. (1989). Back to Math: A quick, thorough mastery of the essentials.
USA: Bell Atlantic Education Services Department.
- Bowker, R. (1988). Wordbook. New York, NY: Johnson O'Connor Research Foundation, Inc.
- Venolia, J. (1988). Write right! A desktop digest of punctuation, grammar, and style. Berkeley, CA: Ten Speed Press.

Appendix M
General Information Given to All Instructors

NOTES TO INSTRUCTORS

1. On the first night of instruction, present an overview of the course. Participants have already been oriented to the project in a prior orientation session. Most participants have already completed the required questionnaires and have taken the tests.
2. For the data from this investigation to be reliable, courses at all locations should be delivered as consistently as possible. Adhere to the content of this course as indicated by the training manual. Also, adhere to the time limits for the course content sections. Content delivery and methodology are NOT variables to be examined as part of this study.
3. Take attendance at each session by having participants initial the attendance roster for each session attended. Send rosters to the Continuing Education office in your area after the last class of each month. Stress the importance of excellent attendance and punctuality to the course participants. This research can only be successful if each person attends each class.
4. Collect all math and writing inventories when they are completed. Inform participants that they should always indicate incorrect answers with an "X", and they should also indicate their starting level (1-8) and number correct directly on their inventories. Explain to participants that the inventory data is important to the research and that all course data is confidential.
5. Stress the importance of homework, since this course is brief and filled with information. During the last session, participants will be asked to approximate the amount of time they spent on homework each week.
6. Explain to participants that some class time in the middle of the sessions will be allocated to Learning Labs. Explain that Learning Labs provide an excellent opportunity for participants to discuss homework, etc.
7. Occasionally, items may appear on the writing or math inventories which have not been reviewed previously in the workbooks. These instances are opportunities to teach a new concept or idea to the class and should be included in the math and writing mini-lessons.

8. Remind participants that the course will conclude during a separate session in which questionnaires and a selection battery will be administered. Also, they will be asked to evaluate the course.
9. Inform participants that a 10-15 minute break will be included in each session. (Breaks are not indicated on the Course Outline in the training manual.)

THREE VERSIONS OF THE TEST-PREPARATION COURSE

Course #1:

0 hours preparation on cognitive skills
+ 6 hours preparation on general test-taking skills

6 hours (i.e., 2 3-hour sessions)

Course #2:

30 hours preparation on cognitive skills
+ 0 hours preparation on general test-taking skills

30 hours (i.e., 10 3-hour sessions)

Course #3:

30 hours preparation on cognitive skills
+ 6 hours preparation on general test-taking skills

36 hours (i.e., 12 3-hour sessions)

**CONTENT OUTLINE OF TEST-PREPARATION COURSE
THAT INCLUDES BOTH TYPES OF SKILLS**

- 0 **General Test-Taking Techniques**
- 0 **Mathematics**
 (Beginning and Advanced Computations)
- 0 **Writing**
 (Grammar and Usage, Style, Diction, Mechanics)
- 0 **Reading Accuracy**
 (Vocabulary in Context of Sentence)
- 0 **Number Groups**
 (Patterns of Numbers)
- 0 **Following Directions**
 (Written and Oral Directions)
- 0 **Detail Perception**
 (Identifying Similarities and Differences)

INSTRUCTIONAL APPROACH

- 0 Math and Writing Inventories
- 0 Drills
- 0 Mini-Lessons
- 0 Learning Labs
- 0 Homework/Self-Study
 - 0 Back to Math: Participants should study and complete needed exercises and use the review book as homework/self-study.
 - 0 Write Right: Participants should study and review all sections/chapters covered in class as homework/self-study.
 - 0 Wordbook: Participants should complete at least two texts at the levels indicated by the Preliminary Vocabulary test as homework/self-study.

Note: Instructors should explain to participants that homework is required. Because this course is short and filled with important information, they can only be successful if they complete assignments, reading, and review outside of class. They can also use the Learning Labs later in the course for self-study or obtain assistance from their instructor.

Appendix N
Examples of Drills and Exercises Designed
For Participants to Practice
Each Cognitive Skill Area

Writing Drill

Circle the correct choice in each of the following:

1. Relocating and finding a job (is, are) two of the most challenging tasks in life.
2. Sue Sabbat and Lori Nettles (work, works) together well.
3. Each female employee must provide (her, their) own car.
4. Is swimming better exercise than (to run, running)?
5. Either one of these keys on the dining room table (unlock, unlocks) the front door.

Rewrite these sentences to correct grammatical errors:

6. Be sure to purchase enough paint to cover the room before you begin.

7. The evening passed very pleasantly, playing chess and sharing stories about our children.

Insert punctuation marks where needed.

8. My cousins roommate a young man from Atlanta Georgia collects butterflies.
9. Although costs have risen so has productivity therefore we do not plan to raise our prices.

Cross out and place a capital letter over each letter that should be capitalized.

10. clemont daniel of university of baltimore in baltimore maryland gave his farewell address in spanish.
11. his father is recovering from pneumonia at st. john's hospital in tucson, arizona.

Mathematics Drill

Solve these problems in 4 minutes or less.

1. Circle the larger:
(x represents the same number)
a) $x/3$
b) $x/4$
2. $2^2 + 4^3 =$
3. $100 - 10^2 =$
4. Circle the largest:
 $1/200$, 5%, $1/5$, .5%
5. $1\ 1/2\%$ of 180 =
6. Circle the largest:
 $3/4\%$, $3/4$, .75%
7. $\frac{1/3 \times 10}{8 + 1/4} =$
8. Find the value of ab^2 , if $a=3$ and $b=-11$
9. Find the value of $x - xy$, if $x=10$ and $y=90$
10. Find the value of x , if $3x-5=20$
11. Circle the larger:
a) The value of x if $x-17=34$
b) The value of x if $x+17=34$
12. The percent of increase from 3 to 4 is?

Reading Accuracy Exercise

The purpose of this exercise is to provide practice in choosing the word that best fits the meaning of the sentence which it completes. You will have to search for contextual clues and may have to try each word choice before choosing the one which best completes the sentence.

1. Girl Scouts learn dozens of _____ and exciting skills, from cooking a meal to sailing a boat.
a. useless b. scholarly c. worthwhile

2. Many people believe it is the responsibility of the schools to _____ our children for situations they will have to cope with later in life.
a. detain b. educate c. restrain

3. Even though the store manager's tone of voice was polite, the customer found the overall affect of his words to be _____.
a. aggrandizing b. antagonistic c. antidotal

4. The new boundaries were conveniently regular and linear; they were obviously determined by legislation without reference to _____ features of the land.
a. geographical b. geological c. governmental

5. Individuals who contract a contagious disease after casual _____ to it are said to have low resistance.
a. exposure b. acquaintance c. appeal

6. All the stars in a galaxy _____ in circular orbits around a galactic center.
a. rotate b. descend c. disappear

Following Directions Exercise

Instruct students to use the following lined page as their answer sheet. Then, without any additional explanation, read the following test instructions. Be sure not to repeat any directions.

"You will hear the directions and questions only once. Follow each direction carefully and promptly in order to avoid confusion. Do not mark your paper until you are instructed to do so."

1. Write your full name, last name first, on the first line next to the left margin.
2. Write the date using the name of the month on the top line at the right side of the paper.
3. Answer the following questions beginning on the fourth line down, using a separate line for each answer. Do not skip lines.
 - a. Write the name of the day before yesterday.
 - b. Write the letters that are omitted in this reading of the alphabet: a, b, d, f, g, h, j, k, l, m, r, s, t, v, w, z.
 - c. Write the numbers 4, 2, 6, 5, 3 and circle the smallest.
 - d. If $3 \times 3 = 6$, draw a circle; if not, draw a triangle.
 - e. Of the two words 'company' and 'man', write the longer.
 - f. Write the sum of 3, 1, 5, 4, and 10.
 - g. If Washington was not the first President of the United States, write the shorter of the words 'red' and 'green'; if he was, write the word 'blue'.

Detail Perception Drill

Each problem contains four parts marked a, b, c, and d. Three of the pairs have identical parts. In the next 90 seconds, mark the letter of the pair which is slightly different.

- | | | | |
|----|-----|-------------------|-------------------|
| 1. | (a) | 1100 June Rd. | 1100 June Rd. |
| | (b) | 809 Elm Ave. | 809 Elm Ave. |
| | (c) | 1920 Fair St. | 1920 Fair St. |
| | (d) | 1416 East St. | 1614 East St. |
| 2. | (a) | 213-80-8742 | 213-80-8742 |
| | (b) | 975-16-4431 | 975-16-4431 |
| | (c) | 006-92-8808 | 006-92-8880 |
| | (d) | 141-83-9880 | 141-83-9880 |
| 3. | (a) | H. I. Long | H. I. Long |
| | (b) | K. B. Rodgers | K. B. Rogers |
| | (c) | W. A. Roper | W. A. Roper |
| | (d) | C. A. Aunt | C. A. Aunt |
| 4. | (a) | 622 Appletree Ct. | 622 Appletree Ct. |
| | (b) | 233 Bluebird Ct. | 233 Bluebird Ct. |
| | (c) | 555 May Ave. | 555 May Ave. |
| | (d) | 461 First Ave. | 461 Furst Ave. |
| 5. | (a) | 32004XVTUY | 32004XVTUY |
| | (b) | 89ABD89ABD | 89ABD89ABD |
| | (c) | 566650089L | 566560089L |
| | (d) | MNOQZ12468 | MNOQZ12468 |

Appendix O

Example of an Informed Consent Form

TEST-PREPARATION STUDY

PURPOSE OF THE STUDY: to evaluate a new test-preparation course to determine what kinds of educational interventions can help associates improve their test performance. The test-preparation course is designed to provide instruction on general test-taking skills, to familiarize you with the testing environment, and/or to provide exercises that teach you basic cognitive skills needed to qualify on one of the Human Resource Assessment tests.

PARTICIPATION CRITERIA

The entire project will require your participation in 14 sessions that will meet 2 nights per week, for a total of 7 weeks. Each class will last approximately 2 1/2 to 3 hours. During this time, you will be asked to complete a few questionnaires related to your background and your motivations and attitude toward taking tests. Also, you will take one or two forms of a selection battery, and are expected to participate fully in the instructional materials.

Please read the following:

- You must attend the first and last classes in which the tests will be given AND attend at least 80% of the course classes (i.e., at least 10 of the 12) in order to have your test scores count. This requirement is to ensure that you receive the maximum benefit from the course material. No make-up tests or course classes will be given.
- If you pass the test either time it is administered, your test scores will count and be logged into the management test tracking system.
- Test scores will be sent to the employment office, only with your consent.
- If you do not qualify on either administration of the test, your test scores will not be logged into the tracking system and you must wait 6 months to retake the test after the completion of the project.
- You will be notified of your performance level on both administrations of the test via letter only after the second test is taken.
- Feedback on the progression of your skill development will be given throughout the course.
- You must also qualify on the remaining Human Resource Assessment test in order to become eligible to enter the Management Development Program. The remaining test will not be administered as part of this project.
- Except for test data relevant to the HRA process, all information that you provide is confidential.
- All results of this project will be reported in group form. No individuals will be identified.

TEST-PREPARATION STUDY (CONTINUED)

PLEASE ASK QUESTIONS REGARDING THESE CRITERIA AT THIS TIME.

NAME: _____

SOCIAL SECURITY NUMBER: _____

JOB TITLE: _____

PHONE NUMBER: () _____

WORK ADDRESS: _____

LOCATION OF COURSE: _____

LENGTH OF COURSE (CIRCLE ONE):

2 weeks

6 weeks

7 weeks

DAYS ON WHICH THE CLASS WILL MEET (CIRCLE TWO):

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

I acknowledge that I received the criteria for participation in the project for evaluating a new Test-Preparation course. I have been provided an opportunity to read the information and ask questions regarding these criteria. My participation is completely voluntary.

Date

Signature