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BERGER, Vincent F., 1943-
THE EFFECTS OF ITEM DIFFICULTY SEQUENCE,
ANXIETY REACTION TYPE, AND TEST SETTING
ON APTITUDE TEST PERFORMANCE.

The University of Oklahoma, Ph.D., 1968
Education, psychology

University Microfilms, Inc., Ann Arbor, Michigan

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE EFFECTS OF ITEM DIFFICULTY SEQUENCE, ANXIETY
REACTION TYPE, AND TEST SETTING ON
APTITUDE TEST PERFORMANCE

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

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Norman, Oklahoma

1968

THE EFFECTS OF ITEM DIFFICULTY SEQUENCE, ANXIETY
REACTION TYPE, AND TEST SETTING ON
APTITUDE TEST PERFORMANCE

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ACKNOWLEDGEMENTS

The author wishes to thank each of his committee members for their patient guidance and prudent advice.

Special thanks go to Dr. Henry Angelino, major professor and committee chairman, for his continual guidance, support, and encouragement throughout the period of the doctoral program.

Special thanks also go to David C. Munz, whose suggestions were invaluable to the development of this dissertation.

Finally, I wish to thank all of my students. The knowledge gained and excitement generated from my interaction with them contributed infinitely to my graduate program.

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THE EFFECTS OF ITEM DIFFICULTY SEQUENCE, ANXIETY
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CHAPTER I

INTRODUCTION

For years authors writing in the field of test construction have consistently stated, with little or no empirical evidence, that test items should be arranged in order of increasing difficulty; that is, with the easiest items first, followed by progressively more difficult items (for example see Green & Jorgensen, 1939; Remmers & Gage, 1943; Conrad, 1951; Jordon, 1953). Numerous logical arguments have been advocated for and against such a practice.

Lund (1953) summarized the various logical arguments for arranging test items in an order of increasing difficulty into the following five major arguments:

1. Difficult items early in the test disrupt the intellectual functioning of the subject.

2. Encountering difficult items early in testing is likely to result in an unwise use of time and to thereby lower the performance score.

3. The less able subject is unable to cope with the items and will be discouraged. This reasoning implies that this principle applies only to low ability subjects.

4. Normal arrangement of items is necessary to encourage naive subjects but that sophisticated subjects would not be disconcerted by other arrangements.

5. The overall morale or motivation level of the subjects would be adversely affected by encountering difficult items early in the testing (Lund, 1953, pp. 7-8).

Considering these arguments, it appears that test constructors believe that arranging items in a sequence from easy-to-hard will eliminate numerous adverse response sets which other item sequences (such as hard-to-easy or random) would establish. Some authors feel that students who receive easier items early in the test adapt more rapidly to their test-taking anxiety, thereby increasing their performance, than if the items were ordered in a hard-to-easy sequence. Furthermore, it was thought that an easy-to-hard sequence of items would increase motivation. It has also been suggested that a hard-to-easy sequence produces lower performance scores due to the disruptive effect of encountering difficult items early in the test.

Although this test construction procedure (sequencing easy-to-hard) has been widely utilized on the basis of these above mentioned logical arguments, there has been, until recently, little empirical evidence for any theoretical argument and even less evidence for the practice itself.

Lund (1953), testing two matched groups of 90 subjects each (selected from the freshman class at a junior college), used two forms of the Henmon-Nelson Tests of Mental Ability Form B for High School and College Students to investigate the effects of different item sequences on test performance. One form contained 72 of the original items arranged in the conventional easy-to-hard order; the second form contained the most difficult 25 per cent of the items first, with the remaining 75 per cent in the conventional arrangement. The results indicated that changing the item sequencing to the hard-to-conventional sequence resulted in a significant lowering of performance scores. The interpretation given by Lund was that although subjects who encountered difficult items early in the test did not have their ability to answer easy items significantly affected, the experience of failure early in the test did result in a lowered motivational level to confront subsequent difficult items, and this in turn resulted in a significant lowering of their performance scores. On the basis of his study, Lund rejected the first four reasons (expressed earlier) for using the increasing difficulty sequencing, but accepted the fifth (i.e., due to changes in the subject's level of motivation) and concluded that easy-to-hard arrangement should continue to be used.

Sax and Carr (1962) pointed out two of the ways (methods) in which items on an achievement or aptitude

test can be arranged. The first method consists of grouping all of the items measuring the same subject matter together to form separate subtests; the second method is the spiral-omnibus form of organization where different types of items are intermixed and placed in ascending order of difficulty (this is the type of easy-to-hard arrangement found in the Henmon-Nelson Test mentioned above in Lund's 1953 study). The authors stated that increasingly, but without empirical justification, publishers of intelligence and aptitude tests have been employing this spiral-omnibus arrangement in preference to using separate subtests (Sax & Carr, 1962, p. 371). While there have been a number of logical arguments for and against the use of the spiral-omnibus arrangement (Findley & Scates, 1946; Bradfield & Morlcork, 1957), Sax and Carr (1962) were the first to justify empirically its superiority over the subtest method. They administered forms A and B of the Henmon-Nelson Tests of Mental Ability for College Students to 335 freshmen enrolled in an introductory education course. One form consisted of items left in the spiral-omnibus arrangement, i.e., mixed in regard to content and placed in an easy-to-hard fashion (this is the normal form of the Henmon-Nelson Test); the second form was developed by reorganizing the original items into three separate subtests -- vocabulary, mathematics, and spacial relationships. The findings of their study led the authors to hypothesize that:

...the presence of increasingly complex items in a subtest tends to discourage students from responding to the more difficult items, and conversely, the presence of different types of questions may provide some partial reinforcement and motivation to continue if the subject is able to respond correctly, let us say, to a vocabulary item rather than having to face the prospect of additional mathematics items when he has already had difficulty with a number of them (Sax & Carr, 1962, p. 374).

From their findings, the authors concluded that: "Inasmuch as subjects attempted significantly more items and obtained significantly more items and obtained significantly higher scores on the spiral-omnibus form than on the subtest form, evidence indicating the presence of a response set dependent upon test format and form of item presentation was indicated" (Sax & Carr, 1962, p. 375). Thus, although not dealing directly with the problem of item sequencing, Sax and Carr's (1962) results strongly suggest a superiority of the spiral-omnibus (easy-to-hard sequencing) form in aptitude testing.

In a more recent study, Brenner (1964), in a series of four experiments, investigated the effects of different item-difficulty orders on achievement test scores. His major item-difficulty orders were: (a) easy-to-hard arrangement where the items were arranged in an increasing order of difficulty; (b) hard-to-easy arrangement in which the items were arranged in a decreasing order of difficulty; and (c) random arrangement of items. Brenner did not find a significant item arrangement effect, and he concluded that item difficulty order on a power test of facts and principles given in the normal college classroom does not affect the difficulty level of the test.

One of the major problems with the existing empirical investigations of item sequencing effects is that, in general, they have not attempted to explore two of the major arguments (as stated earlier) used to support easy-to-hard sequencing -- one argument stating that students who receive easier items early in the test would adapt more rapidly to their test taking anxiety; and the second argument contending that a hard-to-easy sequence would produce lower performance scores due to the disruptive effects of encountering difficult items early in the test. In a well-controlled study, Smouse and Munz (1968) attempted not only to clear up the inconsistencies found in the earlier studies, but also attempted to test the two major arguments mentioned above. They attempted to evaluate the effect of three item difficulty orders (easy-to-hard, hard-to-easy, and random) on achievement performance scores in the classroom; the three item difficulty orders were designed and administered in such a way as to detect and assess the possible disruptive and/or adaptive effects on test performance. The authors concluded:

...this research does not support the hypothesis that there is an item difficulty sequence effect generally operating on the scores of power achievement tests typically found in the classroom. Further, within the limits of this study, it can be concluded that the two major arguments for arranging test items in an easy-to-hard sequence are not valid in any general way (Smouse & Munz, 1968, p. 183).

Such findings were surprising in view of the fairly consistent expectations to the contrary. However, in attempting to

explain their results, the authors suggested that: "If it can be assumed that test-taking anxiety underlies an existing sequence effect, whatever its form, then a very high initial [level of] anxiety would have overshadowed differences in test performance due to the relatively small amounts of anxiety differentially generated by the various item difficulty orders" (Smouse & Munz, 1968, p. 183). The authors continued to speculate about their findings and stated that:

Another possible approach to the assessment of sequence effects would be the investigation of individual reactions to test-taking anxiety which would have been masked by the group measures used in this study. Such differential reactions might well interact with item difficulty sequence...(Smouse & Munz, 1968, p. 183).

Pursuing the above approach in another study, Munz and Smouse (1968) pointed out that there is an abundance of literature on personality factors which might influence test-taking behavior -- one such factor being differential individual reactions to test-taking anxiety. Taking into consideration one of the major arguments supporting the arrangement of test items in an easy-to-hard (E-H) sequence [i.e., that this arrangement decreases test-taking anxiety (thereby facilitating performance), while random (R) arrangement does not influence test performance, and hard-to-easy (H-E) sequencing depresses performance by increasing test-taking anxiety], these authors investigated the possibility that item difficulty arrangement does indeed significantly affect performance scores, but only by interacting with test-taking

personality factors. As item difficulty arrangements, the authors used the same sequencing as their earlier study (Smouse & Munz, 1968) -- i.e., E-H, H-E, and R. To identify their personality types Munz and Smouse (1968) used the Achievement Anxiety Test (AAT) developed by Alpert and Haber (1960). Analysis of data, using a 3x4 (item sequence/reaction type) analysis of variance design, yielded findings that supported their first three hypotheses, namely: (1) there was no significant item sequencing effect upon performance score [this was not only consistent with their earlier study (Smouse & Munz, 1968), but also supported the findings of Brenner (1964)]; (2) differential reactions to test-taking anxiety, as measured by the AAT, did significantly affect performance scores; and (3) item difficulty sequence (E-H, H-E, R) and achievement anxiety reaction types (facilitators, debilitators, non-affecteds, and high-affecteds) did interact to produce a significant effect on performance scores.

Because these authors found interactions other than in the predicted directions, they attempted (on an a posteriori basis) to explain these and other findings on the basis of two assumptions: the first involved the inverted U hypothesis, and the second dealt with the relative arousal potentials of the three item difficulty forms. Reviewing the inverted U hypothesis, it states that: "...behavioral efficiency varies as a curvi-linear function of what has variously been called

'arousal' (Malmo, 1959), 'drive level' (Easterbrook, 1959), and 'activation level' (Fiske & Maddi, 1961)' (Munz & Smouse, 1968). This function, which is shaped roughly like an inverted U, implies that there is a degree of arousal which is optimal for performance of a given task; if an individual is functioning at a "drive level" which is greater or less than this optimum, then performance on that task is impaired. Munz and Smouse's (1968) second assumption was that each of the item arrangements produces a different degree of arousal -- the random order producing the least arousal, the H-E order the most arousal, and the E-H order producing a degree of arousal falling between these two. By combining these two assumptions the authors were able to explain eleven of their twelve results (see Munz & Smouse, 1968). Munz and Smouse (1968) concluded that the standard test construction practice of arranging test items in an order of increasing difficulty cannot be justified from the argument that an E-H item sequence produces higher performance scores than a H-E or R arrangement. In fact, from their data, these authors suggest that: "...the H-E sequence provides least variance attributable to personality factors and should be used when one is attempting to assess only academic achievement" (Munz & Smouse, 1968).

The present study is an attempt not only to clarify and extend the findings of Munz and Smouse (1968), but also represents an attempt to clarify the inconsistent evidence

concerning the effects of item sequencing. This inconsistency arises from the fact that Lund (1953) and, less directly, Sax and Carr (1962) both found the existence of an item sequence effect and concluded that the E-H item sequence should continue to be used in preference to other sequences; while Brenner (1964), Smouse and Munz (1968), and Munz and Smouse (1968) all found that item sequencing, based on the assumption that this form leads to high test performance, is not justified.

Examination of the above studies reveals (1) the type of tests used (aptitude or achievement), and (2) type of setting the tests were administered in ("laboratory" or "field" -- these are described below), to be possible sources of the apparent contradiction. The present author describes a "laboratory" setting as a setting that is created by the experimenter, while a "field" setting may be described as the reverse -- a setting that is natural rather than created. An analogy might be drawn to an experimenter who brings subjects into his laboratory or into what is obviously an experimental situation; these subjects know something is going to happen, that is, that the experimenter is going to create some situation. On the other hand, if this experimenter goes out into the natural setting (field) to test his subjects, then their behavior is occurring under natural rather than what appears then to be a created situation (regardless of whether it is actually created or not, the subjects believe

it is a natural setting). More specifically, if a subject is given an aptitude or achievement test and he believes that these will be used, respectively, to predict his future academic success and to determine his grade or degree of success in a specific area, then he is in a "field" situation; but, if he believes that the results of these aptitude and achievement tests are not going to be used as expressed above, but rather are being used for research or some other purpose, then he is in a "laboratory" situation.

Looking more closely at the inconsistent evidence regarding item sequencing, both Lund (1953) and Sax and Carr (1962) used aptitude tests rather than achievement tests. Although Sax and Carr (1962) did not give enough information in their study to determine unquestionably whether they used a laboratory or field setting, the fact that they lengthened the time limit suggests they had a laboratory setting. Lund (1953) obviously had a laboratory setting: "There were no disruptive tensions such as would be characteristic of tests to select students for admission to college or requirements for any particular curriculum. Rather, emphasis was given to the self-understanding phase of the guidance program" (Lund, 1953, pp. 12-13). On the other hand, Brenner (1964), Smouse and Munz (1968), and Munz and Smouse (1968) all used achievement rather than aptitude tests, and used them in what was obviously a field setting since these tests were given as "midterm" and "final" exams and were used to

determine each subject's grade. Thus we observe that aptitude tests given in a laboratory setting (Lund, 1953; Sax & Carr, 1962) resulted in finding a significant item sequence difference, while achievement tests given in a field setting (Brenner, 1964; Smouse & Munz, 1968; Munz & Smouse, 1968) did not result in finding any item sequence differences. Thus, it seems that the conflicting findings on item sequencing might be explained by the differences between aptitude and achievement tests on one hand and laboratory and field settings on the other; therefore, the problem arises as to which variable, test type or test setting, might account for this difference.

Statement of the Problem

This study attempted not only to clarify the inconsistent evidence concerning the effects of item sequencing, but also represented an attempt to clarify and extend the findings of Munz and Smouse (1968). More specifically, one of the purposes of the present study was to answer the question concerning which variable, test type or test setting, might account for the inconsistent findings concerning item sequencing effects; a second purpose was to extend Munz and Smouse's (1968) findings to aptitude tests.

The present study was concerned with giving an aptitude test (The Henmon-Nelson Test of Mental Ability, Revised

Edition, grades 9-12) under both field and laboratory settings, taking into consideration not only item sequencing (E-H, H-E, R), but also different reactions to the test-taking situation (i.e., facilitators, debilitators, non-affecteds, and high-affecteds, as measured by the Achievement Anxiety Test).

If the lack of agreement concerning the effects of item sequencing found in the earlier studies is due to a difference in field and laboratory settings, then one would expect to find a significant item sequence effect in the laboratory setting [thus supporting Lund (1953) and Sax and Carr (1962)], but not in the field setting [thus supporting Brenner (1964), Smouse and Munz (1968), and Munz and Smouse (1968)] (see Hypothesis 1, 1A, and 1B below). In addition, a more general difference between field and laboratory settings might express itself in another way. The subjects in the laboratory setting (cognizant of the experimental situation) might be relatively uninvolved with the task, while the field subjects would be more highly involved since they think the outcome will reflect their ability; this might result in significantly different overall aptitude test scores for the laboratory group when compared to the field group (see Wrightsman, 1962). This would indicate a difference between field and laboratory settings in general.

Now, if these inconsistent results of earlier studies are due to the difference between aptitude and achievement tests (rather than to differences in field and laboratory

settings), then it would be expected than an item sequence effect might be found in both the field and laboratory settings since both represent an aptitude test situation [thus partially supporting the studies of Lund (1953) and Sax and Carr (1962)].

Furthermore, if Munz and Smouse's (1968) findings can be generalized to aptitude testing, we would expect to find a significant effect of test-taking anxiety types upon aptitude test performance (see hypotheses 2A and 2B below). Extending their findings even further, we would expect to find anxiety types interacting with item sequencing to produce significant differences in performance on the aptitude test (see Hypotheses 2C, $2C_1$, $2C_2$, $2C_3$, and 2D below).

The Hypotheses

In the present experiment it is specifically hypothesized that:

Hypothesis 1. There is a significant interaction between item sequencing and test setting (i.e., laboratory vs. field). This hypothesis (including the two sub-hypotheses below) is based on the assumption that the earlier inconsistent findings concerning the effects of item sequencing were due to differences in the test setting rather than the test type.

Hypothesis 1A. Within the laboratory setting there is a significant difference in test performance of the

different item sequences; more specifically, the H-E sequence will produce significantly poorer performance scores than the E-H or R forms. This finding would serve as support for the studies of Lund (1953) and Sax and Carr (1962).

Hypothesis 1B. Within the field setting there are no significant differences in the test performance scores of the different item sequences. This finding would serve as support for the studies of Brenner (1964), Smouse and Munz (1968), and Munz and Smouse (1968).

Hypothesis 2. There is a significant 3-way interaction between anxiety types, item sequencing, and test setting (i.e., laboratory vs. field) as they affect aptitude test scores.

Hypothesis 2A. In the field setting, differential reactions to test-taking anxiety, as measured by the AAT, significantly affect performance scores; more specifically, the facilitators should score significantly higher than either the debilitators or the non-affecteds. This hypothesis is based on the assumption that Munz and Smouse's (1968) findings can be generalized to aptitude testing.

Hypothesis 2B. In the laboratory setting, differences in performance scores due to anxiety reaction types will be looked for, although no specific predictions are made. This part of the present study is exploratory in nature since no earlier study can be used as a source for prediction.

Hypothesis 2C. In the field setting, item sequencing (E-H, H-E, R) and anxiety reaction types (F, D, NA, HA) interact to produce a significant effect on performance scores. This hypothesis (including the three sub-hypotheses below) is also based on an extension of Munz and Smouse's (1968) findings to aptitude testing.

Hypothesis $2C_1$. On the R form, F and HA should have significantly higher aptitude test performance scores than the D or NA.

Hypothesis $2C_2$. On the E-H form, F should score significantly higher than the other three anxiety types.

Hypothesis $2C_3$. On the H-E form, there should be no significant difference among reaction types.

Hypothesis 2D. In the laboratory setting, item sequence and anxiety types interact to produce a significant effect on performance scores (this part of the study is more exploratory than predictive in nature; thus, although the above interaction is predicted, the direction is not stated).

CHAPTER II

METHOD

Subjects

The original pool of subjects consisted of approximately 450 Oklahoma high school seniors.¹ Those subjects who failed to complete all experimental treatments were eliminated from the study, thus reducing the subjects to 346. By a predetermined method (see Procedure section below) the number of subjects was reduced still further to 330 and finally to 240.

Materials

The AAT (Alpert & Haber, 1960) was designed as a self-report measure of the effects of anxiety experienced in test-taking situations. This instrument (see Appendix B) is based on a bi-dimensional construct of anxiety which may have both facilitating and debilitating effects on academic performance -- for some individuals, an anxiety-provoking

¹The author wishes to express his appreciation to the school officials of Carl Albert Jr. and Sr. High School, Del City High School, and Midwest City High School for their cooperation and assistance.

situation such as a college examination will facilitate their performance, while it might depress performance for others. Further, there are individuals whose test performance is not affected by anxiety-provoking situations. Accordingly, the AAT distinguishes different degrees of anxiety that are reported by the test-taker as either facilitating or debilitating to test performance. Each anxiety type is measured by a separate subtest of items: a facilitating scale of nine items, and a debilitating scale of ten items. The test-retest reliabilities for a 10-week interval were .83 and .87 respectively; while the test-retest reliabilities over an 8-month period were .75 for the facilitating scale and .76 for the debilitating scale (Alpert & Haber, 1960).

The second independent variable consisted of three forms of an academic aptitude test; each form consisted of the same 90 multiple-choice items (five alternatives) and differed only in the order of item sequencing (to be explained below). These 90 items were those comprising the Henmon-Nelson Test of Mental Ability, Revised Edition, grades 9-12.²

The Henmon-Nelson Test is composed of 90 items arranged in order of increasing difficulty without regard to the exact character of the items (including items dealing with vocabulary, sentence completion, work classification,

²This author also expresses his appreciation to Houghton-Mifflin Company for their permission to use and alter the Henmon-Nelson Test of Mental Ability.

proverbs, analogies, math reasoning, etc.). Although the present study did not use the Henmon-Nelson Test as a predictor of success, it is still worthy to note that the test has been shown to be both reliable (between the high .80's and .90's) and valid -- congruent validity (validity indicated by comparison with other tests of mental ability) varies from .50 to .84 with the median .76 (see Buros, 1953; Buros, 1959).

Remembering that the Henmon-Nelson items are arranged in increasing order of difficulty, the three item sequence forms used in the present study were constructed in the following way:

- (1) E-H form. The easy-to-hard form consisted of the 90 items arranged in order of increasing difficulty; this is the order used in the Henmon-Nelson test itself (see Appendix G).
- (2) H-E form. The hard-to-easy form consisted of the same 90 items arranged in order of decreasing difficulty; this is a complete reversal of the E-H form (see Appendix H).
- (3) R form. The random form (see Appendix I) was also composed of these 90 items, but they were arranged in a random fashion (see Stilson, 1966, p. 473).

These forms were constructed by cutting and pasting the original test items to form the appropriate item sequences; these were then photocopied and run on a multilith press. This was done (rather than some other process such as mimeographing) in order to create the impression of an "officially" printed test.

Although the time limit on the Henmon-Nelson Test is 30 minutes, in the present study this was extended to 45 minutes. This was done to assure that a student would have sufficient time to finish the test regardless of the form (E-H, H-E, R). Maintaining this time limit also helped create a setting that closely approximates most aptitude test situations. [Careful observation during the actual testing revealed that over 98 per cent of the subjects finished the test by the end of the 45 minute period.]

The third independent variable -- field versus laboratory situation -- is discussed in the Procedure section below.

Pre-experimental Procedure

Approximately two weeks prior to the actual experimental procedure, the AAT was given to all seniors. This was given in the classroom and administered by the regular teacher. In order to avoid the tendency of the students to give "socially acceptable" responses in answering the AAT items, while also taking into consideration the findings of Davids (1955) that scores on anxiety scales are affected by the subjects' particular motivation for filling out anxiety questionnaires, the teachers were asked to read a set of instructions that emphasized the questionnaire was "part of a research project" and "would not be used in any way to evaluate the students themselves" (see Appendix A).

Also prior to the actual experimental procedure, it was necessary to arrange for the assignment of seniors to one of the two testing situations, hereafter referred to as the "field" group and the "laboratory" group. Both groups received the same test forms, but received them under different instructions.

The ideal situation would have been for all seniors in the school to be equally divided and assigned to one of two large testing stations (for example the cafeteria and auditorium or library) so that the two groups could be tested simultaneously. However, school administration policies and school facilities made this "ideal" impossible. Since no one school with a large enough senior class would allow the entire class to be tested, it was necessary to test at three schools in order to get a large enough sample size.

At Carl Albert Jr. and Sr. High School, the entire senior class (127) was tested during the first period -- approximately half of the students were tested in the library, the other half were tested in the cafeteria.

At Del City High School, the two third period English classes were tested first (field setting) followed by the two fourth period English classes (laboratory setting) -- giving a sample of 122.

At Midwest City High School, the two first period psychology classes were tested first (field setting)

followed by the two second period psychology classes (laboratory setting) -- giving a sample of 189.

The total sample used in this study was thus determined in part by administrative demands and therefore was not randomly selected. However, the student body of all three schools have approximately the same socio-economic make-ups, and have similar proportions of college and non-college preparatory students. In addition, the classes selected at Del City and Midwest City High Schools consisted of a cross-section of the student body.

Procedure

As the students for both the "field" and "laboratory" groups entered their respective testing rooms, a school official told them to quietly be seated. The procedure and directions now varied depending on the group. In the "field" group the instructions and setting were constructed in such a way that the students would believe they were in an actual aptitude test setting. This corresponds to a "field" setting since it is meant to parallel those conditions found in the actual aptitude test situation. In the "laboratory" group the instructions and setting were constructed so that the students would believe they were in a research setting. This corresponds to a "laboratory" setting since it approximates experimental situations created in a laboratory as opposed to an actual or field setting.

The instructions for each group were read and the actual testing was conducted (see Appendices C and D).

After the data had been collected and scored, it was subjected to a $3 \times 4 \times 2$ way analysis of variance -- i.e., 3 items sequences (E-H, H-E, R) by 4 personality types [facilitators (F), debilitators (D), high-affecteds (HA), non-affecteds (NA)] by 2 settings (field and laboratory).

The assignment of students to the field and laboratory groups has already been discussed. However, it should be noted that at both Midwest City and Del City High Schools the laboratory setting was conducted after the field setting (as opposed to the reverse order of presentation). This was done in an attempt to prevent experimental contamination of the field group; that is, if any student in the field group heard about the "research project" being conducted in the laboratory setting, this might obviate the field setting instructions. However, if any laboratory group student heard about the testing conducted earlier, this would likely have no effect on the experimental setting.

Within each setting (field and laboratory), the three sequence forms were randomly distributed (see Appendices C and D).

The 4 achievement anxiety types were constructed by selecting subjects from each item arrangement group (that is, from the E-H, H-E, and R groups for both the field and laboratory groups -- thus forming 6 groups). A facilitating

(AAT+) score and a debilitating score (AAT-) were obtained on each subject. Then each subject's AAT- score was subtracted from his AAT+ score; a positive difference indicated a relatively high AAT+ and a negative difference indicated a relatively high AAT-. When these differences were ranked, the top 10 subjects in the distribution were defined as facilitators and the bottom 10 were defined as debilitators. For all remaining subjects the two scores were summed (absolute sum) and ranked. The top 10 subjects in the resulting distribution were defined as high affecteds while the bottom 10 were defined as non-affecteds. The remaining subjects were discarded from the final analysis. Since this was done for each of the 6 item sequence groups (there were 40 subjects within each of these groups), this led to the final 240 subjects used in the major analysis.

In order to control for the possibility of differential ranges of personality types within each of the 6 item arrangement groups above (E-H, H-E, and R for the field group and E-H, H-E, and R for the laboratory group), the number of subjects within each of the 6 groups was originally randomly reduced to 55. Then (for each group) the 10 F's, 10 D's, 10 HA's, and 10 NA's were selected, thus leaving 15 subjects within each group to be discarded (see Appendix K for raw data).

CHAPTER III

RESULTS

The dependent measure analyzed in the present study was the aptitude test score obtained by each subject on the Henmon-Nelson Test of Mental Ability. These aptitude test data were subjected to a $3 \times 4 \times 2$ way analysis of variance -- i.e., 3 item sequences by 4 personality (anxiety) types by 2 test settings.

Table 1 presents the analysis of variance results along with the simple effects analysis (see Appendix J for the means and standard deviations of all cells). Although the analysis revealed no statistically significant differences among the three item sequences ($F=.03$, $df=2/216$, $p > .05$) or between the two test settings ($F=.98$, $df=1/216$, $p > .05$), a significant effect of personality types on performance scores was found ($F=15.17$, $df=3/216$, $p < .01$). Probing with the Newman-Keuls Test (see Winer, 1962, pp. 77-85) revealed that (see Table 2): (1) facilitators scored significantly higher than debilitators ($p < .01$), high-affecteds ($p < .01$), and non-affecteds ($p < .05$); and (2) non-affecteds scored significantly higher than both debilitators ($p < .01$) and high-affecteds ($p < .05$).

Table 1

Analysis of Variance Summary Table of Performance Scores as a Function of Test Setting, Personality Type, and Item Sequence

Source of Variation	df	MS	F	p
A (Item Sequence)	2	3	.03	NS*
B (Personality Type)	3	1244	15.17	p < .01
C (Test Setting)	1	81	.98	NS
A X B	6	24	.29	NS
A X C	2	43	.52	NS
A for C ₁ (Field Setting)	2	23.5	.29	NS
A for C ₂ (Lab Setting)	2	22.5	.27	NS
B X C	3	64	.78	NS
B for C ₁ (Field Setting)	3	443	5.40	p < .01
B for C ₂ (Lab Setting)	3	866	10.56	p < .01
A X B X C	6	135	1.64	NS
AB for C ₁ (Field Setting)	6	80	.97	NS
AB for C ₂ (Lab Setting)	6	80.2	.98	NS
Error	216	82	-	-
Total	239	-	-	-

* NS = not significant at the .05 level

Table 2

Newman-Keuls Test on All Ordered Pairs of Totals for B Main Effect

Order	1	2	3	4
Treatment Totals..	3619 (Debilitators)	3803 (High-Affecteds)	4018 (Non-Affecteds)	4252 (Facilitators)
1 3619	-	184	399**	633**
2 3803		-	215*	449**
3 4018			-	234*
4 4252				-
Truncated range r.....		2	3	4
q.95(r,216).....		2.77	3.31	3.63
q.99(r,216).....		3.64	4.12	4.40
q.95(r,216) $\sqrt{nMS_{error}}$ ***...		194	232	255
q.99(r,216) $\sqrt{nMS_{error}}$		255	289	309

* = significant at the .05 level

** = significant at the .01 level

***n= 60; MS_{error} = 82

In Table 1, neither the three 2-way interactions nor the one 3-way interaction was significant at the .05 level; however, since specific a priori hypotheses were made, simple effects were calculated for the AxC, BxC, and AxBxC interactions. Only under the BxC interaction were significant simple main effects found -- B for C_1 yielded an $F=5.40$ ($df=3/216$, $p<.01$), and B for C_2 yielded an $F=10.56$ ($df=3/216$, $p<.01$). Probing again with the Newman-Keuls Test (NKT) revealed that: (1) under the B for C_1 simple main effect, facilitators scored significantly higher than both debilitators ($p<.01$) and high-affecteds ($p<.01$); and (2) under the B for C_2 simple main effect, not only did facilitators again score significantly higher than debilitators ($p<.01$) and high-affecteds ($p<.01$), but in addition, both the high-affecteds ($p<.05$) and non-affecteds ($p<.01$) also scored significantly higher than the debilitators.

In the present study it was specifically hypothesized that:

Hypothesis 1. There would be a significant interaction between item sequencing and test setting. Since the AxC interaction (see Table 1) was not significant ($F=.52$, $df=2/216$, $p>.05$) this hypothesis was not supported.

Hypothesis 1A. Within the laboratory setting there would be a significant difference in test performance scores of the different item sequences; more specifically the H-E sequence would produce significantly poorer performance

scores than the E-H or R forms. Since the A for C_2 simple main effect under the AxC interaction was not significant ($F=.27$, $df=2/216$, $p>.05$), this hypothesis was also not supported.

Hypothesis 1B. Within the field setting there would be no significant differences in the test performance scores of the different item sequences. Table 1 reveals that the A for C_1 simple main effect under the AxC interaction was not significant ($F=.29$, $df=2/216$, $p>.05$); thus, this hypothesis was supported.

Hypothesis 2. There would be a significant 3-way interaction between anxiety types, item sequencing, and test setting as they affect aptitude test scores. The AxBxC interaction in Table 1 was not significant ($F=1.64$, $df=6/216$, $p>.05$); thus, this hypothesis was not supported.

Hypothesis 2A. In the field setting, differential reactions to test taking anxiety, as measured by the AAT, significantly affect performance scores; more specifically, the facilitators should score significantly higher than either the debilitators or non-affecteds. As shown in Table 1, the B for C_1 simple main effect was significant ($F=5.40$, $df=3/216$, $p<.01$), thus partially supporting the above hypothesis that reactions to test taking anxiety (personality types) do differentially affect performance scores; however, the NKT (discussed above) revealed that facilitators scored significantly higher than both the

debilitators ($p < .01$) and high-affecteds ($p < .01$), but not significantly higher than the non-affecteds ($p > .05$). Thus, in conclusion, this specific hypothesis (2A) was not supported.

Hypothesis 2B. In the laboratory setting, differences in performance scores due to anxiety reaction types were looked for, although no specific predictions were made. Table 1 shows that the B for C_2 simple main effect was significant ($F=10.56$, $df=3/216$, $p < .01$), thus indicating that anxiety reactions (personality types) do affect performance scores within the laboratory setting. Probing with the NKT revealed that facilitators scored significantly higher than debilitators ($p < .01$) and high-affecteds ($p < .01$), and that both the high-affecteds ($p < .05$) and non-affecteds ($p < .01$) also scored significantly higher than the debilitators.

Hypothesis 2C. In the field setting, item sequencing and anxiety types interact to produce a significant effect on performance scores. Since the AB for C_1 simple interaction effect (see Table 1) was not significant ($F=.97$, $df=6/216$, $p > .05$) (nor was the AxB interaction significant; $F=.29$, $df=6/216$, $p > .05$) this hypothesis was not supported.

Hypothesis 2C₁. On the R form, the F and HA should have significantly higher aptitude test performance scores than the D or NA. Probing with the NKT revealed that the only significant differences ($p < .05$) were that F scored significantly higher than D, NA, and HA ($p < .05$); therefore, this hypothesis was not supported.

Hypothesis 2C₂. On the E-H form, the F should score significantly higher than the other three anxiety types. Probing again with the NKT revealed that the only significant difference ($p < .05$) was that NA scored higher than D; therefore, this hypothesis also was not supported.

Hypothesis 2C₃. On the H-E form there should not be any significant differences among reaction types. Probing again with the NKT revealed that there were no significant differences at the .05 level; thus, this hypothesis was supported.

Hypothesis 2D. In the laboratory setting, item sequencing and anxiety types interact to produce significant effects on performance scores. Since the analysis in Table 1 reveals that the AB for C₂ simple interaction effect was not significant ($F = .98$, $df = 6/216$, $p > .05$), this hypothesis was not supported.

As a further check on the possibility of item sequencing differentially affecting performance scores, another analysis of variance design was constructed. In this new design, the anxiety (personality) type dimension was collapsed and the 15 subjects which had been discarded for each of the 6 item sequences (E-H, H-E, R for both the field and the laboratory settings) in the earlier analysis were added to the design (see end of Procedure section). The resulting analysis of variance was a 3x2 design -- 3 item sequences (E-H, H-E, R) by 2 test settings (field and

laboratory); within each of the resulting 6 item sequencing groups were 55 subjects -- 10 F, 10 D, 10 HA, 10 NA, and the 15 subjects that were discarded in the earlier analysis.

As shown in Table 3, the above 3x2 way analysis of variance yielded neither significant main nor interaction effects (see Appendix J for the means and standard deviations of all cells). This second analysis not only added support to the conclusions drawn from the earlier analysis (see Table 1), but also extended the earlier conclusions so that, regardless of whether or not personality (anxiety) types are considered, there appears to exist no item sequence effect, no test setting effect, and no item sequence by test setting interaction.

Table 3
 Analysis of Variance Summary Table of Performance Scores
 as a Function of Test Setting and Item Sequence

Source of Variation	df	MS	F	p
A (Item Sequence)	2	41	.46	NS*
C (Test Setting)	1	.37	.004	NS
A X C	2	152	1.72	NS
Error	324	88	-	-
Total	329	-	-	-

* NS = not significant at the .05 level

CHAPTER IV

DISCUSSION

The present study was not only an attempt to clarify the inconsistent findings concerning the effects of different item sequences on aptitude test performance (Lund, 1953; Sax & Carr, 1962; Brenner, 1964; Smouse & Munz, 1968; Munz & Smouse, 1968), but also represented an attempt to extend the findings of Munz and Smouse (1968).

Two points should be emphasized before considering the implications of the present study. First, the subjects used in this study were high school seniors -- both college and non-college preparatory; however, all the studies on item sequencing (Lund, 1953; Sax & Carr, 1962; Brenner, 1964; Smouse & Munz, 1968; Munz & Smouse, 1968) have used college populations. This same point is extended to the AAT, since the studies using this instrument have also used only college students (see Alpert & Haber, 1960; Dember, Nairne, & Miller, 1962; Herron, 1964; Milholland, 1964; Munz & Smouse, 1968). Since both the motivational and intellectual levels of high school and college populations may vary greatly, this difference in population samples may prove to have far reaching implications.

A second point to consider concerns the limitations imposed by the sample itself and the selection of subjects. It should be remembered that the high school seniors used in the present study were from basically an urban-middle class background and they represented a sample of only three schools -- all in the state of Oklahoma and all within approximately 15 miles of each other.

The inconsistent findings concerning the effects of item sequencing on test performance arose from the fact that aptitude tests given in a laboratory setting (Lund, 1953; Sax & Carr, 1962) resulted in significant item sequencing effects, while achievement tests given in a field setting (Brenner, 1964; Smouse & Munz, 1968; Munz & Smouse, 1968) did not result in any item sequence differences. Thus, it appeared that the contradictory findings on item sequencing might be explained by differences due to test type (aptitude versus achievement) on one hand and/or test setting (laboratory versus field) on the other.

It was thought that if the inconsistent findings were due to differences in laboratory and field settings, then, in the present study, one would expect to find a significant item sequence effect in the laboratory setting [thus supporting Lund (1953) and Sax and Carr (1962)], but not in the field setting [thus supporting Brenner (1964), Smouse and Munz (1968), and Munz and Smouse (1968).] Since the item sequence by test setting (AxC) interactions (see

Tables 1 and 3) were not significant (nor were the A for C_1 or A for C_2 simple main effects) the data indicated that the above inconsistency is not simply a result of differences found in the laboratory-field settings. There was further support for this conclusion. It was further thought that a more general difference between field and laboratory settings might express itself in another way. That is, the subjects in the laboratory setting (cognizant of the experimental situation) might be relatively uninvolved with the task, while the field subjects would be more highly involved since they would think the outcome was important to their future (support for this belief is found in Wrightsman, 1962). This in turn, might result in significantly different overall aptitude test scores for the laboratory and field groups. However, in the present study the C main effect (differences between the laboratory and field setting) in both the first and second analyses (see Tables 1 and 3) was not significant; thus, the idea of an overall laboratory-field difference was again rejected.

Considering the test-type side of the above problem, if the contradictory findings were due to differences between aptitude and achievement tests (rather than to differences in test settings), then it would be expected that significant item sequence effects would be found in both settings since both represent an aptitude test situation [thus supporting Lund (1953) and Sax and Carr (1962) while, at the same time,

not affecting the interpretations of Brenner (1964), Smouse and Munz (1968), and Munz and Smouse (1968)]. However, in the present study an item sequence effect was not found in either analysis (see Tables 1 and 3); therefore, this explanation was also rejected. Thus, although it was one of the purposes of the present study to clarify the test type/test setting problem concerning the effects of item sequencing, this problem still remains unanswered.

Considering a second purpose of the present study (i.e., attempting to extend the findings of Munz and Smouse's 1968 study), it was expected that different item sequences would not have a significant effect on aptitude test scores. As mentioned above, since in the present study there were no $A \times C$ interactions (see Tables 1 and 3) nor a significant A for C_1 or A for C_2 simple main effect, this expectation was supported. In extending Munz and Smouse's (1968) findings further, it was also expected that there would be a significant effect of test-taking anxiety types upon aptitude test performance. As seen in Table 1 (the B main effect), this expectation was also supported. However, it was at this point that the generalizations from Munz and Smouse's (1968) study ended. Although the present study did yield significant effects of test-taking anxiety types on aptitude test scores, these effects were not in the directions consistent with the Munz and Smouse (1968) study. [Munz and Smouse's study revealed that only the differences between the F and D and

between F and NA were significant ($p < .01$), facilitators scoring higher in both instances; however, the present study revealed that F scored significantly higher than D, HA, and NA, and that NA scored significantly higher than D and HA (see Table 2).] Furthermore, if Munz and Smouse's (1968) findings could be extended further, one would expect to find anxiety types interacting with item sequence to produce significant differences in aptitude test scores; however, this interaction (AxB) was not significant (nor were the AB for C_1 and AB for C_2 simple interaction effects), thus rejecting further attempts to extend Munz and Smouse's (1968) findings.

The problem to be dealt with now concerns the possible explanations that might account for: 1) the inability of the present study to solve the laboratory-field/achievement-aptitude problem concerning item sequencing effects; and 2) the fact that Munz and Smouse's (1968) findings can be generalized only so far as to conclude that while there is no item sequence effect on the aptitude test scores of high school seniors, there are significant differences in aptitude test scores obtained by different anxiety (personality) types.

The most obvious explanation for both of the above is that the present study used a high school senior population while all the other studies used college populations. Since one might expect to find a great deal more variation in the "test-taking ability" and "test-taking motivation"

of high school students, it could be that this variability overshadowed any effects produced by the different item sequences. Thus any possibility of item sequencing effects might be masked out by other factors. This explanation leads directly to an idea for further research. That is, that the data analyzed in the present study be re-analyzed as two separate analyses -- first, using only the college preparatory students (this group more closely approximating the typical college population); and second, using only the non-college preparatory students (see Appendix K).

It would also be interesting to "replicate" the present study using college students; this would serve as a further check on the possibility that a crucial consideration in the present study is the difference between high school and college populations.

It should also be re-emphasized that the present study found many of the findings of Munz and Smouse (1968) do not apply to either aptitude tests and/or to high school populations. Therefore, it seems that another logical step would be to first replicate (using achievement tests) the Munz and Smouse (1968) study with college students (a true replication), and then with high school students.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of the present study was to clarify the inconsistent findings concerning the effects of item sequencing on aptitude test performance, and to extend and "replicate" (using an aptitude test) the findings of earlier studies.

More specifically, the present study was concerned with giving an aptitude test (The Henmon-Nelson Test of Mental Ability, Revised Edition, grades 9-12) under two different test settings, taking into consideration not only item sequencing but also differential reactions to the test-taking situation. The two different test settings were the "field" and "laboratory" conditions; the item sequences consisted of three different item arrangement forms of the Henmon-Nelson Test -- the same 90 items were arranged in order of increasing difficulty (E-H form), decreasing order of difficulty (H-E form), and arranged randomly (R form), the differential reactions to test-taking situations (facilitators, debilitators, non-affecteds, high-affecteds) were determined on the basis of the Achievement Anxiety Test (AAT).

The subjects were 330 high school seniors enrolled in three Oklahoma high schools. Approximately two weeks prior to the actual experimental procedure, the Achievement Anxiety Test was given to all the subjects as a basis for classifying the 4 anxiety (personality) reaction types. Also prior to the actual experimental procedure, it was necessary to arrange for the assignment of the subjects to one of the two testing situations (i.e., the field and laboratory groups). Both groups received the same test forms, but received them under different instructions. During the actual experimental procedure, the three forms (E-H, H-E, R) of the Henmon-Nelson Test were randomly distributed within both the laboratory and field groups.

After the data had been collected and scored, 240 of the scores were subjected to a $3 \times 4 \times 2$ way analysis of variance -- i.e., 3 item sequences (E-H, H-E, R) by 4 personality types (facilitators, debilitators, high-affecteds, non-affecteds) by 2 test settings (laboratory and field). Later, a 3×2 way analysis of variance -- 3 item sequences by 2 test settings -- was calculated using all 330 subjects.

The $3 \times 4 \times 2$ way analysis produced no significant interactions and only one significant main effect -- that of anxiety (personality) types. The 3×2 way analysis yielded no significant interactions or main effects. The results lead to the conclusions that: 1) item sequencing does not significantly affect the aptitude test performance of high

school seniors; and 2) differential reactions to test-taking anxiety do have a significant effect on aptitude test performance. A number of possible avenues of investigation were discussed.

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APPENDIX A

Instructions to the Teacher for Giving the AAT

NOTE TO THE TEACHER

When you hand these questionnaires out please emphasize the following points to the students:

- (1) This is part of a research program being conducted at the University of Oklahoma...
- (2) Thus your (the students') responses will in no way be evaluated or used by the administration itself or by the teaching staff...
- (3) Therefore your (the students') only concern in filling out these questionnaires should be to answer each question as honestly as you can; that is, to answer the questions as they best apply to how you ACTUALLY feel and act.

Please make sure that the students fill out all of the information at the top of the questionnaire -- including the college and non-college preparatory questions.

~ ~ ~
Thank you for your cooperation

APPENDIX B

The AAT

Sex

I do or do not intend to
go to college.

I am or am not on a college preparatory program.

Indicate the degree to which each item applies to you by circling the desired number. If, in the following example, you do not like animals at all then you would circle the #1. If you liked animals very much, then you would circle #5. The numbers between 1 and 5 represent different degrees of how you feel about liking animals.

1 2 3 4 5

Not at all Very much

This never happens to me	This practically always happens
--------------------------	---------------------------------

Sex _____

I am or am not on a college preparatory program.

5. The more important the examination, the less well I seem to do.

5	4	3	2	1
Always			Never	

6. While I may (or may not) be nervous before taking an exam, once I start, I seem to forget to be nervous.

5	4	3	2	1
I always forget			I am always nervous during an exam	

7. During exams or tests, I block on questions to which I know the answers, even though I might remember them as soon as the exam is over.

5	4	3	2	1
This always happens to me			I never block on questions to which I know the answers	

8. Nervousness while taking a test helps me do better.

1	2	3	4	5
It never helps			It often helps	

9. When I start a test, nothing is able to distract me.

5	4	3	2	1
This is always true of me			This is not true of me	

10. In courses in which the total grade is based mainly on one exam, I seem to do better than other people.

1	2	3	4	5
Never			Almost always	

11. I find that my mind goes blank at the beginning of an exam, and it takes me a few minutes before I can function.

5	4	3	2	1
I almost always blank out at first			I never blank out at first	

12. I look forward to exams.

1	2	3	4	5
Never			Always	

13. I am so tired from worrying about an exam, that I find I almost don't care how well I do by the time I start the test.

1 2 3 4 5

I never feel
this way

I almost always
feel this way

14. Time pressure on an exam causes me to do worse than the rest of the group under similar conditions.

5 4 3 2 1

Time pressure always seems
to make me do worse on an
exam than others

Time pressure never seems
to make me do worse on an
exam than others

15. Although "cramming" under pre-examination tension is not effective for most people, I find that if the need arises, I can learn material immediately before an exam, even under considerable pressure, and successfully retain it to use on the exam.

5 4 3 2 1

I am always able to
use the "crammed"
material successfully

I am never able to
use the "crammed"
material successfully

16. I enjoy taking a difficult exam more than an easy one.

5 4 3 2 1

Always

Never

17. I find myself reading exam questions without understanding them and I must go back over them so that they will make sense.

1 2 3 4 5

Never

Almost always

18. The more important the exam or test, the better I seem to do.

5 4 3 2 1

This is true
of me

This is not
true of me

19. When I don't do well on a difficult item at the beginning of an exam, it tends to upset me so that I block on even easy questions later on.

1 2 3 4 5

This never happens
to me

This almost always
happens to me

APPENDIX C

Instructions Read to the Laboratory Group

[The material in brackets was not read out loud; it represented directions only for the person administering the tests.]

[Verbal Instructions for the Laboratory Group]

[As the students enter they should be told to quietly be seated. To begin the testing program the guidance counselor, or some other recognized school official, should get the group's attention, and then introduce the experimenter by saying] This is from the University of Oklahoma, who is here today as part of a research project being conducted at the University.

My name is and I am helping in a research project that is concerned with the evaluation of school testing programs. As you already know, in the past the school has given tests which are used to help evaluate and guide you. The test you are going to take today is similar to ones you have taken before. It is an aptitude test and is designed to measure those aspects of mental ability which are important for success in both academic work and in occupational endeavors outside the classroom. This test is part of a research project and, although the scores will NOT become part of your permanent record or be used in any way to directly evaluate you or your ability, it is still an important part of the research that you try to do the best that you can.

I shall distribute a test booklet, IBM answer sheet, and special IBM pencil to each of you. Please write nothing on your answer sheet until I tell you to do so. Keep the test booklet closed with the front cover up. Since there are so many present, as the materials are being passed out please

refrain from talking among yourselves. Are there any questions yet? [The test booklets are to be passed out in an alternating fashion -- i.e., the E, then H, then R, then E again, etc. Thus equal numbers of the three forms are to be distributed and no students sitting next to each other are to have the same forms.]

We shall now fill in the blanks on the answer sheet -- make sure to use only the special pencil given to you. Please PRINT your name, school, birthdate, age, and sex in the appropriate blanks at the top of your answer sheet [Demonstrate]. Now, on your answer sheet where it says Part, write either E, H, or R according to the part of form designated on the front of your test booklet [Demonstrate]. When you have completed this, also print your name on the front of the test booklet. [Wait.] Now, has everyone completed your name, school, birthdate, age, and sex and filled in the Part and also put your name on the test booklet? [Wait.]

Now open the test booklet and fold the cover back [Demonstrate]. The page headed DIRECTIONS TO STUDENTS should be before you. I will read the directions with you. [Read directions and then return to this page (see Appendix E).]

The test has 90 items; you will have 45 minutes of working time. Although no questions about the test itself will be answered after the test has begun, if for some reason, an illegible page, a broken pencil, etc., you need the help of a proctor, just raise your hand. Please remember that there is to be no talking. Are there any questions? [Wait.]

Alright, turn the page and begin. [After 15 minutes and after 30 minutes announce the time remaining. After 45 minutes continue. . .]

Stop. Whether you are finished or not close your test booklet. Look over your answer sheet to make sure your marks are heavy and black and that there are no stray marks. [Wait, then collect the booklets, etc., in the following way:]

Now insert your answer sheet into the test booklet and then pass your booklet to the (right, left, front, etc.). Now pass your pencils in the same direction. [Proctors should collect materials making sure each student has turned in a booklet.]

In closing I want to mention that this is a very difficult test, and you should not be too concerned if you did not perform as well as you think you can. Since it is a hard test, it does not take too many correct responses to perform at an adequate level; therefore, you probably did a lot better than your first impressions might lead you to believe.

APPENDIX D

Instructions Read to the Field Group

[The material in brackets was not read out loud; it represented directions only for the person administering the tests.]

[Verbal Instructions for the Field Group]

[As the students enter they should be told to quietly be seated. To begin the testing program the guidance counselor, or some other recognized school official, should get the group's attention, and then introduce the experimenter by saying] This is who is helping the school in our testing program.

My name is and I am helping in this testing evaluation program for all seniors. I will preface any explanation by stating that since we are in a group setting, and time is a very important factor, I will not be able to accommodate questions from the group as a whole. After I finish explaining the tests and this testing situation, if you have any questions raise your hand and one of the proctors will answer your questions on an individual basis. Please remember that at no time will any talking be allowed.

As you already know, in the past the school has given tests which become part of your permanent record and which are used not only to help guide and evaluate you and to determine your ability to succeed in college and academic pursuits, but also to assess your ability to succeed in various jobs and the world of work in general. This is also the nature of the aptitude test you are going to take today -- it is designed to measure those aspects of mental ability which are important for success in both academic and occupational work. Since the results of this test are extremely important to you, you should try to do the best you can.

I shall distribute a test booklet, IBM answer sheet, and special IBM pencil to each of you. Please write nothing on your answer sheet until I tell you to do so. Keep the test booklet closed with the front cover up. As the materials are being passed out please remember that no talking is allowed. [The test booklets are to be passed out in an alternating fashion -- i.e., E, then H, then R, then E again, etc. Thus, equal numbers of the three forms are to be distributed and no students sitting next to each other are to have the same forms.]

We shall now fill in the blanks on the answer sheet -- make sure to use only the special pencil given to you. Please PRINT your name, school, birthdate, age, and sex in the appropriate blanks at the top of your answer sheet [Demonstrate]. Now, on your answer sheet where it says Part, write either E, H, or R, according to the part of form designated on the front of your test booklet [Demonstrate]. When you have completed this, also print your name on the front of the test booklet. [Wait.] Now, has everyone completed your name, school, birthdate, age, and sex and filled in the Part and also put your name on the test booklet? [Wait.]

Now open the test booklet and fold the cover back [Demonstrate]. The page headed DIRECTIONS TO STUDENTS should be before you. I will read the directions with you. [Read directions and then return to this page (see Appendix F).]

The test has 90 items; you will have 45 minutes of working time. When I tell you to begin -- not yet -- turn the

page and start to work. If you do not understand the instructions, or what you are supposed to do, raise your hand at this time and one of the proctors will come over to answer your questions. Remember that no talking is allowed. [Wait until all questions have been answered.]

Alright, turn the page and begin. [After 15 minutes and after 30 minutes announce the time remaining. After 45 minutes continue. . .]

Stop. Whether you are finished or not close your test booklet. Look over your answer sheet to make sure your marks are heavy and black and that there are no stray marks. [Wait, then collect the booklets, etc., in the following way:]

Now insert your answer sheet into the test booklet and then pass your booklet to the (right, left, front, etc.). Now pass your pencils in the same direction. [Proctors should collect materials making sure each student has turned in a booklet.]

In closing I want to mention that this is a very difficult test, and you should not be too concerned if you did not perform as well as you think you can. Since it is a hard test, it does not take too many correct responses to perform at an adequate level; therefore, you probably did a lot better than your first impressions might lead you to believe.

APPENDIX E

Directions to Students -- Laboratory Group

DIRECTIONS TO STUDENTS

Do not turn this page until directed to do so.

Answers are to be marked only on the separate answer sheet, but you may use the margins of the test booklet for any rough figuring you may need to do.

Please make sure to observe the following rules:

Use the special pencil in marking all answers.

Make sure to make each mark heavy and black. Mark only one answer for each question. If you change your answer, you must erase the first mark completely. Then mark your corrected choice.

As you work on the test, keep your place on the answer sheet. Make certain that the answer you are marking is numbered the same as the item you are answering.

Make sure that you attempt to answer each question even if you are not sure of the answer.

It is very important to this study that you answer each question in turn and do not skip around. Thus you should answer each question before you go on to the next question. Once you have finished answering the questions on one page you may go on to the next page--but remember to answer every question.

The three practice exercises below are given so that you may see how to do the test. Do not mark these three practice questions on your answer sheet, but use the practice spaces provided to the right of these three questions.

Practice 1. Boys like to:

(1) run (2) hat (3) lost (4) red (5) same

Which word tells what boys like to do? Yes, *run* is the right answer. What is the number of the word *run*? The number is 1. Answer space number 1 has been marked to show that word number 1, *run*, is the right answer. You are to mark your answers in the same way.

Practice 2. I saw a . . . tree. A word for the blank is:

(1) quite (2) care (3) big (4) so (5) and

Mark the answer space that you think is right. Your mark should be in the answer space numbered 3.

Practice 3.  is to  as  is to:

(1)  (2)  (3)  (4)  (5) 

What is the number of the right answer? The answer, of course, is number 5, since a *square* is to a *smaller square* as a *triangle* is to a *smaller triangle*. Mark the answer space numbered 5.

PRACTICE EXERCISES

	1	2	3	4	5
1					
	1	2	3	4	5
2					
	1	2	3	4	5
3					

You will have 45 minutes to work on this test. This should be sufficient time to finish all the questions if you work rapidly. Therefore you should not spend too long on any one item--but remember that you should answer each question before you move on to the next question.

Once you have finished the test, close the booklet and turn it face down on your desk--do not go back through the test questions.

Do not begin work until you are told to do so!

APPENDIX F

Directions to Students -- Field Group

DIRECTIONS TO STUDENTS

Do not turn this page until directed to do so.

Answers are to be marked only on the separate answer sheet, but you may use the margins of the test booklet for any rough figuring you may need to do.

Failure to observe the following rules may lower your score:

You must use the special pencil in marking all answers.

Make sure to make each mark heavy and black. Mark only one answer for each question. If you change your answer, you must erase the first mark completely. Then mark your corrected choice.

As you work on the test, keep your place on the answer sheet. Make certain that the answer you are marking is numbered the same as the item you are answering.

Make sure that you attempt to answer each question even if you are not sure of the answer.

Answer each question in turn and do not skip around. Thus you should answer each question before you go on to the next question. Once you have finished answering the questions on one page you may go on to the next page--but remember to answer every question.

The three practice exercises below are given so that you may see how to do the test. Do not mark these three practice questions on your answer sheet, but use the practice spaces provided to the right of these three questions.

Practice 1. Boys like to:

- (1) run (2) hat (3) lost (4) red (5) same

Which word tells what boys like to do? Yes, *run* is the right answer. What is the number of the word *run*? The number is 1. Answer space number 1 has been marked to show that word number 1, *run*, is the right answer. You are to mark your answers in the same way.

Practice 2. I saw a . . . tree. A word for the blank is:

- (1) quite (2) care (3) big (4) so (5) and

Mark the answer space that you think is right. Your mark should be in the answer space numbered 3.

Practice 3. is to as is to:

- (1)  (2)  (3)  (4)  (5) 

What is the number of the right answer? The answer, of course, is number 5, since a *square* is to a *smaller square* as a *triangle* is to a *smaller triangle*. Mark the answer space numbered 5.

PRACTICE EXERCISES

	1	2	3	4	5
1		:	:	:	:
2	:	:	:	:	:
3	:	:	:	:	:

You will have 45 minutes to work on this test. This should be sufficient time to finish all the questions if you work rapidly. Therefore you should not spend too long on any one item--but remember that you should answer each question before you move on to the next question.

Once you have finished the test, close the booklet and turn it face down on your desk--do not go back through the test questions.

Do not begin work until you are told to do so!

APPENDIX G

Aptitude Test

E-H Form

THE HENSON-NELMAN ACADEMIC AND OCCUPATIONAL APTITUDE TEST

FORM (PART) E

NAME _____

DIRECTIONS TO STUDENTS

(Insert Appendix E for Laboratory Group)

(Insert Appendix F for Field Group)

1. If the letters l e t e r a were arranged properly, they would spell:
(1) later (2) elated (3) rattle (4) elevate (5) relate

2.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 

3. Tall is to short as day is to:
(1) long (2) night (3) week (4) day (5) morning

4.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 

5. My sister's daughter is my father's
(1) niece (2) cousin (3) granddaughter (4) sister-in-law (5) aunt

6. 2, 9, 16, 23, 30, What two numbers should come next?
(1) 35 and 42 (2) 39 and 46 (3) 37 and 44 (4) 36 and 40 (5) 31 and 32

7. Which word does not belong with the others?
(1) house (2) factory (3) residence (4) home (5) dwelling place

8. If the letters i n a l e d were arranged properly, they would spell:
(1) delayed (2) lament (3) inlaid (4) denial (5) elapse

9. 5, 9, 13, 17, 21, 25, What two numbers should come next?
(1) 29 and 30 (2) 29 and 31 (3) 29 and 33 (4) 25 and 27 (5) 27 and 29

10. The outline is too vague to the shape. A word for the blank is:
(1) summon (2) resist (3) indicate (4) cause (5) ordain

11.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 

12. Poem is to poet as portrait is to:
(1) sculptor (2) architect (3) painter (4) musician (5) historian

13. 1, 7, 13, 19,, 37. What two numbers should be on the dotted lines?
(1) 27 and 33 (2) 25 and 31 (3) 24 and 30 (4) 26 and 29 (5) 28 and 35

14. mistakes do students careful make not If these words were arranged to make a good sentence, what would be the third letter of the second word?
(1) m (2) d (3) s (4) c (5) u

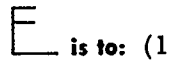
15.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 

16. Which word does not belong with the others?
(1) novice (2) accomplice (3) partner (4) associate (5) helper

17.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 

18. "Give every man thine ear, but few thy voice" means about the same as:
(1) Few words, many deeds. (2) Full vessels give the least sound.
(3) Much talk, little work. (4) The tongue is not steel, yet it cuts.
(5) A man of sense talks little but listens much.

19.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 

20. **Concentrate** is the opposite of:
 (1) think (2) taste (3) owe (4) rebuild (5) disperse
21.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
22. 19, 19, 16, 16, 13, 13, What two numbers should come next?
 (1) 9 and 9 (2) 11 and 9 (3) 10 and 10 (4) 12 and 12 (5) 13 and 8
23. Which word does not belong with the others?
 (1) dainty (2) fastidious (3) delicate (4) exquisite (5) hearty
24. A commendable person is:
 (1) beginning (2) talkative (3) praiseworthy (4) formidable (5) important.
25.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
26. 1, 6, 11, 16,, 31. What two numbers should be on the dotted lines?
 (1) 21 and 26 (2) 17 and 25 (3) 26 and 29 (4) 22 and 27 (5) 20 and 25
27. **Pride** is to **victory** as **humility** is to:
 (1) defeat (2) modesty (3) achievement (4) conceit (5) violence
28. 4, 8, 16, 32, What number should come next?
 (1) 36 (2) 48 (3) 40 (4) 54 (5) 64
29.  is to  as  is to: (1)  (2)  (3)  (4)  (5)  ...
30. A drizzling rain fell without A word for the blank is:
 (1) beginning (2) opposite (3) intermission (4) length (5) moisture
31.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
32. substance made a bricks called and clay are from pottery If these words were arranged to make a good sentence, what would be the word after **substance**?
 (1) bricks (2) clay (3) called (4) are (5) pottery
33. **Truth** is to **falsehood** as **pride** is to
 (1) fear (2) crime (3) honor (4) humility (5) truth
34. 10, 7, 9, 6, 8, 5, 7, What number should come next?
 (1) 6 (2) 8 (3) 10 (4) 4 (5) 5
35. A desert always has:
 (1) a lack of vegetation (2) an oasis (3) nomads (4) camels (5) palm trees....
36. A rosette is a:
 (1) banner (2) decoration (3) seat (4) scepter (5) baton
37. 512, 256, 128, 64, 32, What two numbers should come next?
 (1) 8 and 4 (2) 31 and 30 (3) 33 and 34 (4) 16 and 8 (5) 24 and 16
38. **Water seeks its own** A word for the blank is:
 (1) money (2) weight (3) cold (4) level (5) length
39.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 

40. Which word does not belong with the others?
(1) publication (2) discourse (3) journal (4) periodical (5) magazine
41. My father's son's sister may be my daughter's
(1) uncle (2) aunt (3) cousin (4) grandmother (5) niece
42. How many pints are there in 1 gallon and $1\frac{1}{2}$ quarts?
(1) 7 (2) 9 (3) 11 (4) 15 (5) 19
43. Vague is the opposite of:
(1) ambitious (2) poor (3) opaque (4) definite (5) insincere
44. 8, 4, 2, 1, $\frac{1}{2}$,, What two numbers should come next?
(1) $\frac{1}{4}$ and $\frac{1}{6}$ (2) $\frac{1}{3}$ and $\frac{1}{4}$ (3) 1 and $\frac{1}{2}$ (4) $\frac{1}{4}$ and $\frac{1}{8}$ (5) $\frac{2}{3}$ and $\frac{3}{4}$
45. "An ounce of prevention is worth a pound of cure" means about the same as:
(1) Don't cry over spilt milk. (2) A miss is as good as a mile.
(3) Discretion is the better part of valor. (4) Don't cross a bridge until you come to it.
(5) A stitch in time saves nine.
46. An inaccessible place cannot be:
(1) reached (2) seen (3) described (4) pierced (5) carried
47. The daughter of my uncle has a brother. My father is her brother's
(1) grandfather (2) great-uncle (3) cousin (4) uncle (5) nephew
48. 729, 243, 81, 27,, What two numbers should come next?
(1) 9 and 3 (2) 26 and 25 (3) 20 and 13 (4) 19 and 11 (5) 9 and 7
49. with busy filled the bees air of was hum the If these words were arranged to make a good sentence, what would be the last letter of the third word?
(1) m (2) y (3) d (4) s (5) e
50. A tremulous leaf is:
(1) green (2) brown (3) parched (4) wilted (5) quivering
51. The ranks were by desertions. A word for the blank is:
(1) depleted (2) accustomed (3) arranged (4) joyful (5) assumed
52. Two pints equal one liter. Three liters equal one rabeek. What is the cost of 5 rabeeks of milk at 6¢ a pint?
(1) 90¢ (2) 30¢ (3) \$1.80 (4) 60¢ (5) \$3.60
53. $\triangle$ is to $\triangleright$ as N is to: (1) $\triangleleft$ (2) Z (3) M (4) P (5) $\triangle$
54. When you multiply together the length, the width, and the height of a room, you find its:
(1) perimeter (2) diagonal (3) area (4) volume (5) circumference
55. Listless means:
(1) systematic (2) accurate (3) loathsome (4) enthusiastic (5) indifferent
56. Add is to subtract as humble is to:
(1) rich (2) happy (3) haughty (4) mild (5) ill
57. fruit children good cereals are for and If these words were arranged to make a good sentence, what would be the second word?
(1) fruit (2) children (3) good (4) cereals (5) and
58. 74, 63, 52,,, 19. What two numbers should be on the dotted lines?
(1) 41 and 29 (2) 41 and 30 (3) 42 and 31 (4) 43 and 32 (5) 39 and 28

59. **"Many cooks spoil the broth"** means about the same as:
 (1) A good fire makes a good cook. (2) Every cook praises his own broth.
 (3) Two captains sink the ship. (4) Civilized man cannot live without cooks.
 (5) All lay loads on the willing horse.
60. **Club** is to **member** as **hand** is to:
 (1) arm (2) feel (3) finger (4) body (5) work
61. **his scientific admired taste he knowledge for his artistic and for was** If these words were arranged to make a good sentence, what would be the word after **artistic**?
 (1) taste (2) admired (3) scientific (4) knowledge (5) was
62. **Napoleon said a French soldier was equal to 3 Austrians or to 5 Russians. A dozen Austrian soldiers were equal to how many Russians?**
 (1) 20 (2) 6 (3) 15 (4) 60 (5) 36
63. **7, 5, 8, 6, 9, 7, 10,** What number should come next?
 (1) 7 (2) 10 (3) 8 (4) 11 (5) 5
64. **The uncle of my father's grandson is my:**
 (1) nephew (2) cousin (3) grandfather (4) brother (5) son
65. **"Still waters run deep"** means about the same as:
 (1) Water is the best of all things. (2) After rain comes sunshine.
 (3) Rashness is not valor. (4) The more understanding, the fewer words.
 (5) He that seeks finds.
66. **Electricity** is to **wire** as **gas** is to:
 (1) flame (2) spark (3) hot (4) pipe (5) stove
67. **3, 9, 12, 36, 39, 117,** What two numbers should come next?
 (1) 120 and 360 (2) 120 and 234 (3) 234 and 236 (4) 351 and 354
 (5) 121 and 363
68. **A demure person is always:**
 (1) modest (2) buoyant (3) intelligent (4) ill (5) dependable
69. **In a spelling test a girl had 18 words right, giving her an accuracy of 75%. How many words did she miss?**
 (1) 8 (2) 6 (3) 3 (4) 4 (5) 9
70. **Sorrow** is to **misfortune** as **joy** is to:
 (1) grief (2) happiness (3) hatred (4) success (5) pride
71. **An obvious fact is:**
 (1) assumed (2) hateful (3) clear (4) hidden (5) doubtful
72. **From a class of 20, 15% of the pupils were absent one day. How many were present?**
 (1) 15 (2) 17 (3) 3 (4) 7 (5) 5
73. **Onyx** is a:
 (1) limestone (2) quartz (3) glass (4) granite (5) metal
74. **625, 125, 25, 5,** What number should come next?
 (1) 1 (2) 2 (3) 3 (4) 4 (5) 0
75. **A palette** is used by:
 (1) carpenters (2) lawyers (3) musicians (4) artists (5) physicians

76. **Vivacious** means about the same as:
 (1) intelligent (2) animated (3) sarcastic (4) courageous (5) moody
77. **A certain kind of wood is $\frac{1}{2}$ as heavy as water. Iron is about 7 times as heavy as water. Iron is how many times as heavy as the wood?**
 (1) 21 (2) 7 (3) $3\frac{1}{2}$ (4) 14 (5) $7\frac{1}{2}$
78. **"It is indeed an ill wind that blows no one good"** means about the same as:
 (1) Birds of a feather flock together. (2) Correspondence is half a presence.
 (3) Patience is the key to glory. (4) The tongue is the neck's enemy.
 (5) The calamities of one nation turn to the benefit of another.
79. **Discreet** means:
 (1) wasteful (2) attentive (3) continuous (4) remorseful (5) prudent
80. **Depressed** is the opposite of:
 (1) repressed (2) elated (3) apathy (4) anxious (5) eager
81. **A terse style of writing is:**
 (1) emotional (2) mechanical (3) unsatisfactory (4) concise (5) ironical
82. **When 3 pupils were absent from a class, the attendance was 94%. How many pupils were there in the class?**
 (1) 30 (2) 90 (3) 50 (4) 15 (5) 31
83. **Subsequent** means:
 (1) small (2) attached (3) following (4) irregular (5) important
84. **Anger** is to **violence** as **love** is to:
 (1) caressing (2) hate (3) tempter (4) hope (5) happiness
85. **A craven** is a:
 (1) bird (2) fish (3) vase (4) coward (5) desire
86. **"No sweetness in a cabbage twice boiled or in a tale twice told"** means about the same as:
 (1) A good tale ill told is a bad one. (2) A tale never loses in the telling.
 (3) A good tale is not worse for being twice told.
 (4) There is much good sleep in an old story. (5) A tame tongue is a rare bird.
87. **A recreant individual is:**
 (1) young (2) reborn (3) smug (4) happy (5) cowardly
88. **If a franc were worth $2\frac{1}{2}$ ¢, how many francs would one receive for \$100.00?**
 (1) 2500 (2) 400 (3) 40,000 (4) 250 (5) 4000
89. **A menial person is:**
 (1) servile (2) cunning (3) cross (4) deceitful (5) severe
90. **Ambiguous** is the opposite of:
 (1) definite (2) small (3) genuine (4) enigmatic (5) perpetual

APPENDIX H

Aptitude Test

H-E Form

THE HENSON-NELMAN ACADEMIC AND OCCUPATIONAL APTITUDE TEST

FORM (PART) H

NAME _____

DIRECTIONS TO STUDENTS

(Insert Appendix E for Laboratory Group)

(Insert Appendix F for Field Group)

1. **Ambiguous** is the opposite of:
(1) definite (2) small (3) genuine (4) enigmatic (5) perpetual
2. **A menial person** is:
(1) servile (2) cunning (3) cross (4) deceitful (5) severe
3. **If a franc were worth $2\frac{1}{2}$ ¢, how many francs would one receive for \$100.00?**
(1) 2500 (2) 400 (3) 40,000 (4) 250 (5) 4000
4. **A recreant individual** is:
(1) young (2) reborn (3) smug (4) happy (5) cowardly
5. **"No sweetness in a cabbage twice boiled or in a tale twice told"** means about the same as:
(1) A good tale ill told is a bad one. (2) A tale never loses in the telling.
(3) A good tale is not worse for being twice told.
(4) There is much good sleep in an old story. (5) A tame tongue is a rare bird.
6. **A craven** is a:
(1) bird (2) fish (3) vase (4) coward (5) desire
7. **Anger** is to **violence** as **love** is to:
(1) caressing (2) hate (3) tempter (4) hope (5) happiness
8. **Subsequent** means:
(1) small (2) attached (3) following (4) irregular (5) important
9. **When 3 pupils were absent from a class, the attendance was 94%. How many pupils were there in the class?**
(1) 30 (2) 90 (3) 50 (4) 15 (5) 31
10. **A terse style of writing** is:
(1) emotional (2) mechanical (3) unsatisfactory (4) concise (5) ironical
11. **Depressed** is the opposite of:
(1) repressed (2) elated (3) apathy (4) anxious (5) eager
12. **Discreet** means:
(1) wasteful (2) attentive (3) continuous (4) remorseful (5) prudent
13. **"It is indeed an ill wind that blows no one good"** means about the same as:
(1) Birds of a feather flock together. (2) Correspondence is half a presence.
(3) Patience is the key to glory. (4) The tongue is the neck's enemy.
(5) The calamities of one nation turn to the benefit of another.
14. **A certain kind of wood is $\frac{1}{2}$ as heavy as water. Iron is about 7 times as heavy as water. Iron is how many times as heavy as the wood?**
(1) 21 (2) 7 (3) $3\frac{1}{2}$ (4) 14 (5) $7\frac{1}{2}$
15. **Vivacious** means about the same as:
(1) intelligent (2) animated (3) sarcastic (4) courageous (5) moody
16. **A palette** is used by:
(1) carpenters (2) lawyers (3) musicians (4) artists (5) physicians
17. **625, 125, 25, 5,** What number should come next?
(1) 1 (2) 2 (3) 3 (4) 4 (5) 0

18. **Onyx** is a:
(1) limestone (2) quartz (3) glass (4) granite (5) metal
19. **From a class of 20, 15% of the pupils were absent one day. How many were present?**
(1) 15 (2) 17 (3) 3 (4) 7 (5) 5
20. **An obvious fact is:**
(1) assumed (2) hateful (3) clear (4) hidden (5) doubtful
21. **Sorrow** is to **misfortune** as **joy** is to:
(1) grief (2) happiness (3) hatred (4) success (5) pride
22. **In a spelling test a girl had 18 words right, giving her an accuracy of 75%. How many words did she miss?**
(1) 8 (2) 6 (3) 3 (4) 4 (5) 9
23. **A demure person is always:**
(1) modest (2) buoyant (3) intelligent (4) ill (5) dependable
24. **3, 9, 12, 36, 39, 117,** What two numbers should come next?
(1) 120 and 360 (2) 120 and 234 (3) 234 and 236 (4) 351 and 354
(5) 121 and 363
25. **Electricity** is to **wire** as **gas** is to:
(1) flame (2) spark (3) hot (4) pipe (5) stove
26. **"Still waters run deep"** means about the same as:
(1) Water is the best of all things. (2) After rain comes sunshine.
(3) Rashness is not valor. (4) The more understanding, the fewer words.
(5) He that seeks finds.
27. **The uncle of my father's grandson is my:**
(1) nephew (2) cousin (3) grandfather (4) brother (5) son
28. **7, 5, 8, 6, 9, 7, 10,** What number should come next?
(1) 7 (2) 10 (3) 8 (4) 11 (5) 5
29. **Napoleon said a French soldier was equal to 3 Austrians or to 5 Russians. A dozen Austrian soldiers were equal to how many Russians?**
(1) 20 (2) 6 (3) 15 (4) 60 (5) 36
30. **his scientific admired taste he knowledge for his artistic and for was** If these words were arranged to make a good sentence, what would be the word after **artistic**?
(1) taste (2) admired (3) scientific (4) knowledge (5) was
31. **Club** is to **member** as **hand** is to:
(1) arm (2) feel (3) finger (4) body (5) work
32. **"Many cooks spoil the broth"** means about the same as:
(1) A good fire makes a good cook. (2) Every cook praises his own broth.
(3) Two captains sink the ship. (4) Civilized man cannot live without cooks.
(5) All lay loads on the willing horse.
33. **74, 63, 52, , 19.** What two numbers should be on the dotted lines?
(1) 41 and 29 (2) 41 and 30 (3) 42 and 31 (4) 43 and 32 (5) 39 and 28
34. **fruit children good cereals are for and** If these words were arranged to make a good sentence, what would be the second word?
(1) fruit (2) children (3) good (4) cereals (5) and

35. **Add is to subtract as humble is to:**
 (1) rich (2) happy (3) haughty (4) mild (5) ill
36. **Listless means:**
 (1) systematic (2) accurate (3) loathsome (4) enthusiastic (5) indifferent
37. **When you multiply together the length, the width, and the height of a room, you find its:**
 (1) perimeter (2) diagonal (3) area (4) volume (5) circumference
38.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
39. **Two pints equal one liter. Three liters equal one rabek. What is the cost of 5 rabeks of milk at 6¢ a pint?**
 (1) 90¢ (2) 30¢ (3) \$1.80 (4) 60¢ (5) \$3.60
40. **The ranks were by desertions.** A word for the blank is:
 (1) depleted (2) accustomed (3) arranged (4) joyful (5) assumed
41. **A tremulous leaf is:**
 (1) green (2) brown (3) parched (4) wilted (5) quivering
42. **with busy filled the bees air of was hum the** If these words were arranged to make a good sentence, what would be the last letter of the third word?
 (1) m (2) y (3) d (4) s (5) e
43. **729, 243, 81, 27,** What two numbers should come next?
 (1) 9 and 3 (2) 26 and 25 (3) 20 and 13 (4) 19 and 11 (5) 9 and 7
44. **The daughter of my uncle has a brother. My father is her brother's**
 (1) grandfather (2) great-uncle (3) cousin (4) uncle (5) nephew
45. **An inaccessible place cannot be:**
 (1) reached (2) seen (3) described (4) pierced (5) carried
46. **"An ounce of prevention is worth a pound of cure"** means about the same as:
 (1) Don't cry over spilt milk. (2) A miss is as good as a mile.
 (3) Discretion is the better part of valor. (4) Don't cross a bridge until you come to it.
 (5) A stitch in time saves nine.
47. **8, 4, 2, 1, $\frac{1}{2}$,** What two numbers should come next?
 (1) $\frac{1}{4}$ and $\frac{1}{6}$ (2) $\frac{1}{3}$ and $\frac{1}{4}$ (3) 1 and $\frac{1}{2}$ (4) $\frac{1}{4}$ and $\frac{1}{8}$ (5) $\frac{2}{3}$ and $\frac{3}{4}$
48. **Vague is the opposite of:**
 (1) ambitious (2) poor (3) opaque (4) definite (5) insincere
49. **How many pints are there in 1 gallon and $1\frac{1}{2}$ quarts?**
 (1) 7 (2) 9 (3) 11 (4) 15 (5) 19
50. **My father's son's sister may be my daughter's**
 (1) uncle (2) aunt (3) cousin (4) grandmother (5) niece
51. **Which word does not belong with the others?**
 (1) publication (2) discourse (3) journal (4) periodical (5) magazine
52.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
53. **Water seeks its own** A word for the blank is:
 (1) money (2) weight (3) cold (4) level (5) length

54. **512, 256, 128, 64, 32,** What two numbers should come next?
 (1) 8 and 4 (2) 31 and 30 (3) 33 and 34 (4) 16 and 8 (5) 24 and 16
55. **A rosette is a:**
 (1) banner (2) decoration (3) seat (4) scepter (5) baton
56. **A desert always has:**
 (1) a lack of vegetation (2) an oasis (3) nomads (4) camels (5) palm trees
57. **10, 7, 9, 6, 8, 5, 7,** What number should come next?
 (1) 6 (2) 8 (3) 10 (4) 4 (5) 5
58. **Truth is to falsehood as pride is to**
 (1) fear (2) crime (3) honor (4) humility (5) truth
59. **substance made a bricks called and clay are from pottery** If these words were arranged to make a good sentence, what would be the word after **substance**?
 (1) bricks (2) clay (3) called (4) are (5) pottery
60.  (1)  (2)  (3)  (4)  (5) 
61. **A drizzling rain fell without** A word for the blank is:
 (1) beginning (2) opposite (3) intermission (4) length (5) moisture
62. **A is to  as  is to:** (1)  (2)  (3)  (4)  (5) 
63. **4, 8, 16, 32,** What number should come next?
 (1) 36 (2) 48 (3) 40 (4) 54 (5) 64
64. **Pride is to victory as humility is to:**
 (1) defeat (2) modesty (3) achievement (4) conceit (5) violence
65. **1, 6, 11, 16,, 31.** What two numbers should be on the dotted lines?
 (1) 21 and 26 (2) 17 and 25 (3) 26 and 29 (4) 22 and 27 (5) 20 and 25
66.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
67. **A commendable person is:**
 (1) beginning (2) talkative (3) praiseworthy (4) formidable (5) important
68. **Which word does not belong with the others?**
 (1) dainty (2) fastidious (3) delicate (4) exquisite (5) hearty
69. **19, 19, 16, 16, 13, 13,** What two numbers should come next?
 (1) 9 and 9 (2) 11 and 9 (3) 10 and 10 (4) 12 and 12 (5) 13 and 8
70.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
71. **Concentrate** is the opposite of:
 (1) think (2) taste (3) owe (4) rebuild (5) disperse
72. **# is to  as  is to:** (1)  (2)  (3)  (4)  (5) 

73. "Give every man thine ear, but few thy voice" means about the same as:
 (1) Few words, many deeds. (2) Full vessels give the least sound.
 (3) Much talk, little work. (4) The tongue is not steel, yet it cuts.
 (5) A man of sense talks little but listens much.
74. $\times$ is to $\times$ as $\neg$ is to: (1) $\neg$ (2) $\neg$ (3) $\times$ (4) $\neg$ (5) $\neg$
75. Which word does not belong with the others?
 (1) novice (2) accomplice (3) partner (4) associate (5) helper
76. $|$ is to $|$ as $/$ is to: (1) $—$ (2) $/$ (3) $|$ (4) $\square$ (5) $—$
77. mistakes do students careful make not If these words were arranged to make a good sentence, what would be the third letter of the second word?
 (1) m (2) d (3) s (4) c (5) u
78. 1, 7, 13, 19,, 37. What two numbers should be on the dotted lines?
 (1) 27 and 33 (2) 25 and 31 (3) 24 and 30 (4) 26 and 29 (5) 28 and 35
79. Poem is to poet as portrait is to:
 (1) sculptor (2) architect (3) painter (4) musician (5) historian
80. $\bigcirc$ is to $\bigcirc$ as $|$ is to: (1) $\bigcirc$ (2) $|$ (3) $\square$ (4) $—$ (5) $—$
81. The outline is too vague to the shape. A word for the blank is:
 (1) summon (2) resist (3) indicate (4) cause (5) ordain
82. 5, 9, 13, 17, 21, 25, What two numbers should come next?
 (1) 29 and 30 (2) 29 and 31 (3) 29 and 33 (4) 25 and 27 (5) 27 and 29
83. If the letters i n a l e d were arranged properly, they would spell:
 (1) delayed (2) lament (3) inlaid (4) denial (5) elapse
84. Which word does not belong with the others?
 (1) house (2) factory (3) residence (4) home (5) dwelling place
85. 2, 9, 16, 23, 30, What two numbers should come next?
 (1) 35 and 42 (2) 39 and 46 (3) 37 and 44 (4) 36 and 40 (5) 31 and 32
86. My sister's daughter is my father's
 (1) niece (2) cousin (3) granddaughter (4) sister-in-law (5) aunt
87. $\bigcirc$ is to $\bigcirc$ as $\square$ is to: (1) ψ (2) $\square$ (3) $\sqcup$ (4) $\square$ (5) $\cap$
88. Tall is to short as day is to:
 (1) long (2) night (3) week (4) day (5) morning
89. $\bigcirc$ is to $\bigcirc$ as $\square$ is to: (1) $\square$ (2) $\square$ (3) $\bigcirc$ (4) $\square$ (5) ∞
90. If the letters l e t e r a were arranged properly, they would spell:
 (1) later (2) elated (3) rattle (4) elevate (5) relate

APPENDIX I

Aptitude Test

R Form

THE HENSON-NELMAN ACADEMIC AND OCCUPATIONAL APTITUDE TEST

FORM (PART) R

NAME _____

DIRECTIONS TO STUDENTS

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(Insert Appendix E for Laboratory Group)

(Insert Appendix F for Field Group)

1. **with busy filled the bees air of was hum the** If these words were arranged to make a good sentence, what would be the last letter of the third word?
(1) m (2) y (3) d (4) s (5) e
2. **Two pints equal one liter. Three liters equal one rabek. What is the cost of 5 rabeks of milk at 6¢ a pint?**
(1) 90¢ (2) 30¢ (3) \$1.80 (4) 60¢ (5) \$3.60
3. **4, 8, 16, 32,** What number should come next?
(1) 36 (2) 48 (3) 40 (4) 54 (5) 64
4. **Napoleon said a French soldier was equal to 3 Austrians or to 5 Russians. A dozen Austrian soldiers were equal to how many Russians?**
(1) 20 (2) 6 (3) 15 (4) 60 (5) 36
5. **A recreant individual is:**
(1) young (2) reborn (3) smug (4) happy (5) cowardly
6. **mistakes do students careful make not** If these words were arranged to make a good sentence, what would be the third letter of the second word?
(1) m (2) d (3) s (4) c (5) u
7. **"Give every man thine ear, but few thy voice"** means about the same as:
(1) Few words, many deeds. (2) Full vessels give the least sound.
(3) Much talk, little work. (4) The tongue is not steel, yet it cuts.
(5) A man of sense talks little but listens much.
8. **X is to X as  is to:** (1)  (2)  (3)  (4)  (5) 
9. **"An ounce of prevention is worth a pound of cure"** means about the same as:
(1) Don't cry over spilt milk. (2) A miss is as good as a mile.
(3) Discretion is the better part of valor. (4) Don't cross a bridge until you come to it.
(5) A stitch in time saves nine.
10. **A is to  as  is to:** (1)  (2)  (3)  (4)  (5)  ...
11. **An inaccessible place cannot be:**
(1) reached (2) seen (3) described (4) pierced (5) carried
12. **Anger is to violence as love is to:**
(1) caressing (2) hate (3) tempter (4) hope (5) happiness
13. **"No sweetness in a cabbage twice boiled or in a tale twice told"** means about the same as:
(1) A good tale ill told is a bad one. (2) A tale never loses in the telling.
(3) A good tale is not worse for being twice told.
(4) There is much good sleep in an old story. (5) A tame tongue is a rare bird.
14. **Truth is to falsehood as pride is to**
(1) fear (2) crime (3) honor (4) humility (5) truth
15. **Sorrow is to misfortune as joy is to:**
(1) grief (2) happiness (3) hatred (4) success (5) pride
16. **A certain kind of wood is $\frac{1}{2}$ as heavy as water. Iron is about 7 times as heavy as water. Iron is how many times as heavy as the wood?**
(1) 21 (2) 7 (3) $3\frac{1}{2}$ (4) 14 (5) $7\frac{1}{2}$

17. **The uncle of my father's grandson is my:**
 (1) nephew (2) cousin (3) grandfather (4) brother (5) son
18. is to  as  is to: (1)  (2)  (3) (4)  (5) 
19. **Which word does not belong with the others?**
 (1) dainty (2) fastidious (3) delicate (4) exquisite (5) hearty
20.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
21. **Listless means:**
 (1) systematic (2) accurate (3) loathsome (4) enthusiastic (5) indifferent
22. **19, 19, 16, 16, 13, 13,** What two numbers should come next?
 (1) 9 and 9 (2) 11 and 9 (3) 10 and 10 (4) 12 and 12 (5) 13 and 8
23.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
24. **When you multiply together the length, the width, and the height of a room, you find its:**
 (1) perimeter (2) diagonal (3) area (4) volume (5) circumference
25. **In a spelling test a girl had 18 words right, giving her an accuracy of 75 %.**
How many words did she miss?
 (1) 8 (2) 6 (3) 3 (4) 4 (5) 9
26. **A menial person is:**
 (1) servile (2) cunning (3) cross (4) deceitful (5) severe
27. **3, 9, 12, 36, 39, 117,** What two numbers should come next?
 (1) 120 and 360 (2) 120 and 234 (3) 234 and 236 (4) 351 and 354
 (5) 121 and 363
28. **From a class of 20, 15 % of the pupils were absent one day. How many were present?**
 (1) 15 (2) 17 (3) 3 (4) 7 (5) 5
29. **Tall is to short as day is to:**
 (1) long (2) night (3) week (4) day (5) morning
30. **A demure person is always:**
 (1) modest (2) buoyant (3) intelligent (4) ill (5) dependable
31. **1, 7, 13, 19,, 37.** What two numbers should be on the dotted lines?
 (1) 27 and 33 (2) 25 and 31 (3) 24 and 30 (4) 26 and 29 (5) 28 and 35
32. **512, 256, 128, 64, 32,** What two numbers should come next?
 (1) 8 and 4 (2) 31 and 30 (3) 33 and 34 (4) 16 and 8 (5) 24 and 16
33. **A desert always has:**
 (1) a lack of vegetation (2) an oasis (3) nomads (4) camels (5) palm trees
34. **An obvious fact is:**
 (1) assumed (2) hateful (3) clear (4) hidden (5) doubtful
35. **Vague is the opposite of:**
 (1) ambitious (2) poor (3) opaque (4) definite (5) insincere
36. **2, 9, 16, 23, 30,** What two numbers should come next?
 (1) 35 and 42 (2) 39 and 46 (3) 37 and 44 (4) 36 and 40 (5) 31 and 32
37. **10, 7, 9, 6, 8, 5, 7,** What number should come next?
 (1) 6 (2) 8 (3) 10 (4) 4 (5) 5

38. ○ is to ○ as □ is to: (1) □ (2) □ (3) ○ (4) □ (5) ∞
39. "It is indeed an ill wind that blows no one good" means about the same as:
 (1) Birds of a feather flock together. (2) Correspondence is half a presence.
 (3) Patience is the key to glory. (4) The tongue is the neck's enemy.
 (5) The calamities of one nation turn to the benefit of another.
40. A drizzling rain fell without A word for the blank is:
 (1) beginning (2) opposite (3) intermission (4) length (5) moisture
41. 5, 9, 13, 17, 21, 25, , What two numbers should come next?
 (1) 29 and 30 (2) 29 and 31 (3) 29 and 33 (4) 25 and 27 (5) 27 and 29
42. Discreet means:
 (1) wasteful (2) attentive (3) continuous (4) remorseful (5) prudent
43. If the letters l e t t e r a were arranged properly, they would spell:
 (1) later (2) elated (3) rattle (4) elevate (5) relate
44. A craven is a:
 (1) bird (2) fish (3) vase (4) coward (5) desire
45. 74, 63, 52, . . . , . . . , 19. What two numbers should be on the dotted lines?
 (1) 41 and 29 (2) 41 and 30 (3) 42 and 31 (4) 43 and 32 (5) 39 and 28
46. Poem is to poet as portrait is to:
 (1) sculptor (2) architect (3) painter (4) musician (5) historian
47. A rosette is a:
 (1) banner (2) decoration (3) seat (4) scepter (5) baton
48. Depressed is the opposite of:
 (1) repressed (2) elated (3) apathy (4) anxious (5) eager
49. Which word does not belong with the others?
 (1) publication (2) discourse (3) journal (4) periodical (5) magazine
50. ∩ is to ∪ as E is to: (1) L (2) ∩ (3) ∪ (4) ∩ (5) E
51. Add is to subtract as humble is to:
 (1) rich (2) happy (3) haughty (4) mild (5) ill
52. If the letters i n a l e d were arranged properly, they would spell:
 (1) delayed (2) lament (3) inlaid (4) denial (5) elapse
53. # is to □ as # is to: (1) † (2) □ (3) + (4) † (5) †
54. A terse style of writing is:
 (1) emotional (2) mechanical (3) unsatisfactory (4) concise (5) ironical
55. fruit children good cereals are for and If these words were arranged to make a good sentence, what would be the second word?
 (1) fruit (2) children (3) good (4) cereals (5) and
56. Ambiguous is the opposite of:
 (1) definite (2) small (3) genuine (4) enigmatic (5) perpetual
57. "Many cooks spoil the broth" means about the same as:
 (1) A good fire makes a good cook. (2) Every cook praises his own broth.
 (3) Two captains sink the ship. (4) Civilized man cannot live without cooks.
 (5) All lay loads on the willing horse.

58. **Pride is to victory as humility is to:**
 (1) defeat (2) modesty (3) achievement (4) conceit (5) violence
59. **When 3 pupils were absent from a class, the attendance was 94%. How many pupils were there in the class?**
 (1) 30 (2) 90 (3) 50 (4) 15 (5) 31
60. **7, 5, 8, 6, 9, 7, 10,** What number should come next?
 (1) 7 (2) 10 (3) 8 (4) 11 (5) 5
61. **The outline is too vague to the shape.** A word for the blank is:
 (1) summon (2) resist (3) indicate (4) cause (5) ordain
62. **his scientific admired taste he knowledge for his artistic and for was** If these words were arranged to make a good sentence, what would be the word after **artistic**?
 (1) taste (2) admired (3) scientific (4) knowledge (5) was
63. **8, 4, 2, 1, $\frac{1}{2}$,** What two numbers should come next?
 (1) $\frac{1}{4}$ and $\frac{1}{6}$ (2) $\frac{1}{3}$ and $\frac{1}{4}$ (3) 1 and $\frac{1}{2}$ (4) $\frac{1}{4}$ and $\frac{1}{8}$ (5) $\frac{2}{3}$ and $\frac{3}{4}$
64.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
65. **Club is to member as hand is to:**
 (1) arm (2) feel (3) finger (4) body (5) work
66. **How many pints are there in 1 gallon and $1\frac{1}{2}$ quarts?**
 (1) 7 (2) 9 (3) 11 (4) 15 (5) 19
67. **Concentrate** is the opposite of:
 (1) think (2) taste (3) owe (4) rebuild (5) disperse
68.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
69. **Which word does not belong with the others?**
 (1) house (2) factory (3) residence (4) home (5) dwelling place
70. **If a franc were worth $2\frac{1}{2}$ ¢, how many francs would one receive for \$100.00?**
 (1) 2500 (2) 400 (3) 40,000 (4) 250 (5) 4000
71. **The daughter of my uncle has a brother. My father is her brother's**
 (1) grandfather (2) great-uncle (3) cousin (4) uncle (5) nephew
72. **Subsequent** means:
 (1) small (2) attached (3) following (4) irregular (5) important
73. **Vivacious** means about the same as:
 (1) intelligent (2) animated (3) sarcastic (4) courageous (5) moody

74. The ranks were by desertions. A word for the blank is:
 (1) depleted (2) accustomed (3) arranged (4) joyful (5) assumed
75.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
76. Onyx is a:
 (1) limestone (2) quartz (3) glass (4) granite (5) metal
77. A palette is used by:
 (1) carpenters (2) lawyers (3) musicians (4) artists (5) physicians
78. My sister's daughter is my father's
 (1) niece (2) cousin (3) granddaughter (4) sister-in-law (5) aunt
79. Which word does not belong with the others?
 (1) novice (2) accomplice (3) partner (4) associate (5) helper
80. substance made a bricks called and clay are from pottery If these words were arranged to make a good sentence, what would be the word after substance?
 (1) bricks (2) clay (3) called (4) are (5) pottery
81. My father's son's sister may be my daughter's
 (1) uncle (2) aunt (3) cousin (4) grandmother (5) niece
82.  is to  as  is to: (1)  (2)  (3)  (4)  (5) 
83. 1, 6, 11, 16, , 31. What two numbers should be on the dotted lines?
 (1) 21 and 26 (2) 17 and 25 (3) 26 and 29 (4) 22 and 27 (5) 20 and 25
84. 729, 243, 81, 27, , What two numbers should come next?
 (1) 9 and 3 (2) 26 and 25 (3) 20 and 13 (4) 19 and 11 (5) 9 and 7
85. Water seeks its own A word for the blank is:
 (1) money (2) weight (3) cold (4) level (5) length
86. A tremulous leaf is:
 (1) green (2) brown (3) parched (4) wilted (5) quivering
87. A commendable person is:
 (1) beginning (2) talkative (3) praiseworthy (4) formidable (5) important
88. "Still waters run deep" means about the same as:
 (1) Water is the best of all things. (2) After rain comes sunshine.
 (3) Rashness is not valor. (4) The more understanding, the fewer words.
 (5) He that seeks finds.
89. 625, 125, 25, 5, What number should come next?
 (1) 1 (2) 2 (3) 3 (4) 4 (5) 0
90. Electricity is to wire as gas is to:
 (1) flame (2) spark (3) hot (4) pipe (5) stove

APPENDIX J

Tables of Means, Standard Deviations, and Sample Sizes

Table 4

Means and Standard Deviations of All Cells Involved
in the Analysis of Variance in Table 1*

	F	D	HA	NA			F	D	HA	NA	
E-H Sequence	68.8 7.76 10	59.8 3.97 10	61.6 3.23 10	70.9 3.78 10	65.3 6.86 40	E-H Sequence	70.2 8.48 10	62.4 9.33 10	64.5 7.12 10	63.7 9.20 10	65.2 9.08 40
H-E Sequence	67.5 5.14 10	61.7 11.07 10	62.6 14.44 10	63.9 7.02 10	63.9 10.36 40	H-E Sequence	73.6 5.66 10	58.8 10.24 10	63.4 8.42 10	71.0 8.39 10	66.7 10.22 40
R Sequence	72.6 6.48 10	62.3 9.04 10	62.4 11.81 10	63.5 11.62 10	65.2 10.87 40	R Sequence	72.5 10.61 10	56.9 7.65 10	65.8 7.82 10	68.8 8.20 10	66.0 10.40 40
	69.6 6.90 30	61.3 8.63 30	62.2 10.94 30	66.1 8.87 30	64.8 9.55 120		72.1 8.62 30	59.4 9.42 30	64.6 7.86 30	67.8 9.13 30	66.0 9.94 120
FIELD SETTING						LABORATORY SETTING					

*The three numbers in each cell are respectively: the mean, standard deviation, and sample size.

Table 5
Means and Standard Deviations of All Cells Involved
in the Analysis of Variance in Table 3*

	Field Setting	Laboratory Setting	
E-H Sequence	65.0 7.95 55	63.4 10.05 55	64.2 9.10 110
H-E Sequence	63.4 10.27 55	66.1 10.93 55	64.7 10.69 110
R Sequence	65.9 10.41 55	65.0 10.59 55	65.4 10.51 110
	64.7 9.67 165	64.8 10.59 165	64.8 10.14 330

* The three numbers in each cell are respectively:
the mean, standard deviation, and sample size.

APPENDIX K

Raw Data

ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE	
1	1	1	1	1	1	1	2	33	20	69
1	1	1	2	1	1	1	1	30	22	68
1	1	1	3	2	1	1	2	27	20	64
1	1	1	4	2	1	1	3	32	25	70
1	1	1	5	1	1	1	1	27	21	75
1	1	1	6	1	1	1	2	31	27	72
1	1	1	7	1	1	1	1	29	27	69
1	1	1	8	1	1	2	1	27	25	50
1	1	1	9	1	1	1	3	26	24	82
1	1	1	10	1	1	1	3	24	23	69
1	2	1	11	1	1	1	3	11	43	57
1	2	1	12	2	2	2	3	15	40	63
1	2	1	13	1	1	1	1	18	37	64
1	2	1	14	1	1	1	3	18	36	60
1	2	1	15	2	1	1	2	17	35	66
1	2	1	16	2	1	1	3	17	34	55
1	2	1	17	2	2	2	3	17	33	62
1	2	1	18	2	1	1	1	20	36	53
1	2	1	19	2	2	2	3	19	34	57
1	2	1	20	1	1	1	2	24	39	61
1	3	1	21	2	1	1	1	28	37	63
1	3	1	22	2	2	2	3	28	35	55
1	3	1	23	1	1	1	1	28	33	63
1	3	1	24	2	2	2	3	27	32	62
1	3	1	25	1	1	1	1	23	35	64
1	3	1	26	1	1	2	1	22	36	61
1	3	1	27	2	1	1	3	29	29	66
1	3	1	28	2	1	1	3	28	29	58
1	3	1	29	2	2	2	3	24	33	65
1	3	1	30	2	1	1	2	28	28	59

ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE
1	4	1	31	1	1	1	16	22	71
1	4	1	32	1	1	1	2	21	75
1	4	1	33	2	1	1	1	21	68
1	4	1	34	1	1	1	2	16	75
1	4	1	35	1	1	1	3	18	75
1	4	1	36	1	1	1	2	19	69
1	4	1	37	1	1	1	2	22	76
1	4	1	38	1	1	2	1	23	67
1	4	1	39	2	1	1	3	24	66
1	4	1	40	2	1	1	3	19	67
1	0	1	41	1	2	1	2	25	72
1	0	1	42	2	1	1	1	24	73
1	0	1	43	2	1	2	1	19	63
1	0	1	44	1	1	1	1	27	71
1	0	1	45	2	1	1	1	24	61
1	0	1	46	2	1	1	1	23	74
1	0	1	47	2	2	1	2	24	56
1	0	1	48	2	1	1	2	27	74
1	0	1	49	2	1	1	2	23	59
1	0	1	50	2	1	1	3	24	80
1	0	1	51	2	1	1	3	22	69
1	0	1	52	1	1	1	3	22	42
1	0	1	53	1	2	1	3	25	58
1	0	1	54	1	1	2	3	23	47
1	0	1	55	1	1	1	2	28	66
2	1	1	56	1	1	1	1	33	70
2	1	1	57	1	1	2	3	24	58
2	1	1	58	1	1	1	3	35	75
2	1	1	59	1	1	1	2	32	65
2	1	1	60	1	1	1	1	30	68

ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE
2	1	1	61	1	1	2	35	27	74
2	1	1	62	1	1	1	33	26	62
2	1	1	63	2	1	1	26	19	72
2	1	1	64	1	1	1	26	19	64
2	1	1	65	1	1	2	24	18	67
2	2	1	66	2	2	1	17	41	52
2	2	1	67	1	1	1	16	34	48
2	2	1	68	1	1	1	20	36	51
2	2	1	69	2	2	1	19	33	47
2	2	1	70	2	1	2	26	38	70
2	2	1	71	1	1	1	24	36	62
2	2	1	72	2	2	1	21	33	78
2	2	1	73	1	1	2	24	35	74
2	2	1	74	2	2	2	23	34	62
2	2	1	75	2	1	1	24	34	73
2	3	1	76	1	1	1	28	37	61
2	3	1	77	1	1	1	30	34	71
2	3	1	78	2	1	1	29	34	46
2	3	1	79	1	1	2	26	36	38
2	3	1	80	1	1	2	27	34	51
2	3	1	81	1	1	1	27	33	83
2	3	1	82	2	2	2	26	33	52
2	3	1	83	2	1	1	28	28	79
2	3	1	84	2	1	1	27	29	74
2	3	1	85	1	1	1	23	33	71
2	4	1	86	1	1	1	21	19	62
2	4	1	87	1	1	1	22	19	58
2	4	1	88	1	1	1	25	22	69
2	4	1	89	1	1	1	26	22	65
2	4	1	90	1	1	1	23	26	48

ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE	
2	4	1	91	1	1	1	3	24	25	77
2	4	1	92	1	1	1	3	21	28	67
2	4	1	93	1	1	1	2	24	25	65
2	4	1	94	1	1	1	2	25	24	61
2	4	1	95	1	1	1	2	23	27	67
2	0	1	96	1	1	2	3	22	29	67
2	0	1	97	2	1	1	3	27	28	65
2	0	1	98	1	1	1	3	27	26	71
2	0	1	99	1	2	1	2	24	30	64
2	0	1	100	1	1	1	3	25	30	43
2	0	1	101	1	1	1	3	25	28	54
2	0	1	102	1	1	1	3	26	27	73
2	0	1	103	2	1	1	3	25	25	58
2	0	1	104	2	1	1	3	24	26	60
2	0	1	105	1	1	1	1	23	31	69
2	0	1	106	2	2	2	3	24	28	56
2	0	1	107	1	1	2	1	25	27	40
2	0	1	108	1	1	2	1	24	26	64
2	0	1	109	1	1	1	2	29	25	68
2	0	1	110	2	2	1	3	25	31	75
3	1	1	111	1	1	1	3	32	15	76
3	1	1	112	1	1	1	3	32	15	76
3	1	1	113	1	1	1	2	34	18	71
3	1	1	114	1	1	1	1	28	13	69
3	1	1	115	1	1	1	1	27	15	61
3	1	1	116	1	1	1	2	32	21	70
3	1	1	117	2	2	1	3	29	20	64
3	1	1	118	2	1	1	3	28	20	83
3	1	1	119	1	1	1	2	27	19	78
3	1	1	120	2	1	1	3	31	26	78

ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE
3	2	1	121	2	2	1	13	43	54
3	2	1	122	1	1	1	21	44	74
3	2	1	123	1	1	1	21	39	60
3	2	1	124	2	2	2	15	33	58
3	2	1	125	2	1	1	15	31	68
3	2	1	126	2	1	1	21	36	47
3	2	1	127	2	1	1	20	35	79
3	2	1	128	1	1	1	17	32	63
3	2	1	129	1	2	2	22	37	64
3	2	1	130	1	1	1	20	34	56
3	3	1	131	2	1	1	27	35	74
3	3	1	132	1	1	2	25	36	58
3	3	1	133	1	1	1	25	35	41
3	3	1	134	2	1	1	23	36	61
3	3	1	135	2	2	1	22	36	63
3	3	1	136	1	1	1	28	30	80
3	3	1	137	1	1	2	24	33	44
3	3	1	138	2	1	1	29	28	62
3	3	1	139	1	1	1	29	28	70
3	3	1	140	1	2	2	27	30	71
3	4	1	141	2	1	2	21	22	44
3	4	1	142	1	2	2	22	21	46
3	4	1	143	1	1	1	16	29	70
3	4	1	144	2	2	2	19	26	59
3	4	1	145	1	2	2	18	27	62
3	4	1	146	1	1	1	18	28	73
3	4	1	147	2	1	1	19	27	71
3	4	1	148	1	1	1	25	22	84
3	4	1	149	2	2	1	22	25	59
3	4	1	150	2	1	1	21	27	67

ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE
3	0	1	151	1	1	1	22	27	71
3	0	1	152	2	1	1	24	25	68
3	0	1	153	1	1	2	24	28	58
3	0	1	154	1	1	1	29	27	53
3	0	1	155	2	1	1	29	27	61
3	0	1	156	1	1	1	25	28	64
3	0	1	157	1	1	1	26	24	71
3	0	1	158	1	1	2	27	26	65
3	0	1	159	1	1	1	27	24	71
3	0	1	160	2	2	2	21	30	57
3	0	1	161	1	1	1	28	28	75
3	0	1	162	1	1	1	25	29	85
3	0	1	163	2	1	1	26	29	80
3	0	1	164	2	1	2	18	32	76
3	0	1	165	2	2	1	19	32	59
1	1	2	166	2	1	1	38	22	65
1	1	2	167	1	1	1	32	20	52
1	1	2	168	1	1	1	31	20	73
1	1	2	169	1	1	1	30	20	75
1	1	2	170	1	1	1	26	16	71
1	1	2	171	2	1	1	29	21	81
1	1	2	172	1	1	1	27	19	83
1	1	2	173	1	1	1	26	19	64
1	1	2	174	1	1	1	26	19	67
1	1	2	175	2	1	1	28	21	71
1	2	2	176	2	1	1	15	41	76
1	2	2	177	2	2	1	19	45	50
1	2	2	178	2	2	2	20	42	53
1	2	2	179	1	1	1	13	35	74
1	2	2	180	1	1	1	17	38	66

ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE	
1	2	2	181	1	1	2	1	26	46	50
1	2	2	182	1	1	1	3	16	36	55
1	2	2	183	1	2	2	3	18	37	71
1	2	2	184	1	2	1	2	21	40	63
1	2	2	185	1	1	1	3	19	37	66
1	3	2	186	1	1	1	2	29	41	67
1	3	2	187	1	1	1	1	29	34	75
1	3	2	188	2	1	1	3	31	30	74
1	3	2	189	1	1	1	2	24	37	64
1	3	2	190	2	2	1	2	22	39	57
1	3	2	191	1	1	1	3	31	29	59
1	3	2	192	1	1	1	3	27	31	59
1	3	2	193	2	2	2	1	27	30	60
1	3	2	194	2	1	1	1	26	31	74
1	3	2	195	2	2	1	2	24	33	56
1	4	2	196	2	2	1	2	14	21	70
1	4	2	197	2	1	1	3	17	22	70
1	4	2	198	2	2	1	2	21	18	52
1	4	2	199	1	1	1	2	20	23	60
1	4	2	200	2	2	1	2	21	23	61
1	4	2	201	2	1	1	3	23	21	80
1	4	2	202	2	1	1	3	24	21	76
1	4	2	203	2	2	1	2	16	29	54
1	4	2	204	2	2	1	2	16	30	55
1	4	2	205	2	1	1	3	24	22	59
1	0	2	206	2	1	1	3	26	23	68
1	0	2	207	1	1	1	2	19	28	79
1	0	2	208	2	1	1	1	20	30	52
1	0	2	209	1	1	2	3	25	25	39
1	0	2	210	2	1	1	3	24	32	67

ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE	
1	0	2	211	1	1	1	3	23	33	54
1	0	2	212	1	1	1	2	23	30	68
1	0	2	213	2	1	1	2	23	30	66
1	0	2	214	2	2	2	3	19	31	51
1	0	2	215	2	1	1	3	20	31	51
1	0	2	216	1	1	1	3	20	35	45
1	0	2	217	2	1	1	1	17	34	63
1	0	2	218	1	1	1	2	21	34	61
1	0	2	219	2	1	2	1	27	27	68
1	0	2	220	2	2	2	1	26	24	45
2	1	2	221	1	1	1	3	34	15	83
2	1	2	222	2	1	1	3	30	17	83
2	1	2	223	1	1	1	3	36	25	75
2	1	2	224	2	2	1	2	29	18	73
2	1	2	225	1	1	1	3	30	20	74
2	1	2	226	1	1	1	1	32	23	69
2	1	2	227	1	1	1	2	27	18	76
2	1	2	228	2	1	1	3	27	19	66
2	1	2	229	1	2	2	3	30	23	67
2	1	2	230	2	1	1	1	28	24	70
2	2	2	231	2	2	2	1	15	40	52
2	2	2	232	2	2	2	1	15	36	53
2	2	2	233	1	1	1	3	19	38	71
2	2	2	234	1	2	2	3	16	34	61
2	2	2	235	2	1	1	3	21	38	64
2	2	2	236	2	2	1	2	16	33	61
2	2	2	237	1	2	1	2	18	35	62
2	2	2	238	1	1	1	2	21	36	54
2	2	2	239	1	1	1	2	23	38	36
2	2	2	240	1	2	1	3	19	34	74

ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE
2	3	2	241	1	1	1	30	33	53
2	3	2	242	1	1	1	27	33	59
2	3	2	243	2	1	2	32	28	62
2	3	2	244	1	2	2	24	35	64
2	3	2	245	2	1	1	29	28	80
2	3	2	246	2	1	1	24	32	68
2	3	2	247	2	1	1	24	31	64
2	3	2	248	2	1	1	22	33	63
2	3	2	249	2	1	1	17	38	49
2	3	2	250	2	1	1	24	30	72
2	4	2	251	1	1	1	21	19	77
2	4	2	252	1	1	1	23	19	61
2	4	2	253	2	2	1	24	21	65
2	4	2	254	1	1	1	21	25	67
2	4	2	255	1	1	1	24	23	85
2	4	2	256	1	1	1	22	25	73
2	4	2	257	1	2	1	24	23	56
2	4	2	258	2	1	1	25	24	74
2	4	2	259	2	1	1	26	23	80
2	4	2	260	2	1	1	24	25	72
2	0	2	261	2	1	1	24	30	65
2	0	2	262	1	2	2	19	30	65
2	0	2	263	2	1	1	26	24	78
2	0	2	264	2	1	1	25	25	44
2	0	2	265	1	1	1	22	29	69
2	0	2	266	1	1	1	22	31	77
2	0	2	267	2	2	2	22	28	45
2	0	2	268	2	1	1	21	31	63
2	0	2	269	2	1	1	28	25	70
2	0	2	270	2	1	1	23	29	60

ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE
2	0	2	271	1	1	1	3	19	32
2	0	2	272	2	1	1	3	20	30
2	0	2	273	2	1	1	3	22	30
2	0	2	274	2	1	1	2	24	26
2	0	2	275	2	2	1	2	24	28
3	1	2	276	1	1	2	3	37	16
3	1	2	277	1	1	1	3	34	15
3	1	2	278	2	1	1	2	31	12
3	1	2	279	2	1	1	3	30	13
3	1	2	280	1	1	1	2	27	12
3	1	2	281	2	1	1	3	32	18
3	1	2	282	1	1	1	3	29	16
3	1	2	283	1	1	1	2	30	17
3	1	2	284	1	1	2	3	33	21
3	1	2	285	1	1	1	3	35	23
3	2	2	286	2	1	1	2	10	42
3	2	2	287	2	2	1	2	17	40
3	2	2	288	1	1	1	3	17	37
3	2	2	289	1	2	1	3	16	34
3	2	2	290	2	2	2	1	16	33
3	2	2	291	1	1	1	2	17	33
3	2	2	292	2	2	2	2	21	35
3	2	2	293	1	1	1	2	20	32
3	2	2	294	2	1	1	1	21	32
3	2	2	295	1	2	2	3	17	27
3	3	2	296	1	1	1	2	28	35
3	3	2	297	1	1	1	1	28	35
3	3	2	298	2	2	1	2	29	33
3	3	2	299	2	2	2	1	29	30
3	3	2	300	2	2	2	1	25	34

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ITEM SEQ	PERSON TYPE	TEST SETTING	SUBJECT IDENT NUMBER	SEX	COLLEGE PLANS-PROGRAM	SCHOOL IDENT	FACIL SCORE	DEBIL SCORE	APTITUDE TEST SCORE
3	3	2	301	1	1	2	28	31	58
3	3	2	302	1	1	1	30	28	61
3	3	2	303	1	1	1	29	29	67
3	3	2	304	2	1	1	25	32	72
3	3	2	305	2	1	2	27	30	62
3	4	2	306	2	1	2	21	18	58
3	4	2	307	1	1	1	21	21	63
3	4	2	308	2	1	1	25	18	81
3	4	2	309	2	2	2	22	25	72
3	4	2	310	2	1	1	19	28	75
3	4	2	311	2	1	1	21	28	70
3	4	2	312	2	1	1	22	27	81
3	4	2	313	2	1	1	24	25	68
3	4	2	314	2	1	1	25	26	57
3	4	2	315	1	1	1	26	25	63
3	0	2	316	2	1	1	26	26	65
3	0	2	317	1	1	1	28	24	73
3	0	2	318	2	1	1	24	32	55
3	0	2	319	1	1	1	24	29	65
3	0	2	320	2	2	2	28	26	50
3	0	2	321	1	1	2	26	28	61
3	0	2	322	1	2	2	27	28	58
3	0	2	323	2	1	1	23	30	69
3	0	2	324	2	1	1	23	30	76
3	0	2	325	2	1	1	23	30	63
3	0	2	326	1	1	1	28	25	75
3	0	2	327	2	1	1	28	29	74
3	0	2	328	2	1	1	22	29	64
3	0	2	329	1	1	1	30	23	45
3	0	2	330	2	2	2	28	25	40