

AN EXPERIMENT TO DETERMINE THE EFFECTS OF IMMEDIATE
VERSUS DELAYED KNOWLEDGE OF RESULTS ON INITIAL
LEARNING AND RETENTION OF SELECTED RELATED
LEARNINGS IN TRANSCRIPTION CLASSES

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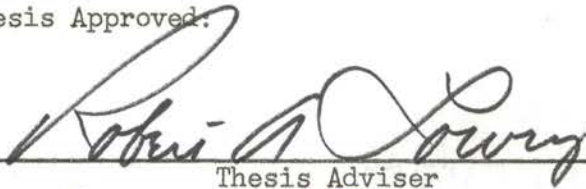
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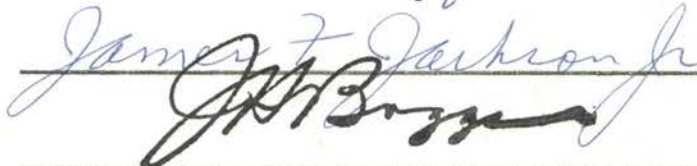
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PREFACE AND ACKNOWLEDGMENTS

Several studies have been conducted concerning the schedule of reinforcement by knowledge of results, but the findings of these various studies are contradictory. The purpose of this study was to contribute some experimental evidence to show the effects of immediate knowledge of results as opposed to delayed knowledge of results in teaching selected related learnings in transcription classes at Oklahoma State University.

My sincere appreciation is extended to Dr. Robert A. Lowry, who served as my major adviser and graduate committee chairman. His interest, encouragement, and guidance were invaluable during my graduate study.

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CHAPTER I

INTRODUCTION

The purpose of the study was to provide some experimental evidence to either support or deny the hypothesis that giving immediate knowledge of correct response is a superior technique of teaching to giving delayed knowledge of correct response, even though the delay may be rather short. This experiment will be an aid in determining if teaching techniques and materials should be designed to give immediate knowledge of correct response or if the more common technique of giving delayed knowledge of correct response is just as effective.

Statement of the Problem

1.2

The problem was to determine if, in transcription classes, students who receive immediate knowledge of correct response on related-learnings teaching materials initially learn and retain significantly more of the selected related learnings than students who receive delayed knowledge of correct response on related-learnings teaching materials. Individual differences of the students in the groups which were compared were controlled in the statistical analysis by pre-test scores and college grade-point averages. Initial learning was measured by interim quiz scores, and retention was measured by post-test scores.

The independent variable was the length of time between response and reinforcement by knowledge of correct response.

The dependent variables were the post-test scores and the interim quiz scores.

The potential intervening variables were: (1) personality of students, (2) motivation of students, (3) personality of teacher, and (4) time of day the classes met.

Null Hypothesis

There will be no significant difference in initial learning or retention between students who receive immediate knowledge of correct response on related-learnings teaching materials and students who receive delayed knowledge of results on related-learnings teaching materials. Individual differences of the students in the groups being compared will be controlled by pre-test scores and college grade-point averages. Initial learning and retention will be measured by interim quiz scores and post-test scores, respectively.

Need for the Study

Most educators seem to agree that teachers have a responsibility to search for improved teaching methods and techniques. Those areas of learning which are taught ineffectively at the present time demand the efforts of educators to teach them more effectively in the future.

A review of the literature revealed that frequently students of shorthand and transcription are deficient in their knowledge of the related learnings and that businessmen express a need for stenographers and secretaries who are competent in their knowledge of the

related learnings. Business educators, stenographers and secretaries, and employers of stenographers and secretaries seem to agree that one area which needs more emphasis in shorthand and transcription is the related-learnings area (Frink, 1961).

As the related learnings are not being adequately taught in many cases and as there is a need for teaching them more adequately, a logical conclusion seems to be that a more effective means of teaching the related learnings is needed. In addition, it seems likely that successful techniques of teaching the related learnings in transcription classes could be employed in teaching similar learnings in other classes, such as English classes and business communications classes.

Scope and Limitations of the Study

All of the transcription classes taught at Oklahoma State University during the spring semester of 1966 were included in the study. These classes were one experimental group and one control group in Office Management 302, Beginning Transcription, and one experimental group and one control group in Office Management 322, Advanced Transcription.

No effort was made to place any student in any particular section of the appropriate transcription course. Each student enrolled in the section he selected.

The sizes of the classes were balanced as nearly as possible by the limitation of class sizes by the department head. One class in Office Management 302 was somewhat larger than the other because the

size of the smaller class had to be limited to the capacity of the room in which it met.

A total of 161 students actually participated in the study, and data for 138 students were used in the final analysis. The data not used were excluded for one of the following reasons: (1) to balance, in the compared groups, the number of students concurrently enrolled in Business Communications 213; (2) to balance, in the compared groups, the number of students concurrently enrolled in English composition; (3) to balance, in compared groups, the number of students included in the final analysis; and (4) to include in the final analysis data for only the students who took the pre-test, the post-test, and an adequate number of the interim quizzes. A few students were absent from class and missed either the pre-test, the post-test, or several of the interim quizzes.

Basic Assumptions

The following are basic assumptions of the study:

(1) The findings of a similar study including a larger sample would yield results comparable to the findings of this study.

(2) The students enrolled in transcription courses at Oklahoma State University during the spring semester of 1966 are representative of students who will enroll in transcription classes at Oklahoma State University in the future.

Definition of Terms

ACT Scores: the scores made on the American College Test. All entering freshmen take this battery of tests. Students transferring

from other colleges or universities did not have ACT scores on record at Oklahoma State University.

Business Communications 213: defined by the Oklahoma State University College Catalog, 1965-1967 on page 195 as "a study of the basic writing skills as they apply to business communications." Some of the selected related learnings of this study are taught in Business Communications 213.

Control Groups: the groups, one in Office Management 302 and one in Office Management 322, which received delayed knowledge of correct response.

Delayed Knowledge of Correct Response: knowledge of the correct answer given after all items in the set of teaching materials have been answered. In this study the delay varied from approximately five to ten minutes.

English Composition: any course defined by the Oklahoma State University College Catalog, 1965-1967 as composition. Specifically, these courses are English 105, 115, 122, 123, 212, 222, and 232. Although the related learnings are not specifically taught in these courses, the students must either have or acquire some knowledge of them in order to write acceptable papers.

Experimental Groups: the groups, one in Office Management 302 and one in Office Management 322, which received immediate knowledge of correct response.

Immediate Knowledge of Correct Response: knowledge of the correct answer within two or three seconds after a response has been made to an item.

Office Management 302 and 303: defined by the Oklahoma State University College Catalog, 1965-1967 as Beginning Transcription and Beginning Dictation, respectively. Prerequisites to taking these courses are one semester of Beginning Shorthand and one semester of Advanced Shorthand, or the equivalent.

Office Management 322 and 313: defined by the Oklahoma State University College Catalog, 1965-1967 as Advanced Transcription and Advanced Dictation, respectively. Prerequisites to taking these courses are Office Management 302 and 303, or the equivalent.

Reinforcement: reward; a certain "condition which follows a response and increases the likelihood that that response will occur again" as defined by Travers (1963) on page 74.

Selected Related Learnings: punctuation; details that mark an acceptable letter; capitalization; numbers; abbreviations; word division; and one word, two words, or hyphenated word. These related learnings were selected from the Reference Manual for Stenographers and Typists by Gavin and Hutchinson.

CHAPTER II

A REVIEW OF SELECTED RELATED RESEARCH AND LITERATURE

The related research and literature was surveyed with three purposes in mind: (1) to review findings concerning giving knowledge of results as opposed to giving no knowledge of results or knowledge of results only a part of the time; (2) to review findings concerning giving immediate knowledge of results as opposed to giving delayed knowledge of results; and (3) to review findings and thinking concerning the need for improved instruction in the related learnings in shorthand and transcription classes. The research and literature surveyed was classified in accordance with these purposes. Some of the studies in the first two classifications were actually related to both classifications; however, all studies dealing with immediate as opposed to delayed knowledge of results were placed in the second classification only. Also, many of the studies included additional information not directly related to the particular classification in which they were placed.

In pointing out the desirability of classroom reinforcement, Skinner (1954) said that perhaps the most serious criticism of the current classroom is the relative infrequency of reinforcement. His experimental work was concerned with an analysis of the effects of

reinforcement in learning and the designing of techniques by which reinforcement can be manipulated with considerable precision.

Some literature mentioned a need for additional study concerning reinforcement using human subjects. According to Renner (1964), studies related to delay of reinforcement have been largely confined to animal studies; and only recently have a number of studies with human subjects been conducted. An important question is whether basic generalizations from animal experiments also apply to human learning situations. He further suggested that, although the available data on human delay-of-reward learning tend to agree with the data from animal studies, more experimental work is needed to clarify the effect of delay of reinforcement.

In addition, Gage (1963) reported that some studies have been conducted concerning the effect of reinforcement on learning, both the kind of reinforcement and the timing of reinforcement; however, relatively few studies have experimentally manipulated reinforcement factors as they operate in practical instruction.

The reviews reported in this chapter all deal with human subjects varying in age from about six years to adults. Their learning tasks vary from relatively simple ones to complex ones.

Schedule and Form of Knowledge of Results

In the studies reviewed, the schedule of knowledge of results varied from no knowledge of results to complete or 100 per cent knowledge of results. When complete or 100 per cent knowledge of results was given, the subjects received knowledge of results 100 per cent of the time. Partial knowledge of results was given in

some cases, meaning that subjects received knowledge of results only a part of the time.

The first study reported in this section, a doctoral study by Melina, deals with a motor skill learning. All other selected research related to the schedule or form of knowledge of results deals with the learning of a verbal task.

Melina's (1963) study examined performance changes in the speed and accuracy of a baseball throw as a function of different conditions of information feedback, with information concerning the speed and/or accuracy of performance given immediately after each throw. The subjects were 55 high school males of 14 to 16 years of age, divided into five groups of 11 each. One group was the control group and received no practice sessions. The other four groups were experimental groups and received 12 practice sessions under the following different information feedback conditions: speed-accuracy feedback, accuracy feedback only, speed feedback only, and no feedback. Initial and final performance tests were given to all groups. The findings were: (1) An improvement in both speed and accuracy resulted with information feedback of both speed and accuracy. (2) An improvement in accuracy and a reduction in speed resulted under both the conditions of information feedback of accuracy only and information feedback of speed only. (3) A reduction in accuracy and no change in speed resulted when no information feedback was given.

Some of the studies concerning the schedule of knowledge of results investigated verbal learning in the acquisition stage only. Ammons (1956) reviewed and summarized research and material available concerning the effects of knowledge of performance. He made several

empirical generalizations based upon what he considered to be adequate studies. One of these generalizations was given on page 283:

"Knowledge of performance affects rate of learning and level reached by learning." Learning will reach a higher level of proficiency at a faster rate when knowledge of performance is provided.

In his review, Jenkins (1950) also said that, generally, acquisition of a learning skill is somewhat more rapid and reaches a higher final level under continuous reinforcement than under partial reinforcement, meaning reinforcement only a part of the time. Partially reinforced groups may reach the same level of proficiency attained by continuously reinforced groups if prolonged training is given; but in general, a continuous schedule is better for building response strength. He did point out, however, that resistance to extinction of the learned task is greater after partial reinforcement than after continuous reinforcement.

Agreeing with Ammons and Jenkins, Amsell (1960) pointed out that programmed instruction is used in the acquisition stages of learning; and continuous schedules of knowledge of results are generally used for this type of task.

In a later study, Aumiller (1963) investigated the effects of knowledge of results on learning to spell new words by third-grade and fifth-grade pupils. His subjects were 80 third-grade pupils and 110 fifth-grade pupils. The control groups received no knowledge of results, and the experimental groups received knowledge of results in the form of the correct answer. His findings were that knowledge of results did not significantly affect the amount of learning on either the third-grade or the fifth-grade level. Students who were provided

knowledge of results made significantly fewer errors on the programmed material, but there was no significant relationship between rate of errors and spelling achievement when learning to spell by means of the spelling program.

Other studies investigated the effects of the schedule of knowledge of results on both learning in the acquisition stage and retention. All of these selected studies were made recently and found that the schedule of knowledge of results had no effect on either acquisition of the learning task or retention. One of these studies was Brown's (1963), which was made to determine the effects of varying the amount of knowledge of results in a programmed text on immediate learning and retention and also to ascertain the relationship between intelligence and knowledge of results in programmed learning. His subjects were 150 university students, divided into high, middle, and low groups according to College Board Verbal scores. From each group, the students were randomly assigned to five versions of a programmed text in introductory psychology. Each of the assigned versions was studied by five students from the high group, twenty from the middle group, and five from the low group. One version gave knowledge of results 100 per cent of the time; another, 75 per cent; another, 25 per cent; another, 0 per cent; and the fifth version was one in which the answers were filled in above and/or below the blanks. The results showed no significant differences in immediate achievement or retention between any of the groups receiving the five versions. However, there was a significant relationship between intelligence and performance on the programmed texts, independent of the amount of knowledge of results provided. The higher intelligence subjects performed significantly higher on the achievement

tests and retention tests. The study concluded, though, that knowledge of results may serve no useful purpose in programmed instruction.

Another study investigated the relationship of individual differences in intelligence to the effectiveness of different patterns of feedback in linear programming (Oppenheim, 1964). Three versions of a program were prepared, one providing answers after each frame, another providing no answers, and another having answers covered by a tab and instructing the student to look at the answers when he felt a need to do so. Both an immediate and a delayed post-test were given to the 189 subjects. The results revealed no significant differences in the three groups.

A very recent study by Rosenstock, Moore, and Smith (1965) compared the effectiveness of programs using no knowledge of results, knowledge of results after each response, knowledge of results a part of the time in a fixed pattern, and knowledge of results a part of the time in a variable pattern. The subjects were 92 sixth-grade students stratified on the basis of sex and randomly assigned to one of four groups. A linear program of a constructed-response type on set theory was used. The measuring instruments were a pre-test, a post-test, and a retention test. The covariates in the analysis of covariance were intelligence test scores and mathematics achievement scores. The findings revealed that the amount of achievement on the post-test and on the retention test was not significantly affected by the schedule of knowledge of results used.

Austin's (1965) recent study compared the effectiveness of two different methods of supplying students with confirming answers to a programmed text for teaching multiplication of fractions to sixth

graders. One text was written so the student gave a multiple-choice answer; the other, a written answer. Reinforcement by confirming answers was given on a 50 per cent schedule and a 100 per cent schedule. Also, half of the groups were given a pre-test and immediate post-test; the other half, a pre-test and delayed post-test. The 300 subjects were randomly divided into the eight treatment groups. The results showed no significant difference in the gain score between reinforcement 50 per cent of the time and reinforcement 100 per cent of the time. Also, there was no significant difference in the amount of material recall immediately after having studied the text and one week later.

In some of the studies reviewed, the form of knowledge of results varied with the amount of knowledge given about the answer. In some cases knowledge of results was merely an indication that the response made by the subject was correct or incorrect. In other cases more specific knowledge was given by providing the correct answer to the subject. Most of the cited studies indicated that the more specific knowledge was desirable.

One of Ammons' (1956) generalizations as stated on page 287 was: "The more specific the knowledge of performance, the more rapid the improvement and the higher the level of performance."

Studies agreeing with Ammons' generalization were by Hirsch (1952), Irion and Briggs (1957), and Briggs (1961). Hirsch (1952) concluded that there was less effect when students were simply told right or wrong than when the correct answer was also provided. The best results were found when the correct answer was presented in the context of repeating the question, thus giving an added practice trial. Irion and Briggs (1957) and Briggs (1961) found that giving knowledge of

results by showing the correct answers was significantly better than merely a right or wrong indication.

A recent study which contradicted these earlier findings was by Moore and Smith (1964). Their study compared the effects of several types of knowledge of results on achievement level to determine whether direct response confirmation on each trial was necessary and also whether the form in which the confirmation was presented affected the level of achievement. The subjects were 220 college students in an introductory psychology course. The different forms of knowledge of results were: no knowledge of results, immediate knowledge of what the correct response should be by means of a teaching machine, immediate knowledge of whether the given response was correct, immediate knowledge of results plus extrinsic reward (one penny for each correct response), and immediate knowledge of what the correct response should be by means of a programmed text. In addition, for each of these types of knowledge of results, one mode of responding was by multiple choice and another mode was by a constructed response, or a written response. The results indicated that the type of reinforcement, the mode of presentation (teaching machine or programmed text), and the mode of responding did not significantly affect achievement. However, students who received knowledge of what the correct response should be and students who received an extrinsic reward in addition to knowledge of results had a lower error rate on the programmed materials.

Immediate and Delayed Knowledge of Results

In the studies reported in this section, immediate knowledge of results gave the subjects information feedback instantly upon their making a response. Some studies defined immediate knowledge of results as a 0.0-second delay, and the subjects in the immediate knowledge of results group were compared with other subjects receiving a delayed feedback as short as 0.5 seconds.

In some of the studies reported, delayed knowledge of results varied from 0.5 seconds to 30 seconds. In other cases the delay was one day, until the following class period, or until the following learning session. Therefore, some of the delays were as long as two or three or even four days.

Other factors given consideration in the various studies reported were the effects of: intervening activity between response and knowledge of results for the groups receiving delayed knowledge of results; accompanying knowledge of results with accessory stimuli, such as a bell, light, or mild electric shock; the amount of cue content in the material being learned; the method of presenting the material being learned; accompanying knowledge of results with a tangible reward, usually a monetary reward; and the complexity and meaningfulness of the material to be learned.

These studies concerning immediate and delayed knowledge of results were divided into two groups, those in which the subjects learned a motor skill and those in which the subjects were given a verbal learning task. Most of the early studies dealing with immediate versus delayed knowledge of results were concerned with the learning of a motor skill.

Motor Skill Learning

Renner (1964) in his historical review stated that, relatively speaking, most of the studies involving human subjects have been concerned with the effect of delayed knowledge of results on performance in a simple motor task. He said that almost all of these studies indicated that delay of knowledge of results did not interfere with performance. These studies concluded that the delay between responses, and not the delay between response and knowledge of results, was the crucial time; and only long intervals between responses were damaging to performance.

One study which agreed with Renner's (1964) conclusions was Saltzman's (1955) investigation of the effect of delay of reward on the speed with which human subjects learned a simple motor skill. The reward was informing the subject that his response was correct. The subjects were 90 undergraduate college men and women selected randomly and divided into three groups of 30 each. Group I received immediate knowledge of the accuracy of the response; Group II, a 10-second delay; and Group III, a 20-second delay. The results showed no significant difference in the speed of learning between any of the groups.

Lavery's (1964) findings partially agreed with Renner's (1964) conclusions. His study compared both acquisition and retention between groups receiving immediate knowledge of results and groups receiving a one-trial delay of knowledge of results on a tossing skill and also measured the effect on learning of giving subjects specific knowledge of results. The results indicated that acquisition of learning was slightly slower for the group receiving knowledge of results after a one-trial delay, but retention was significantly better under this

treatment. In both groups performance was significantly better when more specific knowledge of results was given.

Other studies do not support Renner's (1964) conclusions concerning delay of knowledge of results in the learning of a motor skill. One of these studies was by McGuigan (1960) in which he sought to (1) confirm previous findings that the longer the delay of knowledge of results the poorer the performance, (2) determine whether the length of time by which knowledge of results antedated a response affected performance, (3) compare the effectiveness of knowledge of results that immediately followed a response with knowledge of results that immediately antedated a response, and (4) study the effects of a second series of trials in which knowledge of results was not provided. The subjects in his study were 56 female college students randomly assigned to four groups of 14 each. The subjects were blindfolded, asked to draw a 3-inch line, and then given knowledge of results by a verbal "short," "right," or "long." One group received knowledge of results immediately after each response, following which the subject immediately drew the next line. The second group was given knowledge of results 20 seconds after each response, following which the subject immediately drew the next line. The third group was given knowledge of results immediately after each response, following which the subject waited 20 seconds before drawing the next line. The fourth group received knowledge of results 20 seconds after each response, following which the subject waited 20 seconds before drawing the next line. The results were: immediate knowledge of results after a response was superior to delayed knowledge; variation in the length of time that knowledge antedated a response did not

affect performance; there was no significant difference between knowledge furnished immediately before and immediately after a response; and the superiority of training with immediate knowledge of results after a response was lost when knowledge was removed.

In another study, Greenspoon and Foreman (1956) investigated the effect of delaying knowledge of results on the speed of learning a motor task. The subjects were 40 undergraduate college students randomly assigned to five groups of eight each. Group I received immediate knowledge of results. Group II received knowledge of results after a 10-second delay; Group III, a 20-second delay; and Group IV, a 30-second delay. Group V received no knowledge of results. The findings showed a significant difference between all groups in the speed of learning with one exception. The indication was that increasing the length of the delay of knowledge of results reduced the rate of learning significantly with the exception of the difference between the 20-second and the 30-second delay groups. A delay of 30 seconds was found to be superior to no knowledge of results.

Smode (1957) approached the subject from the point of view of determining the motivational effect of supplying specific and continuous knowledge of results throughout each trial in learning a motor skill. He pointed out that the literature illustrates three essential features inherent in knowledge of performance: (1) in tasks that are highly overlearned, it increases the level of performance; (2) as evidenced by more rapid acquisition, it facilitates learning; and (3) it leads subjects to report that the task is more interesting, less tedious, and less fatiguing. Therefore, the inference was drawn that knowledge of performance has a motivational effect. In his experiment a one-

dimensional electronic compensatory tracking apparatus was used for 160 male volunteer subjects. Two schedules of knowledge of performance were used. At the end of each trial, the experimenter verbally gave discrete performance information to the low-level information groups. Throughout each trial, immediate and continuous performance information was given audio-visually to the high-level information groups. The results showed that motivation arising from knowledge of performance information had a significant effect on both performance and learning. The learning effects and performance effects appeared to be similar in magnitude.

Verbal Learning

In testing the effects of immediate knowledge of results versus delayed knowledge of results, Porter (1957) on page 139 of his review on teaching machines stated that the crucial test of the value of immediate reinforcement has to meet the following criteria:

- (1) Provide both experimental and control groups with knowledge of results, making sure that both groups receive equivalent information about the correctness of their responses.
- (2) Reinforce subjects in the experimental group as quickly as possible after a response is made.
- (3) Delay reinforcement of the control group.

All of the studies reported in this section meet the criteria set up by Porter (1957). Many of them compared other factors in addition to immediate and delayed knowledge of results and therefore gave evidence concerning other potential variables of learning as well as the timing of reinforcement.

In stressing the importance of immediate reinforcement, Skinner (1954) stated that the lapse of only a few seconds between response and reinforcement destroys most of the effect of reinforcement unless

explicit mediating behavior has been set up. In one of his experiments, he pointed out that the important feature of the learning device used in the experiment was that reinforcement for the right answer was immediate.

Some writers have reviewed the literature and research findings and arrived at what they call principles of learning or generalizations about learning. For example, Wolfe (1951) reviewed research findings and determined that a number of general principles of learning have emerged from laboratory studies. One such principle concerning knowledge of results was stated on page 1267: "Laboratory studies are unequivocal in emphasizing the importance of giving a subject as specific and as immediate information as possible concerning the outcome of his efforts." Another principle was stated on page 1268: "The subject should be told his results not only as precisely as possible, but also as soon after each trial as possible. This principle applies to both animals and men." Another similar principle was given on pages 1268 and 1269: "The knowledge of results in training programs should be automatic, immediate, and meaningfully related to the task being learned."

Similarly, on page 287, Ammons (1956) arrived at the following empirical generalization: "The longer the delay in giving knowledge of performance, the less effect the given information has."

Some studies investigated the effect of the timing of knowledge of results on only the acquisition of a learning task and found that immediate knowledge of results produced faster acquisition or a higher level of learning or both than did various schedules of delay in knowledge of results. One of these studies, by Saltzman (1951),

investigated the effects of delay of reward on verbal learning of moderate difficulty. The reward was information feedback to the subject that his response was correct or incorrect. The delay period was for 6 seconds in the delay-of-reward group. The subjects were 44 undergraduate college men and women randomly divided into two groups of 22 each. In the first experiment no significant difference in the speed of learning was found between the two groups, but the difference was in favor of the immediate-reward group. However, at the end of this experiment, it was learned that 37 of the 44 subjects were not learning the numbers but only a pattern of correct responses; so the experimenter was not actually controlling the time between the stimulus-response occurrence and the reward because of the subjects' approach to the problem. The experiment was repeated with the same design and with the same number of subjects, but the pattern would not necessarily produce the correct answers. The results of this experiment showed a significant difference in the speed of learning in favor of the group receiving immediate reward.

Another study investigated concept identification as a function of both delay of information about the correctness of a response and the degree of task complexity as measured in terms of the amount of irrelevant information (Bourne, 1956). The 162 subjects were to classify geometric patterns into four categories. Nine subjects served in each of the 18 groups. Six delay intervals were set up: 0.0, 0.5, 1.0, 2.0, 4.0, and 8.0 seconds; and three levels of irrelevant information were set up: 1, 3, and 5 bits. The three performance measures used were time to solution, trials to solution, and errors. Also, the grade-point averages of the students were used as measures

of intelligence. The results of the study showed that performance decreased at a positively accelerated rate as the delay increased. Also, performance decreased linearly with an increase in irrelevant information. No performance measure correlated significantly with grade-point averages.

Meyer's (1960) study was concerned with the principles of the teaching machine. Her review of related literature and research indicated that teaching machines are designed to (1) require constant responding or activity on the part of the student, (2) provide sufficient guidance to minimize chance of error, (3) provide immediate knowledge of the correct answer, and (4) require that each correct answer be emitted by the student. The subjects in her study were 44 eighth-grade students attempting to learn Latin prefixes in English words. One group received immediate knowledge of the correct answers by means of programmed instruction. For the other group, the experimenter corrected the responses between learning sessions. It was found that the delay group made a significantly greater number of errors on the learning materials. The gain in points from the pre-test to the post-test was significantly less in the delay group than in the immediate group. This study supported the hypothesis that students who commit the fewest errors on the learning materials make the highest test scores. The findings suggested that the elimination of errors is an important part of efficient teaching.

Another of these studies was made by Champion and McBride (1962) to compare the effect of a 2-second and a 5-second delay of reinforcement by knowledge of results and also to compare the effect of activity between response and knowledge of response under the delay of

reinforcement of 2 seconds and of 5 seconds. The subjects were 80 undergraduate college students divided into four groups receiving the following treatments: (1) 2-second delay of reinforcement with no activity during delay, (2) 2-second delay of reinforcement with activity during delay, (3) 5-second delay of reinforcement with no activity during delay, and (4) 5-second delay of reinforcement with activity during delay. The material to be learned consisted of paired associates. The measure used was the speed with which the response was given. The results showed that both a delay in reinforcement and activity during the delay had significant detrimental effects.

Similarly, Landsman and Turkewitz (1962) made a study to determine whether a 6-second delay of knowledge of results was detrimental in learning a cognitive task. The subjects were 20 undergraduates divided into two groups of ten each. One group was given knowledge of results immediately, and the other group was given knowledge of results after a 6-second delay. The results showed that the number of trials required to learn the cognitive task was significantly greater for the group receiving delayed knowledge of results than for the group receiving immediate knowledge of results. The experimenter suggested that a wide range of tasks, from purely motor to purely cognitive, should be tested for the effect of delay of knowledge of results.

Two recent studies which found that a delay in knowledge of results was not detrimental to the acquisition of learning were by Brackbill and Kappy (1962) and by Ottina (1964). Brackbill and Kappy's (1962) study was concerned with teaching a serial-learning task. They reasoned that when cues were present the delay had no effect.

The study by Ottina (1964) investigated the effects of a 10-second delay in knowledge of results on the amount of material learned by teaching-machine methods using teaching materials which differed in cue content. Four groups of seventh-grade students were used, each group consisting of 15 students. The groups were individually matched on sex and intelligence, and the groups as a whole were matched on arithmetic reasoning and arithmetic fundamentals. Two groups were given materials having high cue content, and two groups were given materials having low cue content. Both sets of materials covered identical topics of fundamentals in algebra and differed only in cue content. Immediate knowledge of results was given to one group using high cue-content material and to one group using low cue-content material. A delay of 10 seconds in knowledge of results was given to the other two groups. Each subject used the machine at his own pace. The training time of each subject was recorded, and at the conclusion the subjects were tested. The results showed no significant difference in the amount of learning between the groups receiving immediate knowledge of results and the groups receiving a 10-second delay of knowledge of results. However, a significantly shorter training time was required by the groups using high cue-content material. The recommendations were that future designs of teaching machines should consider the constraint of "immediate knowledge of results" to be satisfied if knowledge of results can be provided within 10 seconds. Also, high cue-content items should be used to minimize student and equipment time. He also suggested that more research is needed to determine the value or range of values for cue content for minimum training time.

A study by Mario-Piana (1956) approached the subject from a somewhat different point of view. He indicated that some theory suggests that feedback procedures enhance learning through influencing the subject's active search for the reasons underlying a correct response. The two feedback procedures used in his study were one in which the subject was immediately told the correct answer when he gave an incorrect response and another in which the subject was told to keep trying until he discovered the right answer. The results showed that the subjects who had to keep searching for the correct answer learned to define significantly more concepts than the subjects who were immediately given the correct answer.

A number of studies investigated not only the acquisition of learning but also retention as a function of the timing of knowledge of results. Some of this research was summarized by Briggs (1964). He concluded that a slight delay in exposing the answer on the teaching machine is advantageous because it increases retention. The immediate learning may be no different than with immediate knowledge of results, but retention is enhanced. He further pointed out that previous studies indicate contradictory results on initial verbal learning with immediate and delayed knowledge of results, but in many of these studies retention has not been evaluated. Although delayed reinforcement retards learning in animals and often no learning at all occurs with a delay of more than a few seconds, researchers have pointed out that language is used to bridge the gap of time in human verbal learning so that reinforcement may be effective several hours or even days after the response.

Another hypothesis by Briggs (1964) was that the more complex the learning task, the more benefit is derived from increasing the delay of knowledge of results within some limit, both for immediate and delayed retention. This limit must be determined empirically, as only indirect evidence is available to support this hypothesis.

One study which considered both immediate learning and retention found that immediate knowledge of results enhanced retention of one day but had no significant effect upon immediate learning or retention of three weeks. Smith (1964) studied the effects of two degrees of immediacy of knowledge of results and three methods of presentation on the retention of knowledge contained on a filmstrip. The subjects were 745 fifth-sixth, seventh-eighth, and eleventh-grade students. Within each grade group, students were randomly assigned to one of six different treatment groups. The groups received either no knowledge of results, immediate knowledge of results by means of how far the stylus went into the punchboard if the response to a test item was correct, or the correct answer to a test item on the following day. The data were analyzed by covariance, with science achievement scores and intelligence quotients being the covariates. The findings indicated that immediate knowledge of results appeared to have a significant effect on immediate retention (one day) of information but did not have a significant effect on immediate learning or long-term retention (three weeks). In grade eleven, knowledge of results did not facilitate learning or retention of information; but in grades seven-eight and five-six, knowledge of results was helpful.

Another study which considered both acquisition and retention introduced accessory stimuli in one treatment. Culclasure (1964) attempted to answer the following two questions: (1) Does introducing knowledge of results with accessory stimuli (bell, light, or mild electric shock) facilitate acquisition and retention of verbal learning tasks? (2) Does introducing a 2-second delay in knowledge of results inhibit acquisition and retention of verbal learning tasks? The subjects of the study were 50 enlisted Army volunteers who learned lists of nonsense trigrams which were presented in multiple-choice program frames by an auto-instructional device. Each list consisted of ten frames, and the individual program frames contained a stem trigram and two alternative trigrams, one of which was the correct match for the stem trigram. Five such lists were used. The correct response was accompanied by either (a) knowledge of results (the control condition), which consisted of immediate delivery of the succeeding frame by the device; (b) knowledge of results accompanied by an accessory stimulus; or (c) knowledge of results after a 2-second delay. The results showed that a significant effect upon acquisition and retention of verbal learning was not found by accompanying knowledge of results with an accessory stimulus or by introducing a 2-second delay of knowledge of results.

The findings of studies which were concerned with retention only are just as contradictory as those dealing with acquisition only or acquisition and retention. One experiment of interest found that retention was enhanced by a delay of knowledge of results in one kind of learning situation but was not affected in another kind of learning situation. In Lintz and Brackbill's (1966) study, they

pointed out that recent investigations have indicated that delay of reinforcement during learning facilitates retention. These studies have used subjects from six to nine years of age and have used a discrimination form of learning. Their particular study tested the generality of previous findings with respect to the type of learning task and the age of the subjects. Another purpose of their study was to assess the relative contributions of the delay-retention effects upon knowledge of results and upon tangible reward. Four experiments were reported. The results of Experiments I and II were so different from the results obtained previously in children studies that Experiments III and IV were carried out as replication. The subjects in these experiments were of college age and were given either paired-associate learning or discrimination learning. The variables of the two levels of reinforcement were 0- and 10-second delays. The results of the experiments showed that delayed reinforcement improved retention of paired associates but had no effect on retention in the discrimination learning. The effects of monetary reward were not significant. These findings suggest that for human subjects the learning process may not be the same at all developmental levels.

Another study by Brackbill, Isaacs, and Smelkinson (1962) pointed out that previous studies which concluded that delay of reinforcement during learning improves retention used uniform material that was familiar and had meaning to the subjects. This particular experiment was for the purpose of determining whether the same results would occur using unfamiliar nonsense material. The subjects were 24 third-grade boys. The results showed that reinforcement during learning improved retention on unfamiliar nonsense material.

An earlier study with results that contradict those of the two previously cited studies was Angell's (1949) investigation of the effect of immediate and delayed knowledge of quiz results on learning in freshman chemistry. The experimental group received immediate knowledge of the correctness of their answers by means of a punchboard on which a red color became visible as soon as the punch was made if the selection punched was the correct answer. The delayed knowledge of results group answered on IBM score sheets which were scored and returned the class period following the test. Both groups were given the same three quizzes at the same hour on the same day. The quiz papers were returned to both groups at the class period following the test, and a full 50-minute period was used for discussing errors and correcting answers for every test item. Both groups used IBM answer sheets on the final examination, which was the criterion score. The data were first analyzed by covariance, using all available cases and holding the pre-scores constant. Later the data of 81 matched pairs were analyzed by the variance technique. The results showed a significant difference in favor of the experimental group on the final examination scores.

Related Learnings

The reviews reported concerning related learnings emphasized that effective teaching of the related learnings is vital and that in many instances the related learnings are not being successfully taught. These opinions have been expressed by business educators, by stenographers and secretaries, and by employers of stenographers and secretaries.

One business educator, in her analysis of research findings and thought pertaining to shorthand and transcription, was very emphatic in pointing out the need for improved instruction in the related learnings. In her study, Frink (1961) reported that more than 80 per cent of the students completing one year of shorthand instruction in the secondary schools cannot produce mailable transcripts from material dictated at 60 words a minute; and more than 50 per cent completing two years cannot produce mailable transcripts from material dictated at 80 words a minute.

Frink (1961) further reported that student lack of knowledge of correct spelling, punctuation, grammatical construction, and word usage was ranked high on a list of problems of stenographic teachers. Also, graduates employed in stenographic jobs said that more emphasis should be given to related learnings. In some instances graduates recommended an additional course in business English, but in most cases they thought that more time should be devoted to teaching related learnings in the shorthand and transcription classes. In addition, businessmen indicated that less than 40 per cent of their stenographic employees had adequate preparation in related learnings. Furthermore, an error analysis of student transcripts revealed that errors in related learnings accounted for approximately 40 per cent of total errors. Also, an analysis of English and punctuation errors of 1,765 business letters sent out by firms in 42 different states revealed that 82 per cent of the letters contained at least one error. In these letters containing errors, 47 per cent of the errors were in English and 53 per cent were in punctuation.

Several other doctoral studies made strong cases for the need of improved instruction in the related learnings. In pointing out the importance of teaching punctuation in secretarial classes such as transcription, Green (1950) stated that the stenographer has complete responsibility for the correctness of punctuation. Also, Aberle's (1954) study indicated that graduates reported a need for more knowledge of business English. Wilke's (1961) study indicated that more emphasis should be given to teaching the related learnings, particularly punctuation usage, in shorthand classes.

James's (1963) research revealed the following as the greatest technical weaknesses found by employers in beginning stenographic and secretarial workers: poor spelling, poor grammar, poor dictation and transcription, poor typewriting, and lack of English fundamentals.

Stehr (1958) pointed out in his doctoral study that poor punctuation skill, poor penmanship, and inability to perform accurate arithmetic computations were the chief deficiencies in basic skill training.

Tate's (1952) study analyzed the duties of 107 secretarial workers employed in eleven different categories of businesses. The businesses were classified as small-, medium-, or large-sized offices. A command of English was identified as one of the basic factors on which secretarial work is based to a considerable extent.

Sarthou (1960) made a survey to determine the needs of secretaries who were members of seven selected chapters of the National Secretaries Association in 1959. Data were collected by a questionnaire designed to elicit information concerning educational background and additional

education needed. Of the respondents, 90 per cent stated a need for refresher training in business law, office management, accounting, English, and psychology. These respondents believed that English, psychology, office management, business law, accounting, business organization, and filing should receive major emphasis in a college secretarial curriculum.

Flood (1962) also presented a good case for improved instruction in the related learnings. In an unpublished study of errors made in 1,000 business letters that had been mailed, she found that only 248 of these letters were considered mailable. A mailable letter was defined as one which contained none of the types of errors usually checked in her classes at Mankato State College and which was clear in meaning. The total number of errors in these letters was 1,103, and more than half of these were related-learnings errors. Word division errors occurred 649 times, and punctuation errors occurred 173 times. The other errors were in spelling, poor erasures, placement, strikeovers, or typewriting.

Some of Anderson's (1962) findings, derived from various research studies relating to shorthand and transcription were: that businessmen frequently report that their secretaries are weak in grammar, spelling, and punctuation; that the most common errors in transcription are in punctuation, typing, grammar, spelling, and capitalization; and that the most frequently reported punctuation errors are in the use of the comma, the apostrophe, and the hyphen. She concluded that one of the significant implications of these findings is that emphasis should be placed on related skills such as English fundamentals of punctuation,

capitalization, and grammar and on correct typing usage in shorthand and transcription classes.

Summary

A thorough review of the research and literature concerning reinforcement by knowledge of results revealed many contradictory thoughts concerning the subject. Some researchers found that giving knowledge of results was better than giving no knowledge of results, and others found that giving no knowledge of results did not have a detrimental effect on learning. Some studies reported that a delay in knowledge of results was detrimental to learning in the acquisition stage but facilitated retention. Other findings were that retention was hindered by a delay in knowledge of results. Some researchers found that immediate knowledge of results facilitated acquisition of learning, and others found that it had no effect.

Even though some writers concluded from their review that some principles of learning can be established and some generalizations can be made, it seems that the review presented in this chapter would cause one to be very hesitant in arriving at any conclusions. Perhaps the safest conclusion is that establishing the effect of knowledge of results in any given situation, on any given age group, and for any given type of learning requires thorough experimentation.

The review concerning the related learnings revealed that very frequently students of shorthand and transcription do not receive adequate instruction of the related learnings. Furthermore, it emphasized the demand for secretarial and stenographic workers who

are competent in the related learnings. There seems to be widespread agreement among business educators, stenographers and secretaries, and employers of stenographers and secretaries that more effective teaching of the related learnings is needed.

CHAPTER III

EXPERIMENTAL DESIGN AND PROCEDURE

Experimental Design - Analysis of Covariance

The statistical test applied was analysis of covariance. According to Wert (1954), analysis of covariance was developed to provide a means of attaining a measure of control of individual differences. Wert (1954) further stated on page 343:

In general, it will provide tests of significance for the comparison groups whose members may have been stratified and whose members have been measured with regard to one or more variable characteristics other than the criterion.

Garrett (1962) also pointed out that the appropriate statistic to be used in an experiment in which a comparison of initially unlike groups is desired is analysis of covariance. Garrett (1962) stated on page 295:

Covariance analysis is especially useful to experimental psychologists when for various reasons it is impossible or quite difficult to equate control and experimental groups at the start: a situation which often obtains in actual experiments. Through covariance analysis one is able to effect adjustments in final or terminal scores which will allow for differences in some initial variable.

It was proposed that individual differences of the students in the groups being compared in this study would be adjusted according to the following variables: (1) pre-test scores, (2) composite ACT scores, (3) English ACT scores, (4) college grade-point averages, and (5) high school grade-point averages. However, the statistical

analysis, shown in Appendix E, indicated that only the pre-test scores and college grade-point averages were significant covariates in making adjustments to equate the groups being compared. Therefore, in the final analysis, these two covariates were the only ones used.

In addition to the variables which were controlled statistically, the number of students concurrently enrolled in Business Communications 213 was equally balanced in the groups being compared. Also, the number of students concurrently enrolled in English composition was equally balanced in the groups being compared.

An analysis of covariance was used to test the significance of the difference in the group mean quiz scores and the group mean post-test scores, holding the pre-test scores and college grade-point averages constant, for the experimental and control groups in Office Management 302 and for the experimental and control groups in Office Management 322. The data for Office Management 302 and for Office Management 322 were analyzed separately, comparing the experimental group with the control group in Office Management 302 and comparing the experimental group with the control group in Office Management 322.

Experimental Procedure

Development of Tests

Two tests, equal in form, were developed. One test was used as a pre-test and post-test, and the other test was divided into parts and used as interim quizzes following the presentation of each set of teaching materials.

The following procedure was used in developing the tests:

(1) The investigator selected and weighted the related-learnings areas to be included in the tests, as shown in Table I. This selection was a judgmental one based upon the emphasis which, in the opinion of the investigator, should be given in the transcription classes used in this study to the related-learnings areas outlined in the Reference Manual for Stenographers and Typists.

(2) The investigator composed two tests of 100 items each. The two tests were intended to be equal in form, and the items were weighted according to the selected distribution shown in Table I.

(3) The tests were submitted to a panel, which was requested to express opinions concerning the appropriateness of the related-learnings areas selected, the appropriateness of the weighting of the selected related-learnings areas, the equality of the two tests, and the validity of the two tests. The tests were revised according to the suggestions of the panel, resubmitted to the panel, and revised again.

(4) The tests were then administered to an Office Management 322 transcription class.

(5) An item analysis was made to determine the item discrimination indices and item difficulty indices.

(6) The reliability of each test was determined statistically by the split-half technique.

(7) The correlation of the two tests was determined statistically.

A more detailed discussion of the procedure used in developing the tests is given under various subheadings in this section.

TABLE I
COMPOSITION OF ORIGINAL TESTS IN TERMS OF ITEMS
REPRESENTING EACH RELATED-LEARNINGS AREA

Related-Learnings Area	Per cent
Details That Mark an Acceptable Letter	20
Punctuation	40
Parentheses (1%)	
Period (1%)	
Question Mark (2%)	
Comma (25%)	
Semicolon (6%)	
Colon (1%)	
Dash (1%)	
Quotation Mark (3%)	
Capitalization	10
Numbers	10
Abbreviations	5
One Word, Two Words, or Hyphenated Word	10
Word Division	5
	100

Validity of Tests

In defining the validity of a test, Garrett (1962) stated on page 354: "The validity of a test . . . depends upon the fidelity with which it measures what it purports to measure." Garrett (1962) stated also that a test is not generally valid but is valid for only a particular situation or purpose.

In determining content validity on educational achievement tests, the opinion of many educators as to what a child of a given age or grade should know about a given subject is used. Face validity is said to be achieved when a test appears to measure what the author intends to measure. Judgments of face validity are useful to an author in helping him to decide whether his test items are relevant to a specific situation (Garrett, 1962).

Davis (1949) pointed out that the first step in building a valid test is to adequately and accurately define the variable to be measured by presenting an outline weighting each topic in proportion to its importance. Secondly, test items should be constructed to measure the variable they are supposed to measure. These items should be criticized, revised, and tried out; and then the most suitable items for testing each topic should be included in the final form of the test with proper regard for the weighting of the outlined topics.

To establish the validity of the tests developed for this study, the first tests composed by the investigator were submitted to a panel. This panel was asked to express opinions concerning not only the validity of the tests but also the appropriateness of the related-learnings areas included in the tests, the appropriateness of the weighting of the selected related-learnings areas, and the equality of the two tests.

Using a panel to review the tests before administering them to a group for the purpose of making an item analysis is suggested by Davis (1949). He pointed out on page 16 that "it is wasteful to use item-analysis techniques to weed out items that are obviously defective to a subject-matter expert." He observed that valuable testing time may be saved by having ambiguities and inaccuracies pointed out by authorities.

The panel selected as authorities to review the tests were three transcription teachers in the Department of Office Management at Oklahoma State University. These persons frequently teach the transcription courses used in this study and were thought to be the most logical persons to make the requested judgments. Memorandum I

in Appendix D, giving instructions as to how test validity is defined and should be established, accompanied the tests which were delivered to the panel.

The panel members independently reviewed each of the tests and then met as a group to decide upon recommendations to be made for improving the tests. Memorandum II in Appendix D outlines the recommendations and expresses the views of the panel concerning the appropriateness of the related-learnings areas selected and the appropriateness of the weighting of the selected related-learnings areas.

At the suggestion of the panel, some additions and revisions were made. Additions were made to include in each test at least two items pertaining to each selected rule from the Reference Manual for Stenographers and Typists. The tests, now lengthened to 150 items each, were resubmitted to the panel. Memorandum III of Appendix D accompanied the tests to explain the changes and revisions that were made in the first tests and to again ask for the opinions of the panel concerning the validity and equality of the two tests.

The suggestions for further revision of these two tests were made orally by each of the panel members. The tests were again revised in accordance with their suggestions and were then considered to be ready to administer to a class for the purpose of making an item analysis.

Item Analysis of Tests

The tests were administered to an Office Management 322 class on January 17, 1966. This particular class was the only Office Management 322 class taught during the fall semester of 1965. This

class seemed to be the only appropriate one to administer the test to for the purpose of making an item analysis. The Office Management 302 classes and the Office Management 213 classes could not be used because the students in these classes would likely be enrolled the following semester in the classes to be included in the study.

The tests, labeled Test 1 and Test 2, were given during the two-hour class period. During the first hour, one-half of the class was given Test 1 and one-half of the class was given Test 2. During the second hour, each one-half of the class was given the test opposite the one they took during the first hour.

An analysis was made to determine the item discrimination indices and item difficulty indices. The distribution of the items in the two tests according to these indices is shown in Table II.

Most of the items having a discrimination index below 10 and most of the items having a difficulty index above 90 were discarded. However, a few of these items were retained for one of the following reasons: (1) to have two questions pertaining to a rule, (2) to include the same rules on each test so that equal forms could be retained, or (3) to maintain the selected weighting of the related-learning areas.

According to Davis (1949), in most achievement and aptitude tests, items with discrimination indices above 20 will ordinarily have sufficient discriminating power. He further pointed out that a large number of factors influence the size of the discrimination index. On pages 15 and 16 he stated:

These include the item's clarity of expression and lack of ambiguity, the degree to which the keyed answer is adequate and incontestably correct, the number of items in the groups

tried out, the intercorrelations of the items, the reliability of the items and criterion scores, the true relationship between the psychological functions measured by the item and by the criterion, the level of competence of the testees with respect to the psychological functions being measured, and to a slight extent the level of difficulty of the item. The fact that item discrimination indices reflect the influence of so many factors means that they must be interpreted and used with great care.

TABLE II

DISTRIBUTION OF ITEMS ON ORIGINAL TESTS
ACCORDING TO DISCRIMINATION INDICES
AND DIFFICULTY INDICES

<u>Discrimination Indices</u>			<u>Difficulty Indices</u>		
Range	Items in Test 1	Items in Test 2	Range	Items in Test 1	Items in Test 2
80-84	0	1	100	41	39
75-79	0	0	95-99	0	0
70-74	1	2	90-94	0	0
65-69	0	0	85-89	15	19
60-64	5	1	80-84	0	0
55-59	7	6	75-79	11	7
50-54	1	1	70-74	19	20
45-49	7	4	65-69	25	20
40-44	14	18	60-64	3	4
35-39	14	7	55-59	6	8
30-34	3	5	50-54	8	16
25-29	21	26	45-49	16	8
20-24	8	4	40-44	1	4
15-19	15	15	35-39	3	1
10-14	8	15	30-34	1	1
5-9	5	6	25-29	0	1
0-4	41	39	20-24	1	2
	<u>150</u>	<u>150</u>		<u>150</u>	<u>150</u>

One factor which may influence the size of the item's discrimination index is the level of competence of the testees with respect to the psychological functions being measured. In this study, using some items with discrimination indices lower than 20 was justified on the ground that one of the tests, Test 1, was to be

used as a pre-test and post-test in a transcription course of a lower level (Office Management 302) than the class on which the item analysis was made. The same test was to be used as a pre-test and post-test on the same level (Office Management 322) as the class on which the item analysis was made. However, at the time the pre-test was administered, the students in this course had a lower level of competence than the students in the class on which the item analysis was made.

Test 2, which was divided into quizzes, was also administered to groups with a lower level of competence than that of the class on which the item analysis was made. For these reasons, it was thought that deviating from the rule which was somewhat reluctantly set by Davis could be justified in order to meet some of the other desired criteria.

Further justification for deviating from any set rule for an acceptable discrimination index is given by Davis (1949) in an example illustrating that statistical considerations alone must not be depended upon in test construction. The discrimination index for an item reflects the relationship between the psychological functions measured by that item and the total score used as a criterion. An item's discrimination index is likely to be high if the total score is composed of items that test material similar to that in the given test item. An item's discrimination index is likely to be low if that item covers material not closely related to the material covered by most items on the test.

The example which Davis (1949) used was one concerning a test on American history. If most of the items dealt with political events

and a few items dealt with social phenomena, the items testing social history would have a markedly lower discrimination index than those items dealing with political history. Yet most historians would insist that some items pertaining to social happenings should be included in a test on American history in order for the test to be valid.

If only discrimination indices were used in selecting items, items tending to have the highest discrimination indices would be chosen. However, Davis (1949) indicated that the requirements of the outline and the distribution of item difficulty indices must be taken into account. A difficulty index is defined by Davis (1949) on page 3 as "the proportion of a certain sample of testees that marks the item correctly."

Garrett (1962) pointed out that the intercorrelations of the items of the test should be considered as well as item difficulty. However, it is hardly feasible to compute all item intercorrelations. For example, for a test of only 50 items, there would be 1,225 phi coefficients.

As precise knowledge of item correlation would usually not be available, the best distribution of item difficulties would be impossible to determine. However, one of the general agreements among test makers is that difficulty indices may range from high to low when item correlations are high, as in most achievement tests, and talent range is wide. The normal curve may thus be taken as a guide so that 50 per cent of the items might have difficulty indices between .25 and .75; 25 per cent, indices larger than .75; and 25 per cent, indices smaller than .25. An item passed by 0 per cent

or 100 per cent, although it has no differentiating value, may be included in a test solely for the psychological effect (Garrett, 1962).

After the item analysis was made, most of the retained items having a discrimination index below 10 and/or a difficulty index above 90 were revised by the investigator with the help of the panel. In many cases the revision of an item was aided by examining the equal item of the opposite test. If the equal item on the opposite test had a higher discrimination index or a lower difficulty index, the item to be revised was changed to be more nearly like its equal item on the opposite test. In a few cases, when no particular reason could be determined for the low discrimination index or high difficulty index, the item was left as it was on the original test.

Table III shows that six items which were included on the final Test 1 originally had a discrimination index below 10; and four items, a difficulty index above 90. Three of those six items having a discrimination index below 10 also had a difficulty index above 90; therefore, only seven items were actually involved here.

On the final Test 2, fourteen items had a discrimination index below 10 on the original test; and eleven items, a difficulty index above 90. Eleven of those fourteen items having a discrimination index below 10 also had a difficulty index above 90; therefore, only fourteen items were actually involved here.

In the distribution of items with discrimination indices in the 15-19 range, fourteen of the fifteen items in Test 1 had a discrimination index of either 18 or 19 and all eleven of the items in Test 2 had a discrimination index of either 18 or 19. Therefore, most of the

TABLE III
DISTRIBUTION OF ITEMS ON REVISED TESTS
ACCORDING TO DISCRIMINATION INDICES
AND DIFFICULTY INDICES

<u>Discrimination Indices</u>			<u>Difficulty Indices</u>		
Range	Items on Test 1	Items on Test 2	Range	Items on Test 1	Items on Test 2
80-84	0	1	100	4	11
75-79	0	0	95-99	0	0
70-74	1	2	90-94	0	0
65-69	0	0	85-89	11	11
60-64	5	1	80-84	0	0
55-59	7	6	75-79	11	6
50-54	1	1	70-74	14	17
45-49	6	5*	65-69	21	17
40-44	12	19*	60-64	3	4
35-39	14	5	55-59	5	6
30-34	3	5	50-54	8	12
25-29	16	16	45-49	15	7
20-24	7	3	40-44	1	3
15-19	15	11	35-39	3	1
10-14	5	9	30-34	1	1
5-9	2	3	25-29	0	0
0-4	4	11	20-24	1	2
	<u>98**</u>	<u>98**</u>		<u>98**</u>	<u>98**</u>

*Two items in Test 1 were switched to Test 2, making more items in this group now than originally.

**Two questions which were not in the original tests were added at the suggestion of the panel. Therefore, the distribution totals are 98 rather than 100.

items in the 15-19 range of discrimination indices were almost 20, which was suggested by Davis (1949) as being sufficient.

After the items were selected, giving consideration to the discrimination and difficulty indices, the percentage of items relating to certain marks of punctuation was slightly altered. Table IV shows the composition of the final tests in terms of the percentage of items representing each of the selected related-learning areas.

TABLE IV
COMPOSITION OF REVISED TESTS IN TERMS OF ITEMS
REPRESENTING EACH RELATED-LEARNINGS AREA

Related-Learnings Area	Per cent
Details That Mark an Acceptable Letter	20
Punctuation	40
Parentheses (2%)	
Period (2%)	
Question Mark (2%)	
Comma (21%)	
Semicolon (4%)	
Colon (4%)	
Dash (1%)	
Quotation Mark (4%)	
Capitalization	10
Numbers	10
Abbreviations	5
One Word, Two Words, or Hyphenated Word	10
Word Division	5
	100

As a result of selecting 100 items judged to be best in terms of discrimination indices and difficulty indices, in 27 cases only one item related to a particular rule was included in each test. The rule numbers from the Reference Manual for Stenographers and Typists to which items in the final tests are related are given in Table V.

The rule numbers relating to items in Test 2, which was used as quizzes, were identical to those in Test 1, which was used as the pre-test and post-test. Test 2 was divided into parts and used according to the schedule in Table VI.

Reliability of Tests

Garrett (1962) on page 337 stated:

A test score is called reliable when we have reasons for believing the score to be stable and trustworthy. Stability

TABLE V
 RULE NUMBERS TO WHICH ITEMS IN
 REVISED TESTS ARE RELATED

Related Learnings Area	Rule Numbers*
Punctuation	
Parentheses	317(2)**
Quotation Mark	311 and 297, 306 and 276(2), 304 and 305
Dash	265
Colon	250(2), 255(2)
Semicolon	248, 247, 245(2)
Comma	240, 233(2), 230(2), 226(2), 223 and 224, 214(2), 213a, 213b, 213c, 212(2), 211a, 211b, 210, 207b(2), 206
Question Mark	196(2)
Period	185(2)
Capitalization	379(2), 372 and 374 and 350(2), 350(2), 366(2), 361, 353 and 350(2), 352 and 358
Numbers	408(2), 406, 404, 402, 396, 393 and 394, 390, 385(2)
Abbreviations	445, 436(2), 434(2)
Word Division	549, 548(2), 546(2)
One Word, Two Words, or Hyphenated Word	533(2), 529, 527, 515(2), 513(2), 512(2)
Details That Mark an Acceptable Letter	143, 139, 131(2), 128b(2), 127(2), 122, 95, 92b(2), 92(2), 90, 80, 78(2), 65(2)

* From Reference Manual for Stenographers and Typists by Gavin and Hutchinson.

** Included in the tests were two items related to all of the rule numbers followed by (2).

TABLE VI
 RULE NUMBER TO WHICH ITEMS IN QUIZZES ARE RELATED
 ACCORDING TO THE SCHEDULE FOR
 ADMINISTERING THE QUIZZES

Quizzes		Rule Numbers*
Week	Set	
3	1	185(2)** , 196, 211a, 207b
3	2	213c, 214a, 214b, 223 and 224
4	1	306 and 276(2), 255(2)
4	2	265, 317(2), 245
5	1	65(2), 92a, 92b
5	2	78(2), 80, 247
6	1	353 and 350(2), 352, 361
6	2	127(2), 128b(2), 366
7	1	385, 393 and 394, 390, 207b, 240
7	2	95, 131(2), 139, 385
8	1	434(2), 230(2)
8	2	92b(2), 436(2)
9	1	211b, 512(2), 513
9	2	515(2), 513, 212
10	1	548, 546(2), 122
10	2	548, 549, 213a, 213b
11	1	196, 297 and 311, 304 and 305, 245
11	2	250(2), 248, 212
12	1	90, 379, 366
12	2	379, 350 and 372 and 374, 372 and 374, 143
13	1	396, 402, 406, 226
13	2	445, 404, 408(2)
14	1	206, 529, 533b, 210
14	2	533p, 527, 233(2), 226

*From Reference Manual for Stenographers and Typists by Gavin and Hutchinson.

**The figure in parentheses following a rule number indicates the number of items on the set related to that particular rule.

and trustworthiness depend upon the degree to which the score is an index of "true ability"--is free of chance error.

Garrett (1962) described four methods of determining the reliability coefficient of a test: (1) test-retest (repetition), (2) alternate or parallel forms, (3) split-half technique, and (4) rational equivalence. In this study the split-half technique was determined to be the most

appropriate of the four. The test-retest technique could not be used because a sufficient amount of time could not be allowed between the first administration of the test and the retest. The alternate or parallel form method could not be used because it could not be determined that the two forms being constructed were parallel until after the tests were administered. Also, a sufficient amount of time could not be given between the administration of the two forms. The rational equivalence method involves the use of two test forms having the same inter-item correlations on both forms. Since it would not be feasible to compute inter-item correlations on two tests containing 150 items each, the rational equivalence method could not be used.

To use the split-half technique, Test 1 and Test 2 for each student in the Office Management 322 class was divided into halves, with the even-numbered items making up one half and the odd numbered items making up the other half. The correlation of the scores for the half-tests was computed for Test 1 and for Test 2. The self-correlation of each whole test was then estimated from the reliability of the half-tests by using the Spearman-Brown prophecy formula (Garrett, 1962).

The reliability of Test 1 was .87, and the reliability of Test 2 was .99. These computations may be seen in Appendix C.

The required size of the reliability coefficient varies with the purpose of the test. Garrett (1962) on page 351 stated:

How large a reliability coefficient we should require depends upon the nature of the test, the size and variability of the group, and the purpose for which the test was given. In order to differentiate between the means of two school grades of relatively narrow range, a reliability coefficient need be no higher than .50 or .60. If the test is to be used to make individual diagnoses (i.e., to separate pupil from pupil), its reliability coefficient for a single grade should be .90 or higher.

In view of these comments by Garrett, it was thought that the reliability coefficients of these tests were adequate.

Correlation of the Two Tests

The coefficient of correlation was the ratio used to determine the relationship between the two tests. Garrett (1962) defined coefficient of correlation on page 125:

The product-moment coefficient of correlation may be thought of essentially as the ratio which expresses the extent to which changes in one variable are accompanied by--or are dependent upon--changes in a second variable.

The correlation of the two tests was .98; consequently, the two tests used were thought to be adequately equal in form. The computation of the coefficient of correlation may be seen in Appendix C.

Development of Teaching Materials

The teaching materials were developed by the investigator with the aid of the same panel who helped in developing the tests. These materials included the same distribution of related-learning areas as the tests. The items were composed by the investigator, submitted to the panel for suggestions and/or criticisms, and then revised according to their suggestions.

The rule numbers relating to each item in the teaching materials are shown according to a weekly schedule in Table VII. Each set of materials contained 20 items, and two sets were given each week for twelve weeks (Weeks 3 through 14 of the semester). A total of 480 items was given.

Description of Teaching Materials

The items included in the teaching materials for the experimental groups and the control groups were identical; however, the form of the

TABLE VII

RULE NUMBERS TO WHICH ITEMS IN TEACHING MATERIALS ARE RELATED
ACCORDING TO THE SCHEDULE FOR ADMINISTERING
THE TEACHING MATERIALS

Teaching Materials		Rule Numbers*
Week	Set	
3	1	183, 184, 185(2)**, 186, 192, 193, 194, 196, 198, 206, 207b, 208, 210, 211a(3), 212, 213a, 213b
3	2	213c, 214a, 214b, 215, 215a, 215b, 215c, 216, 217, 219, 220, 222(2), 223, 224, 244, 245, 246, 247, 248
4	1	225, 227, 228, 229, 231, 234, 236, 239(2), 252, 253, 254c, 255(2), 306 and 276, 278, 291, 292, 296, 323
4	2	245(4), 249, 250, 262, 265(3), 267, 297, 302a, 303, 304, 315, 317, 319(2), 320
5	1	62(2), 63(2), 64, 65(3), 66(3), 67, 92a(2), 92b, 215(4), 220
5	2	69(2), 74(2), 78 and 434, 78, 78b, 80(3), 81, 86a, 86b, 86c, 89, 244, 246, 247, 249, 250
6	1	206, 207a, 208, 210, 243, 351a, 351b, 351c(4), 352(2), 350 and 353(2), 355(2), 361(3)
6	2	127(2), 128a, 128b(2), 357, 358(3), 360, 364, 365, 366(2), 368, 369, 371(2), 373, 375
7	1	206, 207b, 210, 212, 240, 385, 386(2), 287(2), 389(2), 390(2), 391, 393(2), 394(2), 395
7	2	95(2), 131(2), 139, 385, 392, 397, 398, 399, 400, 401, 403, 404(2), 405, 406, 407, 407a, 409
8	1	206, 210, 211b, 212, 225, 230(5), 434(3), 436, 438, 444, 445, 446, 449, 454
8	2	86a, 86b, 86c, 90(2), 91, 92a, 92b(2), 156, 436(2), 438(2), 444(2), 446(2), 449(2)
9	1	211a, 211b(4), 510(2), 511(2), 512(5), 513(2), 514(3), 515
9	2	510(3), 511(3), 513, 515(2), 516(2), 517, 518(2), 521, 206, 210, 212(2), 231

TABLE VII (continued)

Teaching Materials		Rule Numbers*
Week	Set	
10	1	90, 93, 94, 95, 98, 105, 122(4), 534(2), 538, 539, 540, 541, 546(2), 548(2)
10	2	90, 105, 107(3), 108, 206, 213a, 213b, 213c, 541, 542(2), 545(2), 547, 548(2), 549(2)
11	1	192(2), 194, 196(2), 297 and 311, 302(2), 303, 304 and 305, 244(2), 245(3), 248(2), 249(2), 250
11	2	206(2), 210(2), 211a, 212(3), 213c(2), 214a, 214b, 215(5), 220, 248, 250
12	1	90(2), 105, 113(2), 114, 115, 116, 125, 126, 128a, 129, 130, 143, 158, 366(2), 372, 379(2)
12	2	113(2), 114, 116, 135(2), 136(2), 138(2), 139, 143(3), 144, 372, 350 and 374, 374, 379(2)
13	1	206(3), 210(3), 212(2), 226(2), 396(2), 402(2), 406, 411, 412, 420, 422, 423
13	2	374, 376, 377, 380(4), 381, 404(2), 408(2), 421, 424, 425, 426, 445(2), 454(2)
14	1	206, 210(2), 223(2), 224(2), 226, 227(2), 524, 526, 527, 529, 530, 533b(2), 533e, 533p(2)
14	2	207a, 225(2), 226, 227, 233(3), 522, 527, 532, 533a, 533f, 533g, 533h, 533p, 550(4)

*From Reference Manual for Stenographers and Typists by Gavin and Hutchinson.

**When more than one item is related to a particular rule, the figure in parentheses following a rule number indicates the number of items in the set related to that particular rule.

materials for the experimental groups was different from the form of the materials for the control groups.

The materials for the experimental groups were designed to give students immediate knowledge of correct response. The materials were

prepared by typing the answer to each item immediately below that particular item. Each set of materials was duplicated. Windows were cut in one-half of these duplicated sheets in such a way as to eliminate all answers, leaving only the items and windows. Each of these windowed sheets was then attached to a sheet containing both the items and the answers. The answers appearing on the bottom sheet could be seen through the windows of the top sheet. The sheets were attached at the top and two sides but not at the bottom.

Next an insert sheet was prepared. The insert sheet was used by slipping it between the two attached sheets to cover the answers behind each window. This insert sheet was made of green 20-pound mimeograph paper, which was thick enough that the answers could not be seen through it. About one-fourth inch was cut from the side of this sheet so it could be easily inserted between the two attached sheets.

A 2-inch carbon paper strip was stapled to the top 2 inches of the green insert sheet. This design was an aid in determining that the students checked the answer to each item immediately after responding to that item. The carbon strip was wide enough to cover both an item and its answer. Therefore, with the green sheet inserted so the carbon strip faced the answer sheet, a carbon impression was made on the bottom sheet, or answer sheet, when the student responded to an item. If the student pulled the insert sheet below the answer window before making a response to an item, no carbon impression was made on the bottom sheet. Likewise, if the student did not pull the insert sheet below the window to check his answer before continuing to the next item, no carbon impression was made on the bottom sheet for that next item. Illustrations of

the teaching materials used in the experimental groups and the procedure for working through these materials are shown in Appendix B.

With this design of the materials for the experimental groups, it was thought that the classes could be watched closely enough to be fairly sure that the students proceeded through the items as instructed. This design, of course, was not foolproof, as a student could pull the insert sheet below the answer window, look at the answer, push the insert sheet back up, and make his response. However, there was no incentive for any student to proceed in this manner as these materials were not for grading purposes. The students were well aware that these materials were not for grading purposes and that the teacher kept no record of incorrect responses.

The materials for the control groups were designed to give the students delayed knowledge of correct response. One sheet contained only the items to be answered; a separate sheet containing the answers to the items was attached. The students worked completely through the exercises or questions, making a response to each item. After they had responded to all of the items in the set of materials, the students detached the answer sheets and checked their answers. The answer sheets were attached and given to the students along with the set of teaching materials so the students could check their answers as soon as they finished the exercises. The use of this procedure in distributing the answer sheets also saved class time.

A copy of each set of teaching materials used in the control groups may be seen in Appendix B.

Selection and Description of Sample

The sample consisted of students enrolled in the four transcription classes taught at Oklahoma State University during the spring semester of 1966. All were female students enrolled in one of the two sections of Office Management 302 or one of the two sections of Office Management 322. These classes provided an experimental group and a control group for each of the two levels of transcription.

Section 1 of Office Management 302 met at 8:30 a.m. Monday through Thursday, and Section 2 met at 1:30 p.m. Monday through Thursday. Section 1 in Office Management 322 met at 10:30 a.m. Monday through Thursday, and Section 2 met at 1:30 p.m. Monday through Thursday. Students enrolled in Office Management 302, Section 1, were also enrolled in Office Management 303, Section 1, which met at 7:30 a.m. Monday through Friday; and students enrolled in Office Management 302, Section 2, were also enrolled in Office Management 303, Section 2, which met at 12:30 p.m. Monday through Friday. Students enrolled in Office Management 322, Section 1, were also enrolled in Office Management 313, Section 1, which met at 9:30 a.m. Monday through Friday; and students enrolled in Office Management 322, Section 2, were also enrolled in Office Management 313, Section 2, which met at 12:30 p.m. Monday through Friday.

In Office Management 302, Section 2 was the control group. To be more conservative, Section 1 was chosen as the experimental group. As the time of day the classes met was a potential intervening variable, it was thought that the group taking the class at the less desirable time should be the experimental group so that if a significant difference were found in favor of the experimental group

this difference could not be attributed to the experimental group's having met at a more desirable hour than the control group.

In Office Management 322, Section 2 was the experimental group and Section 1 was the control group. Section 2 was chosen to be the experimental group in Office Management 322 because the Office Management 302 class meeting at that same hour was a control group. In addition, it was thought that, of the two hours the Office Management 322 classes met, the Section 2 hour was the less desirable. Consequently, on both levels the experimental group met at the hour thought to be the less desirable.

It should be pointed out that the class hours thought to be the less desirable were determined by the investigator and the other transcription teacher. These decisions were judgmental factors and not based on experimental evidence.

The total number of students enrolled in Office Management 303 and 302, Section 1, was 51; and the total number of students enrolled in Office Management 303 and 302, Section 2, was 35. The total number of students enrolled in Office Management 313 and 322, Section 1, was 39; and the total number of students enrolled in Office Management 313 and 322, Section 2, was 36. In the final analysis, data for 35 students in Office Management 302, Section 1; for 35 students in Office Management 302, Section 2; for 34 students in Office Management 322, Section 1; and for 34 students in Office Management 322, Section 2, were used. Therefore, data for 138 of the 161 students who participated in the study were included in the final analysis.

The data not used was excluded for one of the following reasons: (1) to balance, in the compared groups, the number of students concurrently enrolled in Business Communications 213; (2) to balance, in the compared groups, the number of students concurrently enrolled in English composition; (3) to balance, in compared groups, the number of students included in the final analysis; and (4) to include in the final analysis data for only the students who took the pre-test, the post-test, and an adequate number of the interim quizzes. A few students were absent from class and missed either the pre-test, the post-test, or several of the interim quizzes.

Teaching and Testing Procedures

The teaching involved in this experiment began the third week of the 1966 spring semester. The experiment was started at that time because the students were permitted to add courses during the first two weeks of the semester, and it was desirable to start the experiment after students could no longer add the courses involved. The experiment was ended the fourteenth week of the semester, or one week before the end of regular classes. It was ended at that time to allow at least a one-week period to lapse between the administration of the last set of teaching materials and the post-test.

On Tuesday of the third week of the semester, the pre-test, the revised Test 1, was given to all four groups. No time limit was placed on this test, and all students finished within fifty minutes. The students were told that this test was given for diagnostic purposes and would be used to help determine which areas of the related learnings should be studied most intensely.

Assignments were made in the Reference Manual for Stenographers and Typists according to the schedule in Table VIII. Two sets of teaching materials were administered each week, each set containing 20 items. Most of the items in the teaching materials were related to the assignment for that particular week; however, some items were a review of a previous assignment.

TABLE VIII
SCHEDULE FOR REFERENCE MANUAL ASSIGNMENTS

Week	Assigned Section
3	Punctuation
4	Punctuation
5	Details That Mark an Acceptable Letter
6	Capitalization
7	Numbers
8	Abbreviations
9	One Word, Two Words, or Hyphenated Word
10	Word Division
11	Review of Punctuation
12	Review of Details That Mark an Acceptable Letter and Capitalization
13	Review of Numbers and Abbreviations
14	Review of Word Division and One Word, Two Words, or Hyphenated Word

Before the first set of teaching materials for the week was distributed, students were given an opportunity to ask questions about the assigned material. This period was limited to five minutes. If the students had no questions, the teacher briefly went over a few of the more difficult rules in the assigned section.

Next the teaching materials were distributed. Students in the experimental groups were instructed to answer the first question and

then to pull the green insert sheet down below the first window to check the answer to the first question. They were instructed to proceed through the remainder of the items in a like manner.

The control groups were given a sheet containing the exercises, with an answer sheet stapled to it. These groups were instructed to work through all of the items and then to detach the answer sheet and check their answers.

The number of the rule related to each item was given with the answer on the materials for both the experimental groups and the control groups. Students were instructed to note the items missed and the rule number related to each item missed.

The time period given to working through the exercises and checking the answers was limited to ten minutes for both the experimental groups and the control groups, and on many occasions less time than ten minutes was needed. All students were given enough time to complete the exercises.

Students were then given an opportunity to check the rules related to the items missed and to ask any questions they wished concerning a rule or item. This activity was limited to five minutes, which was ample time.

The materials were collected and a short quiz was given. The time required to answer each quiz was about two minutes. The quiz tested only rules included in the teaching materials for that particular day. After the quizzes were collected, the correct answers were given orally by the teacher.

The second set of materials given each week was administered by the same procedure except the first question period was omitted because

students had already been given an opportunity to ask questions about the assigned section. Also, during the Weeks 11 through 14, no question sessions were given preceding the distribution of the materials because the assignments for these weeks were review sections.

In most cases the total class time required for the complete teaching procedure for a set of materials was from ten to twenty minutes. In no case was it more than twenty-five minutes.

No particular days of the week were specified as days to give teaching materials; but each class of Office Management 302 was given materials on the same days, and each class of Office Management 322 was given materials on the same days. In some cases on a particular day the second set of materials for that week was given to the experimental groups, and the first set was given to the control groups and vice versa. This procedure was followed in an effort to prevent students in the early classes from giving quiz answers to students in the later classes. The students did not know whether both classes would have the same set of materials and the same quiz on any particular day.

On Friday of the fifteenth week, the post-test was administered to all four groups. No time limit was placed on this test, and all students finished within fifty minutes.

The post-test was unannounced so that it would more accurately measure what the students had learned from the teaching materials rather than what they could learn from studying just preceding the test. The early classes were asked not to announce the test to the later classes. Their incentive to refrain from announcing the test was the fact that the test grades were curved on a comparative basis,

combining both sections of Office Management 302 and combining both sections of Office Management 322. The post-test grades were considered in computing the students' final grades.

CHAPTER IV

FINDINGS

When the experiment was completed, the data was arranged by classes into four tables. Data for certain students were then discarded for one of the following reasons: (1) to balance, in the compared groups, the number of students concurrently enrolled in Business Communications 213; (2) to balance, in the compared groups, the number of students concurrently enrolled in English composition; (3) to balance, in compared groups, the number of students included in the final analysis; and (4) to include in the final analysis data for only the students who took the pre-test, the post-test, and an adequate number of the interim quizzes. A few students were absent from class and missed either the pre-test, the post-test, or several of the interim quizzes.

It was first thought that the data for all transfer students would have to be discarded because ACT scores were unavailable for these students. However, the statistical analysis showed that ACT scores were not significant covariates; therefore, no data were discarded because of unavailable ACT scores.

In most cases, when a student was absent from class on a day that a quiz was given, he was permitted to make up the set of teaching materials and the quiz that he missed. However, in a few cases, the students did not make up the work missed; and for these students a

quiz score was computed on a percentage basis (total points divided by total possible points equals percentage score).

When it was necessary to discard data for students because of their concurrent enrollment in Business Communications 213 or in English composition and when it was necessary to discard data to balance the number of students included in the final analysis for the groups being compared, a random procedure was used. For example, if the data for four students in one class needed to be discarded in order to achieve the proper balance of students concurrently enrolled in Business Communications 213, all students in that particular class who were concurrently enrolled in Business Communications 213 were assigned a number. A number corresponding to each of these numbered students was written on a card. These cards were placed in a box and shuffled; then four cards were drawn to determine which data would be discarded.

In all other cases, when it was necessary to discard data, the above-described procedure was followed. This procedure was a simple one, as the data for only 23 students had to be discarded.

The data to be used in the final analysis were then arranged into four tables as shown in Appendix E.

In the analysis of covariance, the quiz scores and post-test scores were adjusted, using the pre-test scores and college grade-point averages as covariates. The other proposed covariates-- composite ACT scores, English ACT scores, and high school grade-point averages--were found to be insignificant in their adjustments to equate the groups being compared (see Appendix E).

← 1.2

||

A standard analysis of covariance program was used to determine the significance of the differences in the group mean quiz scores and the group mean post-test scores for the two groups in Office Management 302 and for the two groups in Office Management 322. This program is available at the Oklahoma State University Computing Center.

Analysis of Quiz Results*

The adjusted group mean quiz scores are as follows:

Office Management 302, Control Group	89.5833
Office Management 302, Experimental Group	88.0110
Office Management 322, Control Group	87.6713
Office Management 322, Experimental Group	90.9816

In Office Management 302, the control group had a slightly higher adjusted mean than the experimental group. The difference in these adjusted means, however, is not significant. The t-value for the difference is 1.92, which is not significant at either the .01 or .05 level of confidence. Therefore, there is no significant difference in the adjusted group mean quiz scores between the experimental group and the control group in Office Management 302.

In Office Management 322, the experimental group had a significantly higher adjusted mean than the control group. The t-value for the difference is 4.04, which is highly significant at the .01 level of confidence. Therefore, there is a significant difference in favor of the experimental group in the adjusted mean quiz scores in Office Management 322.

No particular reason is apparent for the contradictory results in Office Management 302 and Office Management 322 other than the

*Statistical computations and data tables may be seen in Appendix E.

possibility that intervening variables which cannot be controlled were present. One potential intervening variable was the time of day the classes met. If one assumes that a class which starts at 7:30 a.m. is less desirable in terms of student achievement than a class which starts at 12:30 p.m., the experimental group in Office Management 302 may have been detrimentally affected by the time of day the class met.

Although the investigator did not attempt to establish the effects of the time of day on achievement in transcription classes, it is suggested that this factor could be one possible explanation for the contradictory results. Further reasoning for this suggestion is presented in the next chapter.

Analysis of Post-test Results*

The adjusted group mean post-test scores are as follows:

Office Management 302, Control Group	82.6081
Office Management 302, Experimental Group	83.0883
Office Management 322, Control Group	81.2138
Office Management 322, Experimental Group	80.9812

In Office Management 302, the experimental group had a slightly higher adjusted mean than the control group. However, the difference in these adjusted means, having a t-value of .38, does not approach significance at either the .01 or .05 level of confidence. Therefore, there is no significant difference in the adjusted group mean post-test scores between the experimental group and the control group in Office Management 302.

In Office Management 322, the control group had a slightly higher adjusted mean than the experimental group. The difference in these adjusted means, having a t-value of .18, does not approach significance

*Statistical computations and data tables may be seen in Appendix E.

at either the .01 or .05 level of confidence. Therefore, there is no significant difference in the group adjusted mean post-test scores between the experimental group and the control group in Office Management 322.

The results of the post-test indicate that the experimental treatment had no significant effect in either Office Management 302 or Office Management 322. While the experimental treatment did not result in significantly higher scores on the post-test, it appeared to have no detrimental effect.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

1.2

The purpose of this experiment was to determine the effects, if any, of immediate knowledge of correct response as opposed to delayed knowledge of correct response on initial learning and on retention of selected related learnings in transcription classes. Initial learning was measured by quiz scores, each quiz being given immediately following the administration of a set of teaching materials and testing only the related learnings included in that set of teaching materials. Retention was measured by the scores made on a post-test, which was given one week following the administration of the last set of teaching materials.

Two classes in Beginning Transcription (Office Management 302) and two classes in Advanced Transcription (Office Management 322) were used in the experiment, yielding results for two developmental levels in transcription. The subjects were 138 female students who were enrolled in one of the four transcription classes taught at Oklahoma State University during the spring semester of 1966.

← 1.3

The results of the study concerning initial learning were contradictory. The quiz scores revealed no significant difference in the experimental and control groups in initial learning for Office Management 302. However, a highly significant difference in favor of the experimental group was found for Office Management 322.

Two possible explanations are offered for these contradictory results: (1) Immediate knowledge of correct response did in fact facilitate initial learning at the Advanced Transcription developmental level but had no significant effect at the Beginning Transcription developmental level; or (2) Intervening variables were present which could not be measured or controlled and which affected the results in either Beginning Transcription or Advanced Transcription.

The investigator suggests that the time of day the Beginning Transcription class met could have had a detrimental effect in this experimental group. Admittedly, this suggestion is based purely on judgmental evidence. Although the transcription class met at 8:30 a.m. and all teaching materials, quizzes, and tests were administered during this period, the students in this class were concurrently enrolled in Beginning Dictation, which met at 7:30 a.m. The investigator taught the experimental group of Beginning Dictation and Beginning Transcription at 7:30 a.m. and 8:30 a.m. and also the control group of Beginning Dictation and Beginning Transcription at 12:30 p.m. and 1:30 p.m. Throughout the semester, the afternoon group appeared to be more alert, more highly motivated, and more able to follow instructions than the morning group.

One factor which offers some support to the argument that the time of day may have affected achievement in Beginning Transcription is a comparison of the group grade averages of the two sections in Beginning Dictation (Office Management 303). Beginning Dictation was selected for comparison rather than Beginning Transcription because the transcription grades are determined on a comparative basis within classes. In Beginning Dictation, departmental standards are used as

guidelines in determining grades. These standards specify the dictation speed, transcription speed, and transcription accuracy for each letter grade. The Beginning Dictation grade is therefore arrived at more objectively than the Beginning Transcription grade. Although the Beginning Dictation grade cannot be considered to be independent of the treatment in the experiment, other factors, such as dictation speed and accuracy, transcription speed, and typing accuracy, are measured to a greater extent than related learnings by this grade. A comparison of the grade averages, using grades for the same subjects as those whose data were included in the final analysis of the experiment, shows that the 7:30 a.m. group had a grade average of 2.4571 (C+) in Beginning Dictation and the 12:30 p.m. group had a grade average of 3.0314 (B) in Beginning Dictation (based on 4.000 = A). These group grade averages were not adjusted for individual differences between groups; but even so, they seem to lend some support to the thought that the time of day the class met, or possibly some other other variable, may have had a detrimental effect on achievement in the morning section of Beginning Dictation and Beginning Transcription.

The null hypothesis that there will be no significant difference in initial learning between students who receive immediate knowledge of correct response on related-learnings teaching materials and students who receive delayed knowledge of correct response on related-learnings teaching materials can be neither accepted nor rejected on the basis of the results of this experiment.

The results of the study concerning retention indicated no significant differences between the experimental and the control

groups for either Office Management 302 or Office Management 322. Apparently, immediate knowledge of correct response had no significant effect on retention in this experiment.

The null hypothesis that there will be no significant difference in retention between students who receive immediate knowledge of correct response on related-learnings teaching materials and students who receive delayed knowledge of correct response on related-learnings teaching materials is accepted on the basis of the results of this experiment.

The recommendations are:

(1) Because of the contradictory results of this study and also the contradictory results of previous research, a great deal more experimentation must be conducted before conclusive statements can be made concerning the effects of immediate versus delayed knowledge of results in the classroom. These experiments should be conducted in practical learning situations. They should be conducted in the same environment in which the findings might have some value.

(2) A similar experiment should be conducted using subjects in one class but dividing the one class into two treatment groups to minimize the possibility of intervening variables affecting the performance of one group but not the other group.

(3) A similar experiment should be conducted in other classes in which some of the selected related learnings of this study are taught. Such classes might be business communications or English.

(4) A similar experiment should be conducted using only the very basic related learnings in Office Management 213 (Advanced Shorthand), or an equivalent course, to determine the effects of immediate versus

delayed knowledge of results at that particular developmental level.

(5) Educators should continually search for improved techniques and methods of teaching and should use their classes to conduct small-scale research in an effort to determine more effective means of teaching

A SELECTED BIBLIOGRAPHY

- Aberle, John W. "An Evaluation of a College's Curriculum in Business." (unpublished Doctor's thesis, Stanford University, 1954).
- Ammons, R. B. "Effects of Knowledge of Performance: A Survey and Tentative Theoretical Formulation." Journal of General Psychology. Vol. 54. (January, 1956), 279-299.
- Amsell, A. "Error Responses and Reinforcement Schedules in Self-Instructional Devices." Teaching Machines and Programmed Learning. Eds. A. A. Lumsdaine and R. Glaser. Washington, D. C.: National Education Association, 1960.
- Anderson, Ruth I. "Significant Implications of Research in Shorthand and Transcription." American Business Education Yearbook. Vol. 19. (1962) 49-64.
- Angell, George W. "The Effect of Immediate Knowledge of Quiz Results on Final Examination Scores in Freshman Chemistry." Journal of Educational Research. Vol. 49. (January, 1949), 391-394.
- Aumiller, Lee Ellsworth. "The Effects of Knowledge of Results on Learning to Spell New Words by Third and Fifth Grade Pupils." (unpublished Doctor's thesis, The Pennsylvania State University, 1963).
- Austin, Gilbert Raymond. "A Study of Programmed Instruction Response Styles and Reinforcement Schedules for Teaching Multiplication of Fractions." (unpublished Doctor's thesis, The University of Connecticut, 1965).
- Bourne, Lyle Eugene, Jr. "The Effect of Delay of Information Feedback and Task Complexity on the Identification of Concepts." (unpublished Doctor's thesis, The University of Wisconsin, 1956).
- Brackbill, Yvonne, and M. S. Kappy. "Delay of Reinforcement and Retention." Journal of Comparative and Physiological Psychology. Vol. 55. (1962) 14-18.
- Brackbill, Yvonne, Robert B. Isaacs, and Norman Smelkinson. "Delay of Reinforcement and the Retention of Unfamiliar, Meaningless Material." Psychological Reports. Vol. 11. (September, 1962), 553-554.

- Briggs, Leslie J. "Don't Oil Your Teaching Machine." Psychological Reports. Vol. 15. (September, 1964), 350.
- Briggs, Leslie J. "Prompting and Confirmation Conditions for Three Learning Tasks Employing Subject-Matter Trainer." Student Response in Programmed Instruction: A Symposium. Ed. A. A. Lumsdaine. Washington, D. C.: National Academy of Science-National Research Council, Publication No. 493, 1961.
- Brown, Robert Stanley. "An Experimental Study of Knowledge of Results in Complex Human Learning." (unpublished Doctor's thesis, University of Virginia, 1963).
- Buros, Oscar Krisen, ed. The Fifth Mental Measurements Yearbook. Highland Park: The Gryphon Press, 1959.
- Cameron, Howard King. "A Study of the Effectiveness of Feedback in Teaching Principles of Educational Psychology." (unpublished Doctor's thesis, Michigan State University, 1963).
- Champion, R. A., and D. A. McBride. "Activity During Delay of Reinforcement in Human Learning." Journal of Experimental Psychology. Vol. 63. (June, 1962), 589-592.
- Culclasure, David Fikes. "Reinforcement Effects in Auto-Instruction: An Intra-Individual Analysis." (unpublished Doctor's thesis, University of Texas, 1964).
- Davis, Frederick B. Item-Analysis Data. Cambridge: Graduate School of Education, Harvard University, 1949.
- Dissertation Abstracts. Vol. 1-26. (1938-1966).
- Flood, Hazel A. "Helping Students Meet Office Standards in Transcription." Business Education Forum. Vol. 16. (April, 1962), 28-29.
- Frink, Inez. "A Comprehensive Analysis and Synthesis of Research Findings and Thought Pertaining to Shorthand and Transcription, 1946-57." (unpublished Doctor's thesis, Indiana University, 1961).
- Gage, N. L., ed. Handbook on Research of Teaching. Chicago: Rand McNally & Company, 1963.
- Garrett, Henry E. Statistics in Psychology and Education. New York: David McKay Company, Inc., 1958.
- Gavin, Ruth E., and E. Lillian Hutchinson. Reference Manual for Stenographers and Typists. Dallas: McGraw-Hill Book Company, Inc., Gregg Publishing Division, 1962.
- Green, Harold H. "The Nature of Business Education." (unpublished Doctor's thesis, University of Pittsburgh, 1950).

- Greenspoon, Joel, and Sally Foreman. "Effect of Delay of Knowledge of Results on Learning a Motor Skill," Journal of Experimental Psychology. Vol. 51. (March, 1956), 226-228.
- Harris, Chester W., ed. Encyclopedia of Educational Research. New York: Macmillan Company, 1960.
- Hirsch, R. S. The Effects of Knowledge of Test Results on Learning of Meaningful Material. Washington and New York: U. S. Naval Training Device Center, Office of Naval Research, Tech. Rept. No. SDC 269-7-30, September, 1952.
- Irion, A. L., and L. J. Briggs. Learning Task and Mode of Operation Variables in Use of the Subject-Matter Trainer. Lackland Air Force Base, Texas, October, 1957.
- James, Thomas. "A Comparison of Criteria Utilized by Employers in Employing and Promoting Stenographic-Secretarial Workers." (unpublished Doctor's thesis, New York University, 1963).
- Jenkins, W. O., and J. C. Stanley. "Partial Reinforcement: A Review and Critique." Psychological Bulletin. Vol. 47. (May, 1950), 193-234.
- Landsman, Howard J., and Marvin Turkewitz. "Delay of Knowledge of Results and Performance on a Cognitive Task." Psychological Reports. Vol. 11. (August, 1962), 66.
- Lavery, J. J. "The Effect of One-Trial Delay in Knowledge of Results on the Acquisition and Retention of a Tossing Skill." American Journal of Psychology. Vol. 77. (September, 1964), 437-443.
- Lintz, Larry M., and Yvonne Brackbill. "Effects of Reinforcement Delay During Learning on the Retention of Verbal Material in Adults." Journal of Experimental Psychology. Vol. 71. (February, 1966), 194-199.
- Malina, Robert Marion. "Performance Changes in a Speed-Accuracy Task as a Function of Practice Under Different Conditions of Information Feedback." (unpublished Doctor's thesis, The University of Wisconsin, 1963).
- Mario-Piana, Gabriel. "Two Experimental Feedback Procedures: A Comparison of Their Effects on the Learning of Concepts." (unpublished Doctor's thesis, University of Illinois, 1956).
- McGuigan, F. J., F. Crockett, and C. Bolton. "The Effect of Knowledge of Results Before and After a Response." Journal of General Psychology. Vol. 63. (July, 1960), 51-55.
- Meyer, Susan Rogers. "A Test of the Principles of 'Activity', 'Immediate Reinforcement', and 'Guidance' as Instrumented by Skinner's Teaching Machine." (unpublished Doctor's thesis, The University of Buffalo, 1960).

- Moore, J. William, and Wendell I. Smith. "Role of Knowledge of Results in Programmed Instruction." Psychological Reports. Vol. 14. (February-June, 1964), 407-423.
- Oklahoma State University College Catalog, 1965-67. Stillwater: Oklahoma State University. Vol. 61. (1964).
- Oppenheim, Don Bruce. "The Relationship Between Intelligence and Different Patterns of Feedback in a Linear Teaching Program." (unpublished Doctor's thesis, Columbia University, 1964).
- Ottina, John Renaldo. "The Effects of Delay in Knowledge of Results on the Amount Learned in Teaching Machine Programs of Differing Cue Content." (unpublished Doctor's thesis, University of Southern California, 1964).
- Porter, D. A. "A Critical Review of a Portion of the Literature on Teaching Devices." Harvard Educational Review. Vol. 27. (1957) 126-147.
- Psychological Abstracts. Vol. 1-40. (1927-1966).
- Renner, K. Edward. "Delay of Reinforcement: A Historical Review." Psychological Bulletin. Vol. 61. (January-June, 1964), 341-361.
- Review of Educational Research. Vol. 32. (October, 1962), 411-417.
- Rosenstock, Edward H., J. William Moore, and Wendell I. Smith. "Effects of Several Schedules of Knowledge of Results on Mathematics Achievement." Psychological Reports. Vol. 17. (September, 1965), 535-541.
- Saltzman, Irving J. "Delay of Reward and Human Verbal Learning." Journal of Experimental Psychology. Vol. 41. (June, 1951), 437-439.
- Saltzman, Irving J., Frederick H. Kanfer, and Joel Greenspoon. "Delay of Reward and Human Motor Learning." Psychological Reports. Vol. 1. (1955) 139-142.
- Sarthou, Adelina. "A Survey To Determine the Educational Needs of Secretaries in Service." (unpublished Master's thesis, San Francisco State College, 1960).
- Silvey, H. M., ed. Master's Theses in Education. No. 1-13. (1951-1964).
- Skinner, B. F. "Science of Learning and the Art of Teaching." Harvard Educational Review. Vol. 24. (1954) 86-97.

- Smith, Philip Daniel. "Knowledge of Results and Continuity of Various Techniques in Presenting a Filmstrip as Factors in Immediate Learning and Retention." (unpublished Doctor's thesis, The Pennsylvania State University, 1964).
- Snode, Alfred Frederick. "The Motivating Effect of Knowledge of Performance Information on Learning and Performance in a One-Dimensional Compensatory Tracking Task." (unpublished Doctor's thesis, The Ohio State University, 1957).
- Stehr, Bennie William. "An Investigation of Employment Practices in Selected Oklahoma Cities with Implications for Improvement of Terminal Business Education in the Junior College." (unpublished Doctor's thesis, Colorado State College, 1958).
- Tate, Donald Joseph. "An Outline of Topics for a Secretarial Syllabus Developed from Job Analyses." (unpublished Doctor's thesis, New York University, 1952).
- Travers, Robert M. Essentials of Learning. New York: The Macmillan Company, 1963.
- Wert, James E., Charles O. Neidt, and Stanley Ahmann. Statistical Methods in Educational and Psychological Research. New York: Appleton-Century-Crofts, Inc., 1954.
- Wilkes, Mary Nell. "An Annotated Bibliography of Selected Researches Dealing with Methods of Teaching and Materials for Instruction in Shorthand and Transcription, January 1, 1946 - December 31, 1957." (unpublished Master's thesis, University of Colorado, 1961).
- Wolfe, D. "Training." Handbook of Experimental Psychology. Ed. S. S. Stevens. New York: Wiley, 1951.

APPENDIX A

TESTS USED IN EXPERIMENT

PUNCTUATION

1. The two men / appointed to serve on / the entertainment committee /
 A B C
 were efficient.
 D
2. Will you please / return the books / to the library / tomorrow?
 A B C D
3. The table, see page 24, / shows the percentage / of increase from /
 A B C
 1956 to 1960.
 D
4. Will you / please send / me a copy / of your catalog.
 A B C D
5. David has been / very ill with / pneumonia; but he / is better
 A B C
 this morning.
 D
6. The author who / wrote "Victory Through / the Air" is /
 A B C
 very popular.
 D
7. We shall go to the / conference, although we / shall be unable
 A B C
 to / attend all of the meetings.
 D
8. Giving a lecture / on the first / day of class, always /
 A B C
 makes me tense.
 D
9. On Friday / morning we / always have / a test.
 A B C D
10. You are / invited to / the party, / aren't you?
 A B C D
11. They work / hard, and / ask for no / sympathy.
 A B C D
12. Tuesday / was a / cold dreary / day.
 A B C D
13. The book, / entitled "Gone with the / Wind" is very / interesting.
 A B C D

14. Some teachers / are friendly; / others / reserved.
 A B C D
15. Do you know / whether you will / be able to go, / Mr. Thompson?
 A B C D
16. If they insist, I / shall make the speech, / but I am timid /
 A B C
 in front of a crowd.
 D
17. The assignment was too / difficult for the class, / consequently,
 A B
 few of the students / were able to complete it.
 C D
18. The directors at the regular / meeting elected three officers; /
 A B
 namely, president, vice president, / and secretary.
 C D
19. Food, clothing, / and shelter: these / are considered the /
 A B C
 necessities of life.
 D
20. John's article / is "Human / Relations in / Effective Letters".
 A B C D
21. "Why," she / asked, "must / you work / late again?"
 A B C D
22. Most of the architect's suggested / changes (see Enclosure 2) can /
 A B
 be incorporated at / very little additional cost.
 C D
23. John Adams, who / was our second president / was the father of /
 A B C
 John Quincy Adams.
 D
24. The test will be / given on Monday no / matter what the /
 A B C
 students wish.
 D
25. To order supplies / from only one / firm, does not / insure
 A B C
 maximum satisfaction.
 D
26. The coats / were billed / to me / weren't they?
 A B C D

27. The report is / too technical, and / contains too / much material.
 A B C D
28. If anyone / is to / blame it / is I.
 A B C D
29. Our new office / building, containing three / floors will be ready /
 A B C
 for occupancy next month.
 D
30. My brother, John, / will meet / us at the / station. /
 A B C D
 (Explanation: I have two brothers.)
31. Mr. Smith lives / in Chicago; / Mr. Conway / in Detroit.
 A B C D
32. Please file / these annual / statements / Mr. Black.
 A B C D
33. That New York City / is a great / wholesale center / is understood.
 A B C D
34. If a refrigerated car is unavailable, / then you have permission
 A B
 to ship / via a ventilated car, but wire / us collect if you cannot
 C D
 make delivery immediately.
35. Salesmen are coming to / the district meeting from Detroit, /
 A B
 Michigan; Buffalo, New York; / and Cleveland, Ohio.
 C D
36. I have two objections / to the speech: it / is a great deal
 A B C
 too technical, and / it contains too much material.
 D
37. We publish three bulletins each month; / namely; General Business
 A B
 Advice, / Business Conditions, / and Management Conditions.
 C D
38. I asked, / "What was the / last report / we received"?
 A B C D
39. The word "principal" has / a different meaning from the word
 A B
 "principle"; / therefore, the student should / memorize the
 C
 definition of each word.
 D

NUMBERS

51. The office / will be open / at nine / in the morning.
A B C D
52. The first payment / on your car / will be due / in sixty days.
A B C D
53. There were / 18 books / in the / order.
A B C D
54. A discount / of ten / per cent / is standard.
A B C D
55. We are sorry to inform / you that your order for / fourteen
display cabinets cannot / be filled at this time.
A B C D
56. 1936 was the / year this company / merged with / Majier and Sons.
A B C D
57. The salesman / estimated that \$500. / would cover the /
installation costs.
A B C D
58. The price / of the / card is / five cents.
A B C D
59. The truck / driver must / cover twenty miles / each morning.
A B C D
60. My class / starts / in 20 / minutes.
A B C D

ABBREVIATIONS

61. The U. N. / will meet / again in / the near future.
A B C D
62. The operation / will be / performed / by Doctor Johnson.
A B C D
63. Did you / ask Prof. King / for an / appointment?
A B C D
64. We live / in the / SW part / of the city.
A B C D
65. The FBI / performs a / very important / service.
A B C D

WORD DIVISION

66. There are usually / several schedule changes / at the begin-
 ning / of the semester.
 A B C
 D
67. The cen-
 A
 terpiece / is / very / pretty.
 B C D
68. Your own-
 A
 ership / does not / change the / legal question.
 B C D
69. My family / is plann-
 A B
 ing / to take a / vacation.
 C D
70. Your / indebted-
 A B
 ness / has become / too great.
 C D

ONE WORD, TWO WORDS, HYPHENATED WORD

71. The temporarily postponed meeting / was to be / held in the /
 auditorium.
 A B C
 D
72. Please / re-mark / the prices / on the sale items.
 A B C D
73. You have / discovered the / highest-guarded secret / we have.
 A B C D
74. Mr. Cousins, / the / editor, is / well-known.
 A B C D
75. Some / activities / of the school / are closely-guarded secrets.
 A B C D
76. This is / the smallest-sized / coat / we have.
 A B C D
77. One should / have self control / if he wishes / to participate
 A B C D
 in sports.

78. He had / all ready made / his speech / when I arrived.
 A B C D
79. His observations / were up-to-date / in every / respect.
 A B C D
80. You must spend / sometime on the project / in order to do /
 a good job.
 A B C
 D

DETAILS THAT MARK AN ACCEPTABLE LETTER

81. I plan / to arrive / on June / 30th.
 A B C D
82. My next / class meets / in Room / 7.
 A B C D
83. The delivery / should be made / to 1781 / Third Street.
 A B C D
84. I shall / meet you / at Duck & Elm / Streets.
 A B C D
85. We received / your letter / of application / on September 15.
 A B C D
86. Dr. James Gallo, Ph. D., / is the person / whom you should
 contact / as soon as possible.
 A B C
 D
87. The school / is located / at 224 / Thirty-second Street.
 A B C D
88. The new business / is located / at 324 / Sixtieth Street.
 A B C D
89. The school / address is / 26 North / 168 Street.
 A B C D
-
90. Henry P. Jones / A
 2624 North Tenth Street / B
 Stillwater, / Oklahoma 74074
 C D
-

91. Yours sincerely, / A
 Mr. Howard Cole / B
 Manager / C
 acb D
-
92. Respectfully yours, / A
 Mrs. Jane Wolf / B
 Assistant Manager / C
 acb D
-
93. Sincerely yours, / A
 James E. Jones / B
 Sales Manager / C
 JEJ:acb D
-
94. Helen M. Smith / A
 387 Burke Street / B
 Chicago, / Illinois 20462
 C D
-
95. Very Sincerely yours, / A
 Stephen Foster / B
 President / C
 acb D
-
96. Very truly yours, / A
 Dr. J. N. Smith / B
 Assistant Professor / C
 acb D

97. Yours very truly, / A
Nancy Dixon / B
 Mrs. John A. Dixon / C
 acb D

98. Cordially yours, / A

 Stanley R. Logan / B
 Business Manager / C
 ACB:srl D

99. Send us your answer as soon as you have made a decision,
 and we shall make the necessary arrangements.

 Very truly yours, / A

 Charles M. Brown / B
 acb / C
 P. S. This offer expires soon. D

100. (Heading for a two-page letter.)

Mrs. L. R. Smith / A 2 B September 8, 1965 /

see you in the near future. Our whole staff looks forward / C
 to meeting you and your whole family. Please call us as
 soon as you arrive. D

Answers for Pre-test and Post-test

- | | | | |
|-----|---|------|---|
| 1. | E | 51. | E |
| 2. | D | 52. | D |
| 3. | A | 53. | E |
| 4. | E | 54. | B |
| 5. | C | 55. | C |
| 6. | E | 56. | A |
| 7. | E | 57. | B |
| 8. | C | 58. | D |
| 9. | E | 59. | C |
| 10. | E | 60. | C |
| 11. | B | 61. | A |
| 12. | C | 62. | E |
| 13. | A | 63. | B |
| 14. | C | 64. | C |
| 15. | E | 65. | E |
| 16. | B | 66. | E |
| 17. | B | 67. | A |
| 18. | E | 68. | A |
| 19. | B | 69. | B |
| 20. | D | 70. | E |
| 21. | D | 71. | E |
| 22. | E | 72. | E |
| 23. | B | 73. | C |
| 24. | B | 74. | D |
| 25. | C | 75. | D |
| 26. | C | 76. | B |
| 27. | B | 77. | B |
| 28. | C | 78. | B |
| 29. | C | 79. | B |
| 30. | A | 80. | B |
| 31. | C | 81. | D |
| 32. | C | 82. | E |
| 33. | E | 83. | E |
| 34. | C | 84. | C |
| 35. | E | 85. | E |
| 36. | E | 86. | A |
| 37. | B | 87. | D |
| 38. | D | 88. | D |
| 39. | E | 89. | E |
| 40. | B | 90. | A |
| 41. | D | 91. | B |
| 42. | D | 92. | E |
| 43. | B | 93. | E |
| 44. | B | 94. | A |
| 45. | D | 95. | A |
| 46. | B | 96. | B |
| 47. | C | 97. | E |
| 48. | E | 98. | D |
| 49. | E | 99. | E |
| 50. | D | 100. | E |

Quizzes

The directions for answering the quizzes were the same as those for the pre-test and post-test except the answer to each question was written in the left margin beside that question. No answer sheets were used with the quizzes.

These directions were given orally.

Week 3, Set 1

1. Will you / please file / these letters / for Mr. Black?
A B C D
2. You will / help me study / for my test, / won't you?
A B C D
3. The man / whom you saw / in Baltimore / is our neighbor.
A B C D
4. Denmark has been in / an exposed position, and / has often had
A B C
to defend / itself from invaders.
D
5. Will you / please answer / my letter / within ten days.
A B C D

Week 3, Set 2

1. On Thursday evening we / shall have a / guest speaker / at our
A B C D
meeting.
2. The man / selected to review / the book did / an excellent job.
A B C D
3. A husky / belligerent foreman / stood there / clenching his fists.
A B C D
4. His latest / book, containing / 654 pages is / most interesting.
A B C D

Week 4, Set 1

1. "When," / asked John, "do / we get / to eat"?
A B C D
2. Here is the important / point: This policy / would give me
A B
protection and // still not cost too much.
C D
3. Connors asked, / "Just what / would you like me / to do on
A B C D
the trip"?
4. I do know / this; I did / not receive official / notice until
A B C D
yesterday.

4. The three persons whom / you should contact are Mr. Jones, /
 Chemistry Department; Mr. Black, Art Department; / and
 Mr. Jackson, Humanities Department.

Week 6, Set 1

1. Mr. James A. Bronson, / President of / General Products
 Corporation, / will be our guest speaker tonight.
2. The position was / offered to professor / Harold Cox / of
 Oklahoma State University.
3. The work / in a / Production Department is / tedious.
4. Dr. Charles Feige, / chief surgeon / at St. George Hospital, /
 will perform the operation.

Week 6, Set 2

-
1. Cordially yours, / A
- Mr. John S. Wade / B
 Office Manager / C
- acb D
-
2. Yours respectfully, / A
- Mrs. Sue Brown / B
 Office Manager / C
- acb D
-

3. Very sincerely yours, / A

Dr. N. B. Norway / B
Associate Professor / C

acb D

4. Very truly yours, / A

Susan James / B
Mrs. Hoyt James / C

acb D

5. The role of / the government in / controlling monopoly is /
A B C
sometimes questionable.
D

Week 7, Set 1

1. The answers / received / have totaled / 82.
A B C D
2. The price / is \$100. / each for the / filing units.
A B C D
3. 1942 was / the year / Smith and Company started / their business.
A B C D
4. His letter was / addressed to Joan; / and was opened / by Jo Ann.
A B C D
5. That contracts / are valuable / papers is / accepted.
A B C D

Week 7, Set 2

1. The cars / collided at / Maple & Main / Streets.
A B C D

2. Yours respectfully, / A

Soland R. Ames / B
Executive Secretary / C

ACB:sra D

3. We shall look forward to seeing you in our store next Friday. Let us hear from you soon.

Very truly yours, / A

Sidney M. Austin / B

acb / C

P. S. Mr. Jones will show you around. D

4. Yours sincerely, / A

Frank M. Smith / B
Credit Manager / C

FMS:acb D

5. The books / contained / eighteen / chapters each.
A B C D

Week 8, Set 1

1. Prof. Smith / is the head / of that / department.
A B C D

2. Some students / are hard workers; / others / lazy.
A B C D

3. Doctor Smith / will see / the patient / as soon as possible.
A B C D

4. The coats were / billed at \$76 each; / the hats / at \$9 each.
A B C D

Week 8, Set 2

1. The rally / will be held / at 16 West / 82 Street.
A B C D
2. Our meeting / is to be / at 788 / Fortieth Avenue.
A B C D
3. The S. E. C. / regulates stock / listed on the / New York Exchange.
A B C D
4. Have you / ever met anyone / who works / for the FBI?
A B C D

Week 9, Set 1

1. Joe Smith, who is my / favorite cousin has won / more honors
than any other / boy in school.
A B C D
2. Your / patio / is / well-planned.
A B C D
3. The aroma / of the partially-brewed coffee / revived / Mr. Jones.
A B C D
4. The teaching materials / used in the methods / classes should be
kept / up-to-date.
A B C D

Week 9, Set 2

1. You have selected / the highest-priced / piano / we have.
A B C D
2. Three / scantily clad models / entertained / the group.
A B C D
3. Our / greatest-advertised campaign / began / yesterday.
A B C D
4. She attended the / party, although she / knew she would /
not have a good time.
A B C D

Week 11, Set 1

1. Doctor Jones / is the / chief surgeon / isn't he?
A B C D
2. The package is marked "fragile"; / consequently, the / postman
was very / careful in handling it.
A B
C D
3. The name of / the article is "How / To Study for / an Examination".
A B C D
4. As you know, / we usually do not allow / such privileges, but we
shall / make an exception this time.
A B C
D

Week 11, Set 2

1. The university has / three important functions; / that is,
instruction, / research, and extension.
A B C
D
2. We are completely / out of gas, / consequently, we shall /
have to walk.
A B C
D
3. The game must be / played on Tuesday no / matter how many /
players are injured.
A B C
D
4. The committee at its regular meeting elected three officers; /
namely; / chairman, vice chairman, / and secretary.
A B C D

Week 12, Set 1

1. Mr. Thompson's / office / is in Room / 10.
A B C D
2. His main interest / is accounting, and he / is taking investment
management, / this semester.
A B C
D
3. The work of / federal employees / is very / vital.
A B C D

4. The first / installment should / be paid / in thirty days.
 A B C D

Week 14, Set 1

1. All students / do not study; / but Tom takes / his work seriously.
 A B C D
2. You should / re-mark / those labels / which have faded.
 A B C D
3. Have you / all ready / taken / the test?
 A B C D
4. If we had / come late it / would not have / made any difference.
 A B C D

Week 14, Set 2

1. It will / take sometime / to write / the term paper.
 A B C D
2. You should not / be so self conscious / when speaking / to a group.
 A B C D
3. The weather / should be / warmer tomorrow, / Mr. Jones.
 A B C D
4. My sister, Jane, / is going / with us to / the game. /
 A B C D
 (Explanation: I have two sisters.)
5. Let me assure / you that our letter / is serious / Miss Merton.
 A B C D

Answers for Quizzes

Week 3, Set 1

1. D
2. E
3. E
4. B
5. E

Week 3, Set 2

1. E
2. E
3. A
4. C

Week 9, Set 1

1. B
2. D
3. B
4. D

Week 9, Set 2

1. B
2. E
3. B
4. E

Week 4, Set 1

1. D
2. E
3. D
4. B

Week 4, Set 2

1. E
2. E
3. B
4. B

Week 10, Set 1

1. C
2. D
3. E
4. A

Week 10, Set 2

1. E
2. B
3. B
4. B

Week 5, Set 1

1. C
2. E
3. E
4. D

Week 5, Set 2

1. A
2. A
3. A
4. E

Week 11, Set 1

1. C
2. E
3. D
4. C

Week 11, Set 2

1. E
2. B
3. B
4. B

Week 6, Set 1

1. B
2. B
3. C
4. E

Week 6, Set 2

1. B
2. E
3. B
4. E
5. B

Week 12, Set 1

1. E
2. C
3. B

Week 12, Set 2

1. E
2. E
3. D
4. D

Week 7, Set 1

1. E
2. B
3. A
4. B
5. E

Week 7, Set 2

1. C
2. D
3. E
4. E
5. C

Week 13, Set 1

1. D
2. B
3. E
4. A

Week 13, Set 2

1. C
2. D
3. C
4. D

Week 8, Set 1

1. A
2. C
3. E
4. C

Week 8, Set 2

1. E
2. D
3. A
4. E

Week 14, Set 1

1. B
2. E
3. B
4. B

Week 14, Set 2

1. B
2. B
3. E
4. A
5. C

APPENDIX B

TEACHING MATERIALS

Instructions for Teaching Materials

Oral instructions were given. The students were instructed to correct the following items by inserting or deleting wherever necessary. Some items were correct as given; and if the students thought an item was correct, they made no change.

Students were told that most of the items covered rules in the assigned section of the reference manual for that particular week; however, a few items each week were review items and could cover any section of the reference manual which had been previously assigned. Therefore, as the students proceeded through the exercises, they were actually looking for any kind of error which had been previously covered in a reference manual assignment.

Illustrations of Materials Used in
Experimental Groups

Illustrations of Materials Used in Experimental Groups

The first page of Week 5, Set 1, illustrates the form of the teaching materials used in the experimental groups. It may be seen that the items in the materials used in the experimental groups are identical to those in the materials used in the control groups, but the form in which the items are presented and the procedure for working through the materials are different for the two treatment groups.

Figure 1 is an illustration of the materials used in the experimental groups without the green insert sheet. The shaded areas below the items emphasize the windows in the top sheet, with the answers showing through from the bottom sheet.

As indicated in the description of the teaching materials, the top windowed sheet was attached to the answer sheet so that the answers showed through the windows. These two sheets were attached at the top and two sides but left open at the bottom for inserting and removing the green insert sheet.

Figure 2 shows the appearance of the materials with the green sheet completely inserted to cover all of the answers. The materials were assembled in this manner before they were distributed to the experimental classes.

Figure 3 shows the appearance of the materials as the items were answered. The top frame shows that the student answered item No. 1, pulled the green insert sheet below the first window to check the answer to item No. 1, and then answered item No. 2. The middle frame shows that the student pulled the green insert sheet below the second

window to check the answer to item No. 2 and then answered item No. 3. The bottom frame shows that the student pulled the green insert sheet below the third window to check the answer to item No. 3 and was then ready to proceed to item No. 4.

The corrections which the student was expected to make are written in ink to illustrate that the student made his response to the item before uncovering the answer to the item.

These three illustrations should show the form of the materials used in the experimental groups and also the procedure for working through each set of materials.

1. We shall attend the meeting on Feb. 18, 1966.

We shall attend the meeting on February 18, 1966. (62)

2. Please meet us on January third.

Please meet us on January 3. (63)

3. The date of our first meeting was 2/12/65.

The date of our first meeting was February 12, 1965. (64)

4. September 15th is the first day of the semester.

September 15 is the first day of the semester. (65)

5. We have just received your order of the tenth of May.

We have just received your order of the tenth of May. (or 10th of May) (66)

6. The letter from Colonel Smith was dated 21 May 1965.

The letter from Colonel Smith was dated 21 May 1965. (67)

7. Is the following a correct address? 892 Seventh Avenue

Yes. (92a)

8. Is the following a correct address? 248 Twelfth Street

No. 248 12 Street or 248 - 12th Street or 248 - 12 Street. (92b)

9. His birthday is Aug. 17.

His Birthday is August 17. (62)

10. July fourth is a holiday.

July 4 is a holiday. (63)

Figure 1. Illustration of Teaching Materials
Without Insert Sheet

1. We shall attend the meeting on Feb. 18, 1966.



2. Please meet us on January third.



3. The date of our first meeting was 2/12/65.



4. September 15th is the first day of the semester.



5. We have just received your order of the tenth of May.



6. The letter from Colonel Smith was dated 21 May 1965.



7. Is the following a correct address? 892 Seventh Avenue



8. Is the following a correct address? 248 Twelfth Street



9. His birthday is Aug. 17.



10. July fourth is a holiday.



Figure 2. Illustration of Teaching Materials
With Insert Sheet

1. We shall attend the meeting on ^{February} Feb. 18, 1966.

We shall attend the meeting on February 18, 1966. (62)

2. Please meet us on January ³ third.

3. The date of our first meeting was 2/12/65.

1. We shall attend the meeting on ^{February} Feb. 18, 1966.

We shall attend the meeting on February 18, 1966. (62)

2. Please meet us on January ³ third.

Please meet us on January 3. (63)

3. The date of our first meeting was ^{February 12, 1965} 2/12/65.

1. We shall attend the meeting on ^{February} Feb. 18, 1966.

We shall attend the meeting on February 18, 1966. (62)

2. Please meet us on January ³ third.

Please meet us on January 3. (63)

3. The date of our first meeting was ^{February 12, 1965} 2/12/65.

The date of our first meeting was February 12, 1965. (64)

Figure 3. Illustration of Procedure for Working Through Materials

Copy of Materials Used in
Control Groups

Week 3, Set 1

1. Summer vacation begins July 26
2. Now, to make your assignment
3. The first two acts were slow moving but the third act was full of action and suspense.
4. Will you please send me information about the requirements for admission
5. While Mario put the costume on his accompanist played the piano.
6. He asked what had caused the delay?
7. A student, who has not yet discovered what he wants to major in, should learn all he can about the world in which he must some day take his place.
8. He did give you the correct change didn't he.
9. Watching the game from the tree Elmer forgot to hold on.
10. I gave some good advice to Gerald, and got some from him in return.
11. She wants to know what the assignment is?
12. John Thomas is the only senior who won scholarships to three colleges.
13. Will you please send me your latest catalog?
14. No official estimate will be possible until the floodwaters have receded although the newspapers have printed guesses as to the damage.
15. What is the capital of Georgia, of Alabama, of Maine, of Wisconsin.
16. To understand Swift's behavior toward Vanessa one must know something of his relations with Stella.
17. Will you please ship this order three weeks before Christmas
18. The students in the building, and the students outdoors were all excited about the victory.
19. Do you know what the assignment is.
20. The man, who spoke to me, is my science teacher.

Answer Sheet
Week 3, Set 1

1. Summer vacation begins July 26. (183)
2. Now, to make your assignment. (184)
3. The first two acts were slow moving, but the third act was full of action and suspense. (206)
4. Will you please send me information about the requirements for admission. (185)
5. While Mario put the costume on, his accompanist played the piano. (210)
6. He asked what had caused the delay. (193)
7. A student who has not yet discovered what he wants to major in should learn all he can about the world in which he must some day take his place. (211a)
8. He did give you the correct change, didn't he? (196)
9. Watching the game from the tree, Elmer forgot to hold on. (213a)
10. I gave some good advice to Gerald and got some from him in return. (207b)
11. She wants to know what the assignment is. (186)
12. John Thomas is the only senior who won scholarships to three colleges. (211a)
13. Will you please send me your latest catalog. (194)
14. No official estimate will be possible until the floodwaters have receded, although the newspapers have printed guesses as to the damage. (212)
15. What is the capital of Georgia? of Alabama? of Maine? of Wisconsin? (198)
16. To understand Swift's behavior toward Vanessa, one must know something of his relations with Stella. (213b)
17. Will you please ship this order three weeks before Christmas. (185)
18. The students in the building and the students outdoors were all excited about the victory. (208)
19. Do you know what the assignment is? (192)
20. The man who spoke to me is my science teacher. (211a)

Week 3, Set 2

1. Soon after the end of the War of the Spanish Succession Bolingbroke was impeached and fled to France.
2. Nitrogen, oxygen, carbon dioxide, and water vapor, make up the mixture called air.
3. We agreed therefore, to sign the petition.
4. Take with you only indispensable things, leave behind all heavy items.
5. The workmen installed a new gymnasium floor, an improved heating system, etc. in the high school building.
6. There are no set rules which an actor must follow, however, there are certain principles which may help him.
7. We packed her bag, and bought her ticket, and put her on the train.
8. For six months there have been no deaths, caused by automobile accidents, in our city.
9. The Canby, a new theater on Bank Street, announced programs of gangster pictures, and the crowds were enormous.
10. This is indeed a great piece of news.
11. I subscribe to the New Yorker, and the Reporter magazines.
12. Hundreds of church bells, ringing loudly after years of silence, announced the end of the war.
13. She was told that her forehead was wrinkled, that her mouth was firm, but that her eyes had a dreamy, reminiscent look.
14. Obviously upset by the criticism he refused to discuss the matter.
15. It was a cold dark November day.
16. By the way I had a letter from Frances.
17. The committee consisted of Mr. Webster, the president of the bank, Mr. Elton, the manager of the water company, and the mayor.
18. He was formerly on the staff in Moscow, Berlin, Vienna and Madrid.
19. Miss Jones just purchased a new spring coat.
20. Therefore we agreed to sign the petition.

Answer Sheet
Week 3, Set 2

1. Soon after the end of the War of the Spanish Succession, Bolingbroke was impeached and fled to France. (213c)
2. Nitrogen, oxygen, carbon dioxide, and water vapor make up the mixture called air. (220)
3. We agreed, therefore, to sign the petition. (215b)
4. Take with you only indispensable things; leave behind all heavy items. (244)
5. The workmen installed a new gymnasium floor, an improved heating system, etc., in the high school building. (219)
6. There are no set rules which an actor must follow; however, there are certain principles which may help him. (248)
7. We packed her bag and bought her ticket and put her on the train. (222)
8. For six months there have been no deaths caused by automobile accidents in our city. (214a)
9. The Canby, a new theater on Bank Street, announced programs of gangster pictures; and the crowds were enormous. (245)
10. This is indeed a great piece of news. (215c) (Commas might be used to set off the word "indeed" if the dictator gives special emphasis.)
11. I subscribe to the New Yorker and the Reporter magazines. (222)
12. Hundreds of church bells, ringing loudly after years of silence, announced the end of the war. (214b)
13. She was told that her forehead was wrinkled; that her mouth was firm; but that her eyes had a dreamy, reminiscent look. (246)
14. Obviously upset by the criticism, he refused to discuss the matter. (216)
15. It was a cold, dark November day. (223)
16. By the way, I had a letter from Frances. (215)
17. The committee consisted of Mr. Webster, the president of the bank; Mr. Elton, the manager of the water company; and the mayor. (247)
18. He was formerly on the staff in Moscow, Berlin, Vienna, and Madrid. (217)
19. Miss Jones just purchased a new spring coat. (224)
20. Therefore, we agreed to sign the petition. (215a)

Week 4, Set 1

1. We furnish the following articles; towels, sheets, and pillow slips.
2. Morrison a hard-bitten retail dealer has an ironic sense of humor.
3. He asked, "What will be the outcome of the campaign"?
4. All any examination is is an endurance test.
5. "Principal" means the same as "head" or "chief."
6. "Go home", he pleaded, "before you cause more trouble."
7. There are three causes, poverty, injustice, and indolence.
8. You will hear people say for instance that Sicilians don't speak real Italian.
9. In my letter to the Green Company, I said: "This will confirm our telegram which reads, Goods damaged as you did not mark Fragile on the package
10. Mr. J. B. Jones Sr. is our new client.
11. Foreign aid organizations sent: food, clothing, and toys to Europe.
12. The more scientists learn the more they have left to learn.
13. I remember her exact words, "For tomorrow read Frost's poem Mending Wall.
14. I heard her say; "Complete the lesson at home."
15. Intercollegiate athletics continues to be big business, but Hutchins pointed out a simple remedy: Colleges should stop charging admission.
16. She liked the blue dress as well as if not better than the red one.
17. He said "that he was sorry."
18. The lecture, "Life of George Washington", will be presented this evening.
19. There is one strong reason why gambling should not be legalized; Gambling establishments always attract gangsters and criminals.
20. Ever since he has devoted himself to athletics.

Answer Sheet
Week 4, Set 1

1. We furnish the following articles: towels, sheets, and pillow slips. (252)
2. Morrison, a hard-bitten retail dealer, has an ironic sense of humor. (225)
3. He asked, "What will be the outcome of the campaign?" (276, 306)
4. All any examination is, is an endurance test. (323)
5. "Principal" means the same as "head" or "chief." (296)
6. "Go home," he pleaded, "before you cause more trouble." (239)
7. There are three causes: poverty, injustice, and indolence. (253)
8. You will hear people say, for instance, that Sicilians don't speak real Italian. (227)
9. In my letter to the Green Company, I said: "This will confirm our telegram which reads, 'Goods damaged as you did not mark "Fragile" on the package.'" (292)
10. Mr. J. B. Jones, Sr., is our new client. (234)
11. Foreign aid organizations sent food, clothing, and toys to Europe. (254c)
12. The more scientists learn, the more they have left to learn. (228)
13. I remember her exact words, "For tomorrow read Frost's poem 'Mending Wall.'" (291)
14. I heard her say, "Complete the lesson at home." (236)
15. Intercollegiate athletics continues to be big business, but Hutchins pointed out a simple remedy: Colleges should stop charging admission. (255)
16. She liked the blue dress as well as, if not better than, the red one. (229)
17. He said that he was sorry. (278)
18. The lecture, "Life of George Washington," will be presented this evening. (239)
19. There is one strong reason why gambling should not be legalized: Gambling establishments always attract gangsters and criminals. (255)
20. Ever since, he has devoted himself to athletics. (231)

Week 4, Set 2

1. To work, to play, and to raise children, these rights we tend to take for granted.
2. The word strictly is often misspelled.
3. The musicians according to the program they were Gypsies played some sentimental tunes by Victor Herbert.
4. All parts of a plant reduce to three--namely, root, stem, and leaf.
5. The annual report is divided into two sections: 1. financial statements and schedules and 2. general survey of the year's business.
6. The apartment is now available and if you are still interested I should like to hear from you.
7. A yawl, a sloop, and a schooner: these three ships were anchored in the harbor.
8. I enjoyed Hollis Alpert's book, The Home of a Stranger.
9. The recent election affected the stock market see Diagram A temporarily.
10. The second edition of the book, published in 1922, is scarce, but the third edition, published four years later, can be easily found.
11. Dr. Mayhem, Dr. Butcher, and Dr. Sawyer--these three physicians were in attendance.
12. "Business Education World" is a good magazine.
13. The sales for the first quarter--see Table 1--show a favorable trend.
14. Since air is dissolved by water at the surface only the shape of an aquarium is important and too small an opening may cause an oxygen deficiency.
15. He might, and according to plans, should, have reinforced the Second Division.
16. The Queen Mary will sail very shortly.
17. In consideration for the sum of two hundred dollars--\$200-- . . .
18. As generally explained, a folksong is a song communicated through an oral tradition, but what are we to say about the song?
19. Mr. Ray is chairman--or is he vice-chairman?--of that committee.
20. That company had a good product to sell; yet the product was reasonably priced.

Answer Sheet
Week 4, Set 2

1. To work, to play, and to raise children--these rights we tend to take for granted. (265)
2. The word "strictly" is often misspelled. (297)
3. The musicians (according to the program they were Gypsies) played some sentimental tunes by Victor Herbert. (315)
4. All parts of a plant reduce to three; namely, root, stem, and leaf. (250)
5. The annual report is divided into two sections: (1) financial statements and schedules and (2) general surveys of the year's business. (320)
6. The apartment is now available; and, if you are still interested, I should like to hear from you. (245) (Comma after "and" is optional.)
7. A yawl, a sloop, and a schooner--these three ships were anchored in the harbor. (265)
8. I enjoyed Hollis Alpert's book, "The Home of a Stranger." (302a)
9. The recent election affected the stock market (see Diagram A) temporarily. (317)
10. The second edition of the book, published in 1922, is scarce; but the third edition, published four years later, can be easily found. (245)
11. Dr. Mayhem, Dr. Butcher, and Dr. Sawyer--these three physicians were in attendance. (265)
12. Business Education World is a good magazine. (303)
13. The sales for the first quarter (see Table 1) show a favorable trend. (319)
14. Since air is dissolved by water at the surface only, the shape of an aquarium is important; and too small an opening may cause an oxygen deficiency. (245)
15. He might--and according to plans, should--have reinforced the Second Division. (262)
16. The "Queen Mary" will sail very shortly. (304)
17. In consideration for the sum of two hundred dollars (\$200) (319)
18. As generally explained, a folksong is a song communicated through an oral tradition; but what are we to say about the song? (245)
19. Mr. Ray is chairman--or is he vice-chairman?--of that committee. (267)
20. That company had a good product to sell; yet the product was reasonably priced. (249)

Week 5, Set 1

1. We shall attend the meeting on Feb. 18, 1966.
2. Please meet us on January third.
3. The date of our first meeting was 2/12/65.
4. September 15th is the first day of the semester.
5. We have just received your order of the tenth of May.
6. The letter from Colonel Smith was dated 21 May 1965.
7. Is the following a correct address? 892 Seventh Avenue
8. Is the following a correct address? 248 Twelfth Street
9. His birthday is Aug. 17.
10. July fourth is a holiday.
11. Your order of November 10th has been shipped.
12. We expect to have the survey completed by the first of March.
13. Is the following a correct address? 2890 9th Avenue
14. This shipment should reach you not later than May 15th.
15. Our records indicate that we paid this bill on the 28 of December.
16. After all we are in business to make a profit.
17. On the other hand our company takes advantage of all special discounts.
18. Fred, Tom, or Ray, will brief the new correspondent on his duties.
19. As a general rule we do not allow such privileges.
20. As a matter of fact we do not permit vacations during the winter.

Answer Sheet
Week 5, Set 1

1. We shall attend the meeting on February 18, 1966. (62)
2. Please meet us on January 3. (63)
3. The date of our first meeting was February 12, 1965. (64)
4. September 15 is the first day of the semester. (65)
5. We have just received your order of the tenth of May. (or 10th of May) (66)
6. The letter from Colonel Smith was dated 21 May 1965. (67)
7. Yes. 892 Seventh Avenue (92a)
8. No. 248 12 Street, or 248 - 12th Street, or 248 - 12 Street (92b)
9. His birthday is August 17. (62)
10. July 4 is a holiday. (63)
11. Your order of November 10 has been shipped. (65)
12. We expect to have the survey completed by the first of March. (66)
13. No. 2890 Ninth Avenue (92a)
14. This shipment should reach you not later than May 15. (65)
15. Our records indicate that we paid this bill on the 28th of December. (66)
16. After all, we are in business to make a profit. (215)
17. On the other hand, our company takes advantage of all special discounts. (215)
18. Fred, Tom, or Ray will brief the new correspondent on his duties. (220)
19. As a general rule, we do not allow such privileges. (215)
20. As a matter of fact, we do not permit vacations during the winter. (215)

Week 5, Set 2

1. Did you forward the letter of June 18, 1965 to the correct address?
2. Inside addresses should always consist of at least three lines.
True or False
3. Is the following a correct first line for an inside address?
Mr. Harry M. Jones
4. Is the following a correct first line for an inside address?
Dr. A. M. Jackson, Ed. D.
5. Is the following a correct first line for an inside address?
Dr. Albert Swim, Chairman
6. Is the following a correct first line for an inside address?
Mrs. Dr. Samuel Smith.
7. Is the following a correct form for a company name if one does not have the official form? Jackson & Johnson Company
8. In general, is the following a correct company name?
Atlas Company Limited
9. In general, is the following a correct company name?
Smith & Brown Corp.
10. An extremely long company name may be carried over to the second line and indented five spaces. True or False?
11. His letter of May 12, was misplaced during the move to the new office.
12. Is the following inside address correct: Mr. Harry M. Jones
Coyle, Oklahoma
13. What is the correct title to use if the writer does not know whether a woman is Miss or Mrs.?
14. Is the following a correct first line for an inside address?
Doctor James Johnson
15. Is the following a correct first line for an inside address?
Dr. James Johnson, M. D.
16. Idleness is vegetating, industry is living.
17. He said that we should arrange our goods into shipping units, that we should transport them to the place where they will be consumed, and that, if necessary, we should store them there.
18. Ethnically, our city is made up as follows: Irish, 30 per cent, English, 40 per cent, Italian, 20 per cent, and German, 10 per cent.
19. Miss Searcy could almost qualify as an expert in clothing, yet her advice was not followed by everyone in the store.
20. First, plan your report--that is, outline it in detail.

Answer Sheet
Week 5, Set 2

1. Did you forward the letter of June 18, 1965, to the correct address? (69)
2. True (74)
3. Yes (78)
4. No. Omit Ed. D. (80)
5. Yes. Dr. and Chairman are not the same title. (80)
6. No. Mrs. Samuel Smith (81)
7. Yes. (86a)
8. No. Atlas Company, Ltd. (86b)
9. No. Smith & Brown Corporation (86c)
10. False. Indented two spaces. (89)
11. His letter of May 12 was misplaced during the move to the new office. (69)
12. No, Oklahoma should be placed on the third line and the comma omitted after Coyle. (74)
13. Miss (78b)
14. No. Dr. James Johnson (78 also 434)
15. No. Omit M. D. (80)
16. Idleness is vegetating; industry is living. (244)
17. He said that we should arrange our goods into shipping units; transport them to the place where they will be consumed; and, if necessary, store them there. (246) (Words omitted to save space)
18. Ethnically, our city is made up as follows: Irish, 30 per cent; English, 40 per cent; Italian, 20 per cent; and German, 10 per cent. (247)
19. Miss Searcy could almost qualify as an expert in clothing; yet her advice was not followed by everyone in the store. (249)
20. First, plan your report; that is, outline it in detail. (250)

Week 6, Set 1

1. There was a strong south wind blowing as we left England to cross the channel to France.
2. I know that he was questioned by the Securities and Exchange Commission, and the commission exonerated him of all wrongdoing.
3. The Company has arranged for the annual picnic to be held at Bates Woods.
4. My Aunt advised Uncle Sorbin to take a course in evening school.
5. Mr. Mayo, general manager of our company, was out of town last week.
6. The work in his Office is rather strenuous.
7. I know, senator, that he was questioned by the Securities and Exchange Commission.
8. Our Company has taken its case to the Federal Court.
9. The speaker at the convention was Senator Kefauver.
10. Winston Churchill, former prime minister of Great Britain, was also a well-known author.
11. Did you bid on the landscaping for our new High School?
12. Did you hear the president's speech concerning the Viet Nam crisis?
13. Although the company has been growing rapidly, it is not yet in a position to take such a decisive step.
14. He works in a sales department in one of the downtown businesses.
15. Methods for improving communications form an essential part of the training program in a progressive Company.
16. I started the work yesterday; and I finished it early this morning.
17. A number of firms have used our collection letters, and have obtained fine results.
18. When Mr. Lake arrived George met him.
19. The secretary, and the treasurer have announced that the merger is an accomplished fact.
20. We left on May 8, for our trip.

Answer Sheet
Week 6, Set 1

1. There was a strong south wind blowing as we left England to cross the Channel to France. (351a) English Channel
2. I know that he was questioned by the Securities and Exchange Commission, and the Commission exonerated him of all wrongdoing. (351b)
3. The Company has arranged for the annual picnic to be held at Bates Woods. (351c)
4. My aunt advised Uncle Sorbin to take a course in evening school. (352)
5. Mr. Mayo, general manager of our company, was out of town last week. (350, 353)
6. The work in his office is rather strenuous. (361)
7. I know, Senator, that he was questioned by the Securities and Exchange Commission. (355)
8. Our company has taken its case to the Federal Court. (351c)
9. The speaker at the convention was Senator Kefauver. (352)
10. Winston Churchill, former Prime Minister of Great Britain, was also a well-known author. (353, 350)
11. Did you bid on the landscaping for our new high school? (361)
12. Did you hear the President's speech concerning the Viet Nam crisis? (355)
13. Although the Company has been growing rapidly, it is not yet in a position to take such a decisive step. (351c)
14. He works in a sales department in one of the downtown businesses. (361)
15. Methods for improving communications form an essential part of the training program in a progressive company. (351c)
16. I started the work yesterday, and I finished it early this morning. (206)
17. A number of firms have used our collection letters and have obtained fine results. (207a)
18. When Mr. Lake arrived, George met him. (210)
19. The secretary and the treasurer have announced that the merger is an accomplished fact. (208)
20. We left on May 8 for our trip. (243)

Week 6, Set 2

1. President-Elect Kamm was honored at a reception recently.
2. Our lawyer is a member of the American bar association.
3. Please remit your membership dues to the treasurer of the Club today.
4. The House of representatives approved the bill by an overwhelming majority.
5. The navy refused to comment on the report issued by Governor Ellis.
6. A congressman introduced a bill to raise the salaries of federal employees.
7. Mr. Jones is a member of the Rotary Club of the City of Stillwater.
8. Highway patrolmen are employees of the state.
9. Mrs. Jones took a tour of the South last fall.
10. The fourth Thursday of November is thanksgiving day.
11. Hubert wrote his first book, "the beginning of the end," while he was attending Huddleston College.
12. A meeting of the board of aldermen will be held on May 6.
13. The Society for Advancement of Management is recognized by people in industry, commerce, education, and the government.
14. Mr. Page, our representative in the west, reports an increase in sales.
15. This booklet summarizes the results of a survey made by the department of the interior.
16. Is the following a correct signature line? Mr. J. J. Hoyt
17. Is the following a correct typed signature for an unmarried woman? Miss Sherry Stockton
18. Is the following a correct typed signature for a married woman? Mrs. Mary Brown
19. Is the following a correct signature line? Dr. M. B. Smith
20. Is the following a correct typed signature for a married woman? Mrs. Mary Smith Brown

Answer Sheet
Week 6, Set 2

1. President-elect Kamm was honored at a reception recently. (357)
2. Our lawyer is a member of the American Bar Association. (358)
3. Please remit your membership dues to the treasurer of the Club today. (360)
4. The House of Representatives approved the bill by an overwhelming majority. (364)
5. The Navy refused to comment on the report issued by Governor Ellis. (365)
6. A congressman introduced a bill to raise the salaries of Federal employees. (366)
7. Mr. Jones is a member of the Rotary Club of the city of Stillwater. (368)
8. Highway patrolmen are employees of the State. (369)
9. Mrs. Jones took a tour of the South last fall. (371)
10. The fourth Thursday of November is Thanksgiving Day. (373)
11. Hubert wrote his first book, "The Beginning of the End," while he was attending Huddleston College. (375)
12. A meeting of the Board of Aldermen will be held on May 6. (358)
13. The Society for Advancement of Management is recognized by people in industry, commerce, education, and the Government. (366)
14. Mr. Page, our representative in the West, reports an increase in sales. (371)
15. This booklet summarizes the results of a survey made by the Department of the Interior. (358)
16. No. Omit Mr. (127)
17. Yes. (128a)
18. Yes. (128b)
19. No. Omit Dr. (127)
20. Yes. (128b)

Week 7, Set 1

1. In our office there are twelve stenographers and fifteen clerks.
2. About 200 customers were waiting when the store opened.
3. The order for 20 chairs, 12 desks, and seven filing cabinets was sent today.
4. She received the sum of \$10 million dollars in the lawsuit.
5. The total of the bill was seventy-six dollars.
6. The check was written for \$150.00.
7. 12 companies furnished the exhibits used at the convention.
8. Miss Jones just finished her 3rd year of teaching.
9. The price range is from \$200 to 450 a month.
10. We have received almost five hundred requests for samples.
11. In our office there are twelve stenographers, eight clerks, and one receptionist.
12. You will be sent 12 hundred samples.
13. He agreed to pay me five dollars if he lost the bet.
14. Nearly \$1000.00 has been spent on two new couches and an upholstered chair.
15. $\frac{3}{4}$ of the directors were in agreement with the chairman.
16. The president visited his company's branch offices, and spoke at several salesmen's meetings.
17. He realized the risk involved, but he was willing to go through with the project anyway.
18. When the attorney arrived he sent for the bookkeeper and me.
19. Your proposal will probably be accepted although we think it still needs further study.
20. That he is a good student, is no secret.

Answer Sheet
Week 7, Set 1

1. In our office there are 12 stenographers and 15 clerks. (385)
2. About two hundred customers were waiting when the store opened. (386)
3. The order for 20 chairs, 12 desks, and 7 filing cabinets was sent today. (387)
4. She received the sum of \$10 million in the lawsuit. (389)
5. The total of the bill was \$76. (393)
6. The check was written for \$150. (394)
7. Twelve companies furnished the exhibits used at the convention. (390)
8. Miss Jones just finished her third year of teaching. (391)
9. The price range is from \$200 to \$450 a month. (395)
10. We have received almost five hundred requests for samples. (386)
11. In our office there are 12 stenographers, 8 clerks, and 1 receptionist. (387)
12. You will be sent 1200 samples. (389) (Only numbers as large as million or billion)
13. He agreed to pay me \$5 if he lost the bet. (393)
14. Nearly \$1000 has been spent on two new couches and an upholstered chair. (394)
15. Three-fourths of the directors were in agreement with the chairman. (390)
16. The president visited his company's branch offices and spoke at several salesmen's meetings. (207b)
17. He realized the risk involved, but he was willing to go through with the project anyway. (206)
18. When the attorney arrived, he sent for the bookkeeper and me. (210)
19. Your proposal will probably be accepted, although we think it still needs further study. (212)
20. That he is a good student is no secret. (240)

Week 7, Set 2

1. A long figure may be divided at the end of the line provided more than half of the figure is placed on the first line. True or False?
2. Traveling by air, I visited dealers in 22 states.
3. To cover mailing costs, we make a charge of \$.25 on each item.
4. Elake Company now has about a hundred customers.
5. Payment of Two Hundred Dollars (\$200) shall be made upon completion of the work. (Contract)
6. They sold the stock at ninety-eight and one-half.
7. Her grade point average is two point five.
8. Mr. Curtin discovered a ratio of seven to one each time he conducted the tests.
9. This punch bowl holds 4 quarts, 1 pint.
10. At eight p.m. the meeting adjourned.
11. The Norman Conquest took place early in the 11th century.
12. The draperies to be used will require thirty-five and one-half yards.
13. There are no 11 o'clock appointments open for next week.
14. Her appointments were set for 6 and 7:15 p.m.
15. His company purchased facilities where the surplus grape crop could be stored at a constant temperature of 33 degrees.
16. He lives at Third and Maple Streets.
17. Is the following a correct form for reference initials? JEB:acb
18. The letters P. S. must be used in the postscript. True or False?
19. The new office building is located at Gregg and Jackson Drives.
20. Is the following a correct form for reference initials?
acb (typist's initials)

Answer Sheet
Week 7, Set 2

1. False. Never divide a figure at the end of a line. (392)
2. Traveling by air, I visited dealers in 22 states. (385)
3. To cover mailing costs, we make a charge of 25 cents on each item. (397)
4. Blake Company now has about a hundred customers. (398)
5. Payment of Two Hundred Dollars (\$200) shall be made upon completion of the work. (399)
6. They sold the stock at $98\frac{1}{2}$. (400)
7. Her grade point average is 2.5. (401)
8. Mr. Curtin discovered a ratio of 7 to 1 each time he conducted the tests. (403)
9. This punch bowl holds 4 quarts 1 pint. (405)
10. At 8 p.m. the meeting adjourned. (407)
11. The Norman Conquest took place early in the eleventh century. (409)
12. The draperies to be used will require $35\frac{1}{2}$ yards. (404)
13. There are no eleven o'clock appointments open for next week. (406)
14. Her appointments were set for 6:00 and 7:15 p.m. (407a)
15. His company purchased facilities where the surplus grape crop could be stored at a constant temperature of 33 degrees. (404)
16. He lives at Third and Maple Streets. (95)
17. Yes. (131)
18. False. (139)
19. The new office building is located at Gregg and Jackson Drives. (95)
20. Yes. (131)

Week 8, Set 1

1. We have asked Prof. Leary to conduct the experiment.
2. According to our records, the note is due in Dec. of this year.
3. Mr. Ward's plane is due at 4:15 p.m. on Monday.
4. We live in the NW. section, the residential district.
5. My address is 684 W. Maple Street.
6. In the bodies of human beings, H_2O is the principal element.
7. The freight will be shipped F. O. B.
8. Many of our great scientists have contributed to the I.C.B.M. program.
9. Curriculum changes are being considered by Supt. Park.
10. Colonel Lindbergh's feat was a challenge to the young men of his time.
11. Mr. Green owes us rent for more than three months; and he should be compelled to pay us immediately.
12. Call loans must be paid on demand; time loans at the end of a stated period.
13. Although the junior executive was younger than the vice-president, he was more self-assured.
14. The first lot of returned goods was sold in the basement store; the second in the housewares department.
15. These dolls, which came from Hungary, have real sales appeal.
16. Two years ago, Mr. Johns, the meeting was held in Chicago; last year in New York.
17. You may if you like use my name as a reference.
18. Proofreading is my job; copy writing yours.
19. The Prince of Wales--the son of the reigning king--is successor to the throne.
20. Don is to write the letters Tom the news releases.

Answer Sheet
Week 8, Set 1

1. We have asked Professor Leary to conduct the experiment. (434)
2. According to our records, the note is due in December of this year. (438)
3. Mr. Ward's plane is due at 4:15 p.m. on Monday. (444)
4. We live in the northwest section, the residential district. (445)
5. My address is 684 West Maple Street. (446)
6. In the bodies of human beings, H₂O is the principal element. (449)
7. The freight will be shipped f.o.b. (454)
8. Many of our great scientists have contributed to the ICBM program. (436)
9. Curriculum changes are being considered by Superintendent Park. (434)
10. Colonel Lindbergh's feat was a challenge to the young men of his time. (434)
11. Mr. Green owes us rent for more than three months, and he should be compelled to pay us immediately. (206)
12. Call loans must be paid on demand; time loans, at the end of a stated period. (230)
13. Although the junior executive was younger than the vice-president, he was more self-assured. (210)
14. The first lot of returned goods was sold in the basement store; the second, in the housewares department. (230)
15. These dolls, which came from Hungary, have real sales appeal. (211b)
16. Two years ago, Mr. Johns, the meeting was held in Chicago; last year, in New York. (230)
17. You may, if you like, use my name as a reference. (212)
18. Proofreading is my job; copy writing, yours. (230)
19. The Prince of Wales, the son of the reigning king, is successor to the throne. (225)
20. Don is to write the letters; Tom, the news releases. (230)

Week 8, Set 2

1. The F. C. C. has a great responsibility.
2. All stores will close on Wed. afternoons for the summer.
3. The meeting is called for 8 p.m.
4. Do you know where 8594 S.W. 132 Street is?
5. Mixing Na. and Cl. will produce salt.
6. Have you ever met a person associated with the FBI?
7. School will start on Sept. 17 next fall.
8. I shall leave Oklahoma City at 4:35 a.m. and arrive in El Paso at 6:57 a.m.
9. Will you please direct me to 486 East Second Avenue.
10. K. is the symbol for potassium.
11. Is the following a correct address? 1748 West Sixth Street
12. In mixed punctuation a semicolon may follow the salutation. True or False?
13. Is the following a correct form for a company name if one does not have the official form? Roberts and Johns Company
14. Is the following a correct address? One Sansome Street
15. Is the following a correct address? 324 Perkins Rd.
16. Is the following a correct address? 4900 West 29 Street
17. In general, is the following a correct company name? Hilton & Culver, Inc.
18. Is the following a correct address? Room # 16
19. Is the following a correct address? 3826 West Sixteenth Street
20. In general, is the following a correct company name? Wylie M. Argos Co.

Answer Sheet
Week 8, Set 2

1. The FCC has a great responsibility. (436)
2. All stores will close on Wednesday afternoons for the summer. (438)
3. The meeting is called for 8 p.m. (444)
4. Do you know where 8594 Southwest 132 Street is? (446)
5. Mixing Na and Cl will produce salt. (449)
6. Have you ever met a person associated with the FBI? (436)
7. School will start on September 17 next fall. (438)
8. I shall leave Oklahoma City at 4:35 a.m. and arrive in El Paso at 6:57 a.m. (444)
9. Will you please direct me to 486 East Second Avenue. (446)
10. K is the symbol for potassium. (449)
11. Yes. (92a)
12. False. Colon. (156)
13. No, not generally. (86a)
14. Yes. (90)
15. No. 324 Perkins Road (91)
16. Yes. (92b)
17. Yes. (86b)
18. No. (90)
19. No. 3826 West 16 Street, or 3826 West 16th Street. (92b)
20. No. Wylie M. Argos Company (86c)

Week 9, Set 1

1. Miss Jones has a part time job.
2. Our shop is well-equipped to do excellent repair work.
3. The friendly looking saleswoman asked to help the customer.
4. The January-clearance sale will start next week.
5. The editor is well-known.
6. The cheaply-constructed house suffered severe damage in the storm.
7. Not all snarly sounding dogs are dangerous.
8. Her book is up-to-date in every respect.
9. I work in a five girl office.
10. Mr. Smith works part-time in a department store.
11. The huge neon signs were placed on the building.
12. She can take dictation at a speed higher-than-average.
13. A carefully-planned campaign will produce favorable results.
14. The child was frightened by the ugly-looking man.
15. The smallest-sized books sold very rapidly.
16. Our BREIT, which is a very good calculator, is used in most offices in this city.
17. Early in May our buyer reached Paris where he decided to remain for a month.
18. All the businessmen in this community, who are honest and sincere in their dealings, have warned against this company.
19. Mr. Paul Emory who was formerly with our firm is now president of Blane, Inc.
20. Astronaut Banks who has been training for years will make the next flight.

Answer Sheet
Week 9, Set 1

1. Miss Jones has a part-time job. (510)
2. Our shop is well equipped to do excellent repair work. (512)
3. The friendly-looking saleswoman asked to help the customer. (514)
4. The January clearance sale will start next week. (511)
5. The editor is well known. (512)
6. The cheaply constructed house suffered severe damage in the storm. (513)
7. Not all snarly-sounding dogs are dangerous. (514)
8. Her book is up to date in every respect. (512)
9. I work in a five-girl office. (510)
10. Mr. Smith works part time in a department store. (512)
11. The huge neon signs were placed on the building. (511)
12. She can take dictation at a speed higher than average. (512)
13. A carefully planned campaign will produce favorable results. (513)
14. The child was frightened by the ugly-looking man. (514)
15. The smallest sized books sold very rapidly. (515)
16. Our BREIT, which is a very good calculator, is used in most offices in this city. (211b)
17. Early in May our buyer reached Paris, where he decided to remain for a month. (211b)
18. All the businessmen in this community who are honest and sincere in their dealings have warned against this company. (211a)
19. Mr. Paul Emory, who was formerly with our firm, is now president of Elane, Inc. (211b)
20. Astronaut Banks, who has been training for years, will make the next flight. (211b)

Week 9, Set 2

1. Mr. Spellman dislikes high pressure salesmanship.
2. We should like to receive payment of your long-overdue bill.
3. A poorly planned program is not likely to be a success.
4. The blue coat was the higher-priced of the two.
5. The San-Francisco traffic is very heavy.
6. Most high-school students are rather serious in their work.
7. Several large signs will be placed along the road in well-chosen places.
8. I am sending you a new-secretarial booklet.
9. The figures on long-and-short-term loans came from the report.
10. His age is fifty six.
11. They claim that they have the lowest priced models on the market.
12. North-American countries are more prosperous than those of South America.
13. An all, aluminum chair makes a pleasing addition to your patio.
14. She wore her old-blue coat.
15. We can give either a high-or-low-grade paint job.
16. For a long time the public has been conscious of price: but we must now make it conscious of quality.
17. Even though the company appealed to the Supreme Court, it was forced to pay the money.
18. Revise the news release, that is lying on Mr. Trout's desk.
19. After we had eaten the cook, asked us how we liked it.
20. We will notify you when Barr is ready to sign.

Answer Sheet
Week 9, Set 2

1. Mr. Spellman dislikes high-pressure salesmanship. (510)
2. We should like to receive payment of your long overdue bill. (511)
3. A poorly planned program is not likely to be a success. (513)
4. The blue coat was the higher priced of the two. (515)
5. The San Francisco traffic is very heavy. (516)
6. Most high school students are rather serious in their work. (517)
7. Several large signs will be placed along the road in well-chosen places. (510)
8. I am sending you a new secretarial booklet. (511)
9. The figures on long- and short-term loans came from the report. (518)
10. His age is fifty-six. (521)
11. They claim that they have the lowest priced models on the market. (515)
12. North American countries are more prosperous than those of South America. (516)
13. An all-aluminum chair makes a pleasing addition to your patio. (510)
14. She wore her old blue coat. (511)
15. We can give either a high- or low-grade paint job. (518)
16. For a long time the public has been conscious of price, but we must now make it conscious of quality. (206)
17. Even though the company appealed to the Supreme Court, it was forced to pay the money. (210)
18. Revise the news release that is lying on Mr. Trout's desk. (212)
19. After we had eaten, the cook asked us how we liked it. (231)
20. We will notify you when Barr is ready to sign. (212)

Week 10, Set 1

1. May the following word be correctly divided as indicated? edit-ion
2. May the following word be correctly divided as indicated?re-ception
3. May the following word be correctly divided as indicated? dip-ping
4. May the following word be correctly divided as indicated? thou-ght
5. May the following word be correctly divided as indicated? a-larm
6. May the following word be correctly divided as indicated? du-ly
7. May the following word be correctly divided as indicated? cap-ital
8. May the following word be correctly divided as indicated? pres-ume
9. May the following word be correctly divided as indicated?
sub-mitting
10. May the following word be correctly divided as indicated? omit-ted
11. Is the following a correct address? P. O. Box Four
12. Is the following a correct complimentary closing? Very Truly Yours,
13. His address is 3824 NW 82 Street.
14. Is the following a correct complimentary closing? Cordially Yours,
15. His address is 4287 Elmwood Drive, S. W.
16. Is the following a correct complimentary closing?
Respectfully yours,
17. Have you seen the new building at Third & Dixon Streets?
18. Is the following a correct complimentary closing? Very truly yours:
19. The word "City" may be used in place of the full name of a city or town if the letter is addressed to the town or city in which it is mailed. True or False?
20. Is the following a correct punctuation style for a salutation?
Dear Mr. Jones

Answer Sheet
Week 10, Set 1

1. No. Only between syllables. (534)
2. No. recep-tion (546)
3. Yes. (548)
4. No. One-syllable words may not be divided. (538)
5. No. (540)
6. No. (539)
7. No. capi-tal (541)
8. No. Only between syllables. (534)
9. No. submit-ting (546)
10. Yes. (548)
11. No. P. O. Box 4 (90)
12. No. Very truly yours, (122), or Very truly yours (122) (open punctuation)
13. His address is 3824 Northwest 82 Street. (93)
14. No. Cordially yours, (122), or Cordially yours (122) (open punctuation)
15. His address is 4287 Elmwood Drive, S. W. (94)
16. Yes. (122), or Respectfully yours (122) (open punctuation)
17. Have you seen the new building at Third and Dixon Streets? (95)
18. No. Very truly yours, (122), or Very truly yours (122) (open punctuation)
19. False. The full city name should be used. (98)
20. Yes. Open punctuation is a correct style. (105)

Week 10, Set 2

- May the following words be correctly divided as indicated?
1. incurr-ing
 2. old fash-ioned
 3. lay-er
 4. crea-tion
 5. posses-sion
 6. clas-sing
 7. beginn-ing
 8. self suffi-cient
 9. in-sult
 10. necess-ary
 11. Is the following a correct address? 924 Grand Boulevard
 12. Is the following a correct salutation? Dear Doctor Smith:
 13. Is the following a correct punctuation style for a salutation?
Dear Mrs. Gallo,
 14. Is the following a correct salutation? Dear Capt. Dix:
 15. Is the following a correct salutation? My Dear Mr. Jones:
 16. Is the following a correct salutation? Dear Prof. Paden:
 17. Jackson left Cleveland yesterday, and he will arrive tomorrow.
 18. Failing to heed the red light the driver caused a serious accident.
 19. To sell your product effectively you must stand behind it.
 20. During the very first year in college he flunked three courses.

Answer Sheet
Week 10, Set 2

1. No. incur-ring (548)
2. No. old-fashioned (549)
3. No. (542)
4. Yes. (541)
5. Yes. (545)
6. No. class-ing (547)
7. No. begin-ning (548)
8. No. self-sufficient (549)
9. Avoid (542)
10. No. neces-sary (545)
11. Yes. (90)
12. Yes. (107)
13. No. Dear Mrs. Gallo: (105)
14. No. Dear Captain Dix: (107)
15. No. My dear Mr. Jones: (108)
16. No. Dear Professor Paden: (107)
17. Jackson left Cleveland yesterday and he will arrive tomorrow. (206)
18. Failing to heed the red light, the driver caused a serious accident.
(213a)
19. To sell your product effectively, you must stand behind it.
(213b)
20. During the very first year in college, he flunked three courses.
(213c)

Week 11, Set 1

1. When will the research project be finished.
2. Will you please give me a reply before next Tuesday?
3. He is here, isn't he?
4. Do you expect another shipment on Friday.
5. That is correct isn't it.
6. Working regularly at a second job is known as moonlighting; however, there is no rule against it.
7. "Writing Craft" is a book containing three sections.
8. My motto is There is always room at the top.
9. "The Daily American" is a fine paper.
10. College Typewriting is the name of the book used in this class.
11. Your shipment of July 14 arrived yesterday, but, since the merchandise is defective, we are returning it today.
12. File all orders from Buffalo--the rest may be left until next week.
13. The market value of an inventory is difficult to estimate, however, an educated guess can be made.
14. The assignment was too difficult for the class; so few of the students were able to complete it.
15. Some common words are spelled differently by the English: for instance, honour, centre, licence.
16. We are making rapid progress; and, if all goes well, we should be able to fill your orders soon.
17. Some men are industrious all the time, others work sporadically.
18. Your paint has not proved entirely satisfactory; nevertheless, we will give it another trial.
19. This work has to do with the welfare of man; thus it is a very practical study.
20. If you insist, I shall go to the meeting, but I do not want to go.

Answer Sheet
Week 11, Set 1

1. When will the research project be finished? (192)
2. Will you please give me a reply before next Tuesday. (194)
3. He is here, isn't he? (196)
4. Do you expect another shipment on Friday? (192)
5. That is correct, isn't it? (196)
6. Working regularly at a second job is known as "moonlighting"; however, there is no rule against it. (297, 311)
7. "Writing Craft" is a book containing three sections. (302)
8. My motto is "There is always room at the top." (304, 305)
9. The Daily American is a fine paper. (303)
10. "College Typewriting" is the name of the book used in this class. (302)
11. Your shipment of July 14 arrived yesterday; but, since the merchandise is defective, we are returning it today. (Comma after "but" is optional) (245)
12. File all orders from Buffalo; the rest may be left until next week. (244)
13. The market value of an inventory is difficult to estimate; however, an educated guess can be made. (248)
14. The assignment was too difficult for the class; so few of the students were able to complete it. (249)
15. Some common words are spelled differently by the English; for instance, honour, centre, licence. (250)
16. We are making rapid progress; and, if all goes well, we should be able to fill your orders soon. (comma after "and" is optional) (245)
17. Some men are industrious all the time; others work sporadically. (244)
18. Your paint has not proved entirely satisfactory; nevertheless, we will give it another trial. (248)
19. This work has to do with the welfare of man; thus it is a very practical study. (249)
20. If you insist, I shall go to the meeting; but I do not want to. (245)

Week 11, Set 2

1. All written communications should be free from errors in grammar; for example, lack of predicate agreement.
2. The holiday that fell on Sunday was celebrated on Monday-- consequently, we had a three-day week end.
3. As the building is to be used for only a short time, we wish to have it constructed as cheaply as possible; and we wish to move as little equipment as possible.
4. After buying began to accelerate prices rose sharply.
5. The theory although few people understand it is now accepted by scientists.
6. Goods, that cannot be sold at a profit, must be taken off the list.
7. The phrases, printed in red ink, emphasize the selling points.
8. Mr. Kent, realizing his need of help, called for the services of a correspondent.
9. As a result all our dealers are pleased with our transactions with them.
10. The Smith Building, containing large, medium, and small offices is fully occupied.
11. At the present time, we have no vacancy.
12. As you know, the past two weeks have been very cold.
13. Twenty-five students were present and four were absent.
14. To say the least, Taylor's writing is just as polished as Don's.
15. This is Uncle Henry to whom I am indebted for helping me through college.
16. On the contrary your account may be closed by giving advance notice.
17. If Henry can still type that typewriter should suit him.
18. In addition, we have respect for and confidence in our supervisor.
19. During that time, he became well acquainted with Mr. Smith.
20. Every man, who deliberately takes human life, deserves to be executed.

Answer Sheet
Week 11, Set 2

1. All written communications should be free from errors in grammar; for example, lack of predicate agreement. (250)
2. The holiday that fell on Sunday was celebrated on Monday; consequently, we had a three-day week end. (248)
3. As the building is to be used for only a short time, we wish to have it constructed as cheaply as possible and we wish to move as little equipment as possible. (206)
4. After buying began to accelerate, prices rose sharply. (210)
5. The theory, although few people understand it, is now accepted by scientists. (212)
6. Goods that cannot be sold at a profit must be taken off the list. (211a)
7. The phrases printed in red ink emphasize the selling points. (214a)
8. Mr. Kent, realizing his need of help, called for the services of a correspondent. (214b)
9. As a result, all our dealers are pleased with our transactions with them. (215)
10. The Smith Building, containing large, medium, and small offices, is fully occupied. (220)
11. At the present time we have no vacancy. (213c)
12. As you know, the past two weeks have been very cold. (215)
13. Twenty-five students were present and four were absent. (206)
14. To say the least, Taylor's writing is just as polished as Don's. (215)
15. This is Uncle Henry, to whom I am indebted for helping me through college. (212)
16. On the contrary, your account may be closed by giving advance notice. (215)
17. If Henry can still type, that typewriter should suit him. (210)
18. In addition, we have respect for and confidence in our supervisor. (215)
19. During that time he became well acquainted with Mr. Smith. (213c)
20. Every man who deliberately takes human life deserves to be executed. (212)

Week 12, Set 1

1. Is the following a correct address? Four Barker Avenue
2. When the heading of the second page of a two-page letter is blocked, the addressee is on the first line, the page number is on the second line, and the date is on the third line. True or False?
3. Is the following a correct punctuation style for a salutation?
Dear Miss Smith;
4. In open punctuation a comma should follow the complimentary closing. True or False?
5. The attention line is considered a part of the inside address and should be typed two spaces below the inside address. True or False?
6. The salutation of a letter addressed to a firm should contain the name of the person named in the attention line if there is an attention line. True or False?
7. Is the following a correct attention line? Attention of Johnson
8. The subject line is considered a part of the body of the letter and should be typed two spaces below the salutation. True or False?
9. Firm names are never used in the closing lines of a letter. True or False?
10. The name of the dictator is usually typed four spaces below the complimentary close. True or False?
11. Is the following a correct pen-written signature for an unmarried woman? *(Miss) Sherry Stackton*
12. A secretary who signs mail for her employer should sign her name in pen and type "Secretary to Mr. Blank" below her signature. True or False?
13. If the person who signs for another is not the secretary, that person signs his name and types "For Mr. Blank" under his name. True or False?
14. Is the following a correct address? Room 4816
15. The attention line may start at the left margin. True or False?
16. His record shows three courses in advanced accounting and two courses in Statistics.
17. At the meeting in Atlantic City, he advocated federal aid for education.
18. Do you intend to stop in Chicago on your way west?
19. My next class is Beginning Shorthand.
20. Orders came from every state in the union as well as from Canada.

Answer Sheet
Week 12, Set 1

1. No. (90)
2. True. (143)
3. No. Dear Miss Smith: (105)
4. False. No punctuation. (158)
5. True. (113)
6. False. The correct salutation is "Gentlemen." (114)
7. No. Attention of Mr. Johnson (115)
8. True. (116)
9. False. (125)
10. True. (126)
11. Yes. (128a)
12. True. (129)
13. True. (130)
14. Yes. (90)
15. True. (113)
16. His record shows three courses in advanced accounting and two courses in statistics. (379)
17. At the meeting in Atlantic City, he advocated Federal aid for education. (366)
18. Do you intend to stop in Chicago on your way west? (372)
19. My next class is Beginning Shorthand. (379)
20. Orders came from every state in the Union as well as from Canada. (366)

Week 12, Set 2

1. The correct form for the second page of a two-page letter is to type the number "2" in the upper right-hand corner. True or False?
2. Preferably the word "Attention" in the attention line should be abbreviated. True or False?
3. The salutation of a letter should always contain the name of a person even though the letter is addressed to a company. True or False?
4. The word "Subject" must precede the subject line. True or False?
5. A paper attached to a letter is classed as an enclosure. True or False?
6. Is the following a correct carbon copy notation? cc to Mrs. Saxon
7. A postscript precedes the enclosure notation. True or False?
8. A postscript must be indented if the paragraphs are indented. True or False?
9. At least how many lines must be carried over to the second page in a two-page letter?
10. Is the following a correct form of heading for a two-page letter?
Mrs. James F. Smith January 14, 1965 Page 2
11. A colon is necessary after the word "Attention" in the attention line. True or False?
12. Is the following a correct form for the enclosure notation?
Enclosure
13. Is the following a correct carbon copy notation? Carbon Copy to Mrs. Saxon
14. The postscript should precede the reference initials. True or False?
15. What three items are necessary in the heading of the second page of a two-page letter?
16. My cousin studies english, history, mathematics, german, and science
17. Their home is located East of this city.
18. For a pleasant Summer in Maine, consult our listings.
19. The name of this course is principles of management.
20. Our meetings are held in the evening during the spring and fall.

Week 13, Set 1

1. The sales manager has instructed all stores to sell the new spiral notebooks for \$.25 each.
2. Mortgage rates have increased to five per cent.
3. Would you like me to arrange a meeting at 2 on Friday?
4. Roger was sixteen years three months and six days old on the opening day of school.
5. It is expected that approximately \$2 million will be set aside by the 88th Congress.
6. In 1949 112 new employees were hired by the two companies.
7. Your assignment for tomorrow is pages 28-47.
8. Additional comments are on pages 688-689- and 698.
9. The boy spent 29¢ in the dime store.
10. Profit on the sale of groceries is said to range from 13% to 15%.
11. It seems unlikely that we shall hear from them but why should we even think of it?
12. When he arrives at the parking lot; Mr. King sounds his horn loudly.
13. Are you willing to change your opinion if the evidence is all against you?
14. The year, 1066, will always stand out in my memory.
15. Eight men took part in the race but only six men finished it.
16. As the name implies these bandanas actually wear like iron.
17. Water which is composed of hydrogen and oxygen is easily separated into its elements.
18. His brother Tom is an accomplished writer. (He has two brothers.)
19. We shall be glad to have your order--but we cannot promise a definite date for delivery.
20. If the plans are changed we shall submit a new list to you.

Answer Sheet
Week 13, Set 1

1. The sales manager has instructed all stores to sell the new spiral notebooks for 25 cents each. (396)
2. Mortgage rates have increased to 5 per cent. (402)
3. Would you like me to arrange a meeting at two on Friday? (406)
4. Roger was 16 years 3 months and 6 days old on the opening day of school. (411)
5. It is expected that approximately \$2 million will be set aside by the Eighty-eighth Congress. (412)
6. In 1949, 112 new employees were hired by the two companies. (420)
7. Your assignment for tomorrow is pages 28-47. (422)
8. Additional comments are on pages 688, 689, and 698. (423)
9. The boy spent 29 cents in the dime store. (396)
10. Profit on the sale of groceries is said to range from 13 to 15 per cent. (402) (or 13 per cent to 15 per cent)
11. It seems unlikely that we shall hear from them, but why should we even think of it? (206)
12. When he arrives at the parking lot, Mr. King sounds his horn loudly. (210)
13. Are you willing to change your opinion if the evidence is all against you? (212)
14. The year 1066 will always stand out in my memory. (226)
15. Eight men took part in the race, but only six men finished it. (206)
16. As the name implies, these bandanas actually wear like iron. (210)
17. Water, which is composed of hydrogen and oxygen, is easily separated into its elements. (212)
18. His brother Tom is an accomplished writer. (226)
19. We shall be glad to have your order, but we cannot promise a definite date for delivery. (206)
20. If the plans are changed we shall submit a new list to you. (210)

Week 13, Set 2

1. We shall be glad to discount your note in thirty days.
2. We live three miles from the streetcar line.
3. We have only forty-five 3-yard remnants left.
4. The damage amounted to \$3,789.40.
5. As you will see on page 1,303, discounts are given on bills paid promptly.
6. We recently received Invoice Number 40384.
7. My letter should reach you within 2 days.
8. Cards that are three by five inches are suitable for this work.
9. This Spring we listened to a new record.
10. We are now living in the Twentieth Century.
11. On Sunday, December 7, 1941, the Japanese attacked Pearl Harbor.
12. You will find that notation on Page 24 of your book.
13. The name of her lecture is "Up-To-Date Secretaries."
14. In act 1 of the play, two persons make a plea for sanity and humanity in conducting the affairs of English-speaking nations.
15. You will find the information you need in chart 3.
16. Mr. Black is in room 578.
17. The SW. district of the city often flooded.
18. The terms of the sale are 10 days E. O. M.
19. Our house is on the northwest corner of Elmwood Drive and Summit Circle.
20. The abbreviation for Rhode Island is r.i.

Answer Sheet
Week 13, Set 2

1. We shall be glad to discount your note in 30 days. (408)
2. We live 3 miles from the streetcar line. (404)
3. We have only 45 three-yard remnants left. (421)
4. The damage amounted to \$3,789.40. (424)
5. As you will see on page 1303, discounts are given on bills paid promptly. (425)
6. We recently received Invoice No. 40384. (426)
7. My letter should reach you within two days. (408)
8. Cards that are 3 by 5 inches are suitable for this work. (404)
9. This spring we listened to a new record. (374)
10. We are now living in the twentieth century. (376)
11. On Sunday, December 7, 1941, the Japanese attacked Pearl Harbor. (377)
12. You will find that notation on page 24 of your book. (380)
13. The name of her lecture is "Up-to-Date Secretaries." (381)
14. In Act 1 of the play, two persons make a plea for sanity and humanity in conducting the affairs of English-speaking nations. (380)
15. You will find the information you need in Chart 3. (380)
16. Mr. Black is in Room 578. (380)
17. The southwest district of the city often flooded. (445)
18. The terms of the sale are 10 days e.o.m. (454)
19. Our house is on the northwest corner of Elmwood Drive and Summit Circle. (445)
20. The abbreviation for Rhode Island is R. I. (454)

Week 14, Set 1

1. You may send your reply in the self addressed envelope.
2. Re-mark these overtime slips so that the numbers can be easily read.
3. A two thirds majority is required to pass the amendment.
4. Please send the inter-office memorandum immediately.
5. Did you attend the mid January sale?
6. Sometime ago someone suggested that we use television advertising.
7. We shall look for a letter from you some time in the near future.
8. Have you all ready paid your bill?
9. The students are all ready for the examination.
10. Anyone of the teachers could have substituted in the class.
11. If everyone would shop more carefully, there would be fewer returns of purchases and there would be fewer dissatisfied people.
12. Before we can pay your claim it will be necessary for you to sign the enclosed forms.
13. I must clean this dirty grimy typewriter today.
14. An old, winter overcoat was his only protection against the cold.
15. The secretary herself sent the bill.
16. The most controversial item as I see it should be placed at the end of the agenda.
17. As soon as we receive these forms, we will send you a check.
18. She was an attractive friendly skillful interviewer.
19. They were followed all the way by a big black Newfoundland dog.
20. Your appearance--if I may say so--is not so neat as it might be.

Answer Sheet
Week 14, Set 1

1. You may send your reply in the self-addressed envelope. (527)
2. Re-mark these overtime slips so that the numbers can be easily read. (529)
3. A two-thirds majority is required to pass the amendment. (524)
4. Please send the interoffice memorandum immediately. (526)
5. Did you attend the mid-January sale? (530)
6. Some time ago someone suggested that we use television advertising. (533)
7. We shall look for a letter from you sometime in the near future. (533)
8. Have you already paid your bill? (533)
9. The students are all ready for the examination. (533)
10. Any one of the teachers could have substituted in the class. (533)
11. If everyone would shop more carefully, there would be fewer returns of purchases and there would be fewer dissatisfied people. (206)
12. Before we can pay your claim, it will be necessary for you to sign the enclosed forms. (210)
13. I must clean this dirty, grimy typewriter today. (223)
14. An old winter overcoat was his only protection against the cold. (224)
15. The secretary herself sent the bill. (226)
16. The most controversial item, as I see it, should be placed at the end of the agenda. (227)
17. As soon as we receive these forms, we will send you a check. (210)
18. She was an attractive, friendly, skillful interviewer. (223)
19. They were followed all the way by a big black Newfoundland dog. (224)
20. Your appearance, if I may say so, is not so neat as it might be. (227)

Week 14, Set 2

1. A good sportsman must practice self control.
2. Mr. Jones walked in to the office unaware of the prevailing discontent.
3. Secretary Treasurer Dowd does not in any way approve of the report.
4. The ringing of the chimes at noon is an every-day occurrence.
5. Would you believe that he is one-hundred fifteen years old?
6. If there is anyway in which we can be of service to you, please let us know.
7. It will take you some time to complete the test.
8. We are allmost grateful for your help.
9. May the following be correctly divided as indicated? May 21,
1961
10. May the following be correctly divided as indicated? Henry
S. Jones
11. May the following be correctly divided as indicated? 136
First Street
12. May the following be correctly divided as indicated? Stillwater,
Oklahoma
13. Whenever you say the word John we are ready.
14. Parliament, the lawmaking body of England, corresponds to our Congress.
15. The book, entitled "Grammar in Action," is used in many schools.
16. It is quite impossible, my dear sir for us to accept your conditions.
17. Both hotels are good but the Stanford is nearest our office building.
18. A fine new radio set the gift of a wealthy uncle arrived the next day.
19. Your reply to the teacher was, to say the least, impertinent.
20. You foolish child you have ruined the toy by leaving it in the water.

Answer Sheet
Week 14, Set 2

1. A good sportsman must practice self-control. (527)
2. Mr. Jones walked into the office unaware of the prevailing discontent. (533)
3. Secretary-Treasurer Dowd does not in any way approve of the report. (532)
4. The ringing of the chimes at noon is an everyday occurrence. (533)
5. Would you believe that he is one hundred fifteen years old? (522)
6. If there is any way in which we can be of service to you, please let us know. (533)
7. It will take you some time to complete the test. (533)
8. We are all most grateful for your help. (533)
9. Yes. (550)
10. No. (550)
11. No. (550)
12. Yes. (550)
13. Whenever you say the word, John, we are ready. (233)
14. Parliament, the lawmaking body of England, corresponds to our Congress. (225)
15. The book entitled "Grammar in Action" is used in many schools. (226)
16. It is quite impossible, my dear sir, for us to accept your conditions. (233)
17. Both hotels are good, but the Stanford is nearest our office building. (207a)
18. A fine new radio set, the gift of a wealthy uncle, arrived the next day. (225)
19. Your reply to the teacher was, to say the least, impertinent. (227)
20. You foolish child, you have ruined the toy by leaving it in the water. (233)

APPENDIX C

STATISTICAL COMPUTATIONS IN
DEVELOPING TESTS

Standard Deviation

$$SD = \frac{\sqrt{N\Sigma X^2 - (\Sigma X)^2}}{N}$$

Form 1 (Y)

$$SD = \frac{\sqrt{47(701,186) - 32,741,284}}{47}$$

$$SD = \frac{\sqrt{32,955,742 - 32,741,284}}{47}$$

$$SD = \frac{\sqrt{214,458}}{47}$$

$$SD = \frac{463.0960}{47}$$

$$SD = 9.8531$$

Form 2 (X)

$$SD = \frac{\sqrt{47(693,540) - 32,398,864}}{47}$$

$$SD = \frac{\sqrt{32,596,380 - 32,398,864}}{47}$$

$$SD = \frac{\sqrt{197,516}}{47}$$

$$SD = \frac{444.4153}{47}$$

$$SD = 9.4556$$

Correlation of the Two Tests

$$r = \frac{N\Sigma XY - \Sigma X \times \Sigma Y}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2] [N\Sigma Y^2 - (\Sigma Y)^2]}}$$

$$r = \frac{47(697,294) - (5,692 \times 5,722)}{\sqrt{197,516^* \times 214,458^*}}$$

$$r = \frac{32,772,818 - 32,569,624}{444.4153 \times 463.0960}$$

$$r = \frac{203,194}{205,806.8088} = .98+$$

* Same term as numerator in standard deviation formula.

TABLE IX
 DATA USED IN COMPUTING THE STANDARD DEVIATION
 AND THE CORRELATION OF THE TWO TESTS

X	X ²	Y	Y ²	XY
142	20,164	140	19,600	19,880
138	19,044	136	18,496	18,768
137	18,769	136	18,496	18,632
137	18,769	135	18,225	18,495
134	17,956	135	18,225	18,090
133	17,689	135	18,225	17,955
131	17,161	133	17,689	17,423
131	17,161	133	17,689	17,423
130	16,900	132	17,424	17,160
130	16,900	132	17,424	17,160
128	16,384	130	16,900	16,640
127	16,129	129	16,641	16,383
126	15,876	129	16,641	16,254
125	15,625	129	16,641	16,125
125	15,625	127	16,129	15,875
124	15,376	126	15,896	15,624
124	15,376	125	15,625	15,500
124	15,376	125	15,625	15,500
124	15,376	125	15,625	15,500
123	15,129	124	15,376	15,252
123	15,129	124	15,376	15,252
122	14,884	124	15,376	15,128
122	14,884	124	15,376	15,128
121	14,641	123	15,129	14,883
120	14,400	123	15,129	14,760
120	14,400	123	15,129	14,760
120	14,400	121	14,641	14,520
119	14,161	120	14,400	14,280
119	14,161	119	14,161	14,161
119	14,161	118	13,924	14,042
119	14,161	118	13,924	14,042
118	13,924	117	13,689	13,806
118	13,924	117	13,689	13,806
117	13,689	116	13,456	13,572
115	13,225	115	13,225	13,225
115	13,225	115	13,225	13,225
114	12,996	114	12,996	12,996
113	12,769	113	12,769	12,769
112	12,544	112	12,544	12,544
112	12,544	112	12,544	12,544
111	12,321	110	12,100	12,210
111	12,321	109	11,881	12,099
107	11,449	108	11,664	11,556
105	11,025	107	11,449	11,235
103	10,609	104	10,816	10,712
102	10,404	101	10,201	10,302
102	10,404	99	9,801	10,098
<u>5,692</u>	<u>693,540</u>	<u>5,722</u>	<u>701,186</u>	<u>697,294</u>

Form 1 = Y
 Form 2 = X
 N = 47

Mean of X = 121.106
 Mean of Y = 121.745

(X)² = 32,398,864
 (Y)² = 32,741,284

Reliability of Test:

Form 1

Correlation of Half-Test

$$r = \frac{N\Sigma XY - \Sigma X \times \Sigma Y}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2] [N\Sigma Y^2 - (\Sigma Y)^2]}}$$

$$r = \frac{47(174,737) - (2,845 \times 2,870)}{\sqrt{[47(173,391) - (2,845)^2] [47(176,732) - (2,870)^2]}}$$

$$r = \frac{8,212,639 - 8,165,150}{\sqrt{(8,149,377 - 8,094,025) (8,306,404 - 8,236,900)}}$$

$$r = \frac{47,489}{\sqrt{(55,352) (69,504)}}$$

$$r = \frac{47,489}{\sqrt{3,847,185,408}}$$

$$r = \frac{47,489}{62,025.69}$$

$$r = .7656$$

Spearman-Brown Prophecy Formula

$$r = \frac{2r_{\frac{1}{2}}}{1 + r_{\frac{1}{2}}}$$

where $r_{\frac{1}{2}}$ = coefficient of correlation
of half-test

$$r = \frac{2(.7656)}{1 + .7656}$$

$$r = \frac{1.5312}{1.7656}$$

$$r = .867240$$

TABLE X
DATA USED IN COMPUTING THE RELIABILITY OF TEST FORM I

X	Y	XY	X ²	Y ²
68	72	4,896	4,624	5,184
66	70	4,620	4,356	4,900
68	68	4,624	4,624	4,624
69	66	4,554	4,761	4,356
64	71	4,544	4,096	5,041
67	68	4,556	4,489	4,624
67	66	4,422	4,489	4,356
64	69	4,416	4,096	4,761
65	67	4,355	4,225	4,489
64	68	4,352	4,096	4,624
66	64	4,224	4,356	4,096
65	64	4,160	4,225	4,096
65	64	4,160	4,225	4,096
64	65	4,160	4,096	4,225
60	67	4,020	3,600	4,489
61	65	3,965	3,721	4,225
62	62	3,844	3,844	3,844
64	61	3,904	4,096	3,721
61	64	3,904	3,721	4,096
65	59	3,835	4,225	3,481
59	65	3,835	3,481	4,225
62	62	3,844	3,844	3,844
60	63	3,780	3,600	3,969
62	61	3,782	3,844	3,721
65	58	3,770	4,225	3,364
61	62	3,782	3,721	3,844
61	60	3,660	3,721	3,600
59	60	3,540	3,481	3,600
61	58	3,538	3,721	3,364
57	61	3,477	3,249	3,721
56	61	3,416	3,136	3,721
57	61	3,477	3,249	3,721
59	57	3,363	3,481	3,249
61	55	3,355	3,721	3,025
56	59	3,304	3,136	3,481
58	56	3,248	3,364	3,136
56	58	3,248	3,136	3,364
57	56	3,192	3,249	3,136
58	54	3,132	3,364	2,916
60	52	3,120	3,600	2,704
56	54	3,040	3,136	2,916
54	54	2,916	2,916	2,916
55	53	2,915	3,025	2,809
50	57	2,850	2,500	3,249
54	49	2,646	2,916	2,401
49	52	2,548	2,401	2,704
47	52	2,444	2,209	2,704
<u>2,845</u>	<u>2,870</u>	<u>174,737</u>	<u>173,391</u>	<u>176,732</u>

X = Even-numbered items

Y = Odd-numbered items

Reliability of Test

Form 2

Correlation of Half-Test

$$r = \frac{N\sum XY - \sum X \times \sum Y}{\sqrt{[N\sum X^2 - (\sum X)^2] [N\sum Y^2 - (\sum Y)^2]}}$$

$$r = \frac{47(173,806) - (2,856 \times 2,841)}{\sqrt{[47(174,377) - (2,853)^2] [47(172,891) - (2841)^2]}}$$

$$r = \frac{8,168,882 - 8,113,896}{\sqrt{(8,195,719 - 8,139,609) (8,125,877 - 8,071,281)}}$$

$$r = \frac{54,986}{\sqrt{(56,110) (54,596)}}$$

$$r = \frac{54,986}{\sqrt{3,063,381,560}}$$

$$r = \frac{54,986}{55,347.82}$$

$$r = .9934$$

Spearman-Brown Prophecy Formula

$$r = \frac{2r_{\frac{1}{2}}}{1 + r_{\frac{1}{2}}} \quad \text{where } r_{\frac{1}{2}} = \text{coefficient of correlation of half-test}$$

$$r = \frac{2(.9934)}{1 + .9934}$$

$$r = \frac{1.9868}{1.9934}$$

$$r = .996689$$

TABLE XI
DATA USED IN COMPUTING THE RELIABILITY OF TEST FORM 2

X	Y	XY	X ²	Y ²
70	72	5,040	4,900	5,184
68	70	4,760	4,624	4,900
68	69	4,692	4,624	4,761
69	68	4,992	4,761	4,624
71	63	4,473	5,041	3,969
70	63	4,410	4,900	3,969
65	66	4,290	4,225	4,356
65	66	4,290	4,225	4,356
65	65	4,356	4,225	4,225
66	64	4,224	4,356	4,096
63	65	4,095	3,969	4,225
63	64	4,032	3,969	4,096
64	62	3,968	4,096	3,844
65	61	3,965	4,225	3,721
61	64	3,904	3,721	4,096
64	60	3,840	4,096	3,600
63	61	3,843	3,969	3,721
58	66	3,828	3,364	4,356
59	65	3,835	3,481	4,225
61	62	3,782	3,721	3,844
62	61	3,782	3,844	3,721
60	62	3,720	3,600	3,844
61	61	3,721	3,721	3,721
60	61	3,660	3,600	3,721
60	60	3,600	3,600	3,600
60	60	3,600	3,600	3,600
60	60	3,600	3,600	3,600
60	60	3,600	3,600	3,600
60	60	3,600	3,600	3,600
60	60	3,600	3,600	3,600
60	59	3,540	3,600	3,481
61	59	3,599	3,721	3,481
59	60	3,540	3,481	3,600
61	58	3,538	3,721	3,364
60	58	3,480	3,600	3,364
58	60	3,480	3,364	3,600
60	57	3,420	3,600	3,249
59	56	3,304	3,481	3,136
55	60	3,300	3,025	3,600
55	58	3,190	3,025	3,364
56	57	3,192	3,136	3,249
60	52	3,120	3,600	2,704
56	56	3,136	3,136	3,136
58	53	3,074	3,364	2,809
55	56	3,080	3,025	3,136
55	53	2,915	3,025	2,809
50	55	2,750	2,500	3,025
54	49	2,646	2,916	2,401
50	52	2,600	2,500	2,704
50	52	2,600	2,500	2,704
<u>2,853</u>	<u>2,841</u>	<u>173,806</u>	<u>174,377</u>	<u>172,891</u>

X = Even-numbered items

Y = Odd-numbered items

APPENDIX D

CORRESPONDENCE TO AND FROM
VALIDATING PANEL

Memorandum I

To: Galloway, Garner, and Coonrad
 From: Arnola C. Bose
 Date: December 10, 1965
 Re: Validating Tests and Teaching Materials

I have attempted to make up a test in two equal forms to be used as a pre-test and post-test and as quizzes in my study. The tests should cover the following sections of the Reference Manual for Stenographers and Typists by Gavin and Hutchinson.

Details that Mark an Acceptable Letter	20%
Punctuation	40%
Parentheses	1%
Period	1%
Question Mark	2%
Comma	25%
Semicolon	6%
Colon	1%
Dash	1%
Quotation Mark	3%
Capitalization	10%
Numbers	10%
Abbreviations	5%
One Word, Two Words, Hyphenated Word	10%
Word Division	5%
	<hr/>
	100%

In order to establish the validity of the test, I am asking a panel of the transcription teachers in our department to examine the tests and the teaching materials to be used.

When we ask how valid a test is, we are inquiring whether the test measures what we want it to measure, all of what we want it to measure, and only what we want it to measure. The analysis is essentially a rational and judgmental one.

I shall be attempting to measure achievement in selected related learnings in the transcription classes (Office Management 302 and 322). The areas which I have selected, I believe, represent the related learnings which I have emphasized in my classes. If there are other related learnings which you think should be included, please let me know. I would like to limit the related learnings covered to those in the Reference Manual for Stenographers and Typists if you think such a limitation is appropriate.

The areas listed are the ones I have emphasized in the past, but I should like to cover the areas which the department as a whole has emphasized.

If you suggest additional areas to be covered, will you please indicate what per cent of the total test this area should represent and which of the areas I have listed should be reduced. Also, if you think the per cent of the test devoted to each area is out of balance according to the emphasis you place on that area, please make the necessary adjustments.

In your opinion, do my test items measure what I have indicated that I am attempting to measure?

Do the directions for the test clearly indicate what the student should do?

Although I can statistically test to see if my two forms are equal forms, I should like your opinion concerning the equality of the two forms. The items with identical numbers on each form are intended to be equal, i.e., Form 1, Question 1 = Form 2, Question 1.

The reliability of the tests will be established statistically. I plan to administer the tests to a group not included in the study in order to check the reliability, but I need to establish the validity of the tests first. In other words, do the tests measure what I say we are teaching in related learnings.

On the punctuation section of the test, I have circled in red the punctuation marks which will be omitted. On the other sections of the test, I have filled in the correct answers in red.

I appreciate your willingness to help validate these tests. I shall also need your help to validate the teaching materials; however, I think I should warn you that this process may be rather time consuming for you. I shall have a total of about 480 items to validate (24 sets of materials of 20 items each). My tests must be validated in time to administer this semester, but the teaching materials can wait until the first two or three weeks of the spring semester. If you think you will not have the time to help, I shall certainly understand your position.

A. C. B.

Memorandum II

To: Arnola Bose

From: Coonrad, Galloway, and Garner

Arnola, we met Wednesday afternoon and went over the sentences of Forms 1 and 2. We offer the following comments and suggestions for your consideration:

1. We suggest that, if possible, you avoid using any sentences that might or could be written one way or another, depending on the emphasis given a word or phrase or because of a lack of agreement among authorities or because some authorities would agree that another way would be equally correct. Specifically, we have in mind the following sentences: 19, 31, 34, 60, 82, 85, 86, and 87.
2. Several sentences on Form 1 do not seem to be comparable to or consistent with the matching sentences on Form 2. We question the following:
 - 20--the "either-or" of Form 1
 - 30--introductory phrase opposed to introductory clause
 - 53--dollar figure end of sentence opposed to dollar figure within sentence. A student could make the mistake of placing a decimal after the figure placed within the sentence but could not make this mistake when the figure ends the sentence.
 - 72--suggest that you use "over" in each
 - 73--in one sentence "planned" is a part of the verb phrase "has been planned"
 - 76--similar to No. 72
3. Sentence 35 on Form 1 contains "vice president," which involves another rule of punctuation and one on which all authorities do not agree.
4. We wonder whether one sentence is sufficient coverage of some rules; for example, Sentence 2 covering Rule 185. Would two sentences for each rule improve the validity of the tests?
5. We could arrive at no better percentage distribution for the various areas than those you show. However, since we would like to see more than one sentence (at least two) for any rule, the number of sentences would have to be increased to 200 unless you changed some of the percentages.
6. The related learnings listed adequately cover the areas we have emphasized.
7. The test items appear to measure what you are attempting to measure

Memorandum III

To: Galloway, Garner, and Coonrad
From: Arnola Bose
Date: January 7, 1966

I have revised and added to the tests which you examined last month in accordance with your suggestions and Dr. Brobst's suggestions.

The percentage of questions covering each area has not been changed. However, there are at least two questions on each rule covered, as you suggested. Dr. Brobst agreed that it would be desirable to have at least two questions on each rule covered. This means that about one-fourth of the rules previously covered were eliminated.

The reason I eliminated some of the rules rather than doubling the length of the test is that I thought a test of 200 items would be too long. I believe that a test of 200 items could not be administered in a 50-minute class period, and students might tend to become tired and careless near the end of a test of that length.

Dr. Brobst did suggest that lengthening the test should increase its reliability; however, most of the commercial tests seem to have from 60 to 100 items on the grammar section. The language usage grammar section of the Differential Aptitude Test contains 60 items. Since my test will be $2\frac{1}{2}$ times as long as the DAT language usage grammar section, I think it has been sufficiently lengthened to increase its reliability. If it lacks sufficient reliability now, I think it will be for reasons other than the length of the test. Do you agree with my reasoning?

The form used on my tests was suggested by Dr. Brobst and is patterned after the DAT test battery. Dr. Brobst emphasized the importance of having an objective test so that I can check the item difficulty and item discrimination. I hope this form seems acceptable to you; but if you do have any criticisms of it, please do not hesitate to say so. As you know, the data for my study can be no better than the instruments used to obtain the data.

Miss Galloway has said that I may administer these tests to her O. M. 322 class on Monday, January 17. If you could possibly give me your suggestions by Thursday afternoon, January 13, then I could revise the tests Thursday night and have them duplicated on Friday.

Thank you again for your help.

A. C. B.

APPENDIX E

DATA AND STATISTICAL COMPUTATIONS IN ANALYSIS
OF RESULTS OF EXPERIMENT

Explanation of Data Tables

All of the data for the final analysis of the results of the experiment are listed in Tables XII through XV. In Tables XII and XIII, only the data for students No. 1 through 29 were used to determine the significance of the proposed covariates as students No. 30 through 35 were transfer students and had no ACT scores. In Tables XIV and XV, only the data for students No. 1 through 30 were used to determine the significance of the proposed covariates as students No. 31 through 34 were transfer students and had no ACT scores.

To determine which of the proposed covariates were significant in equalizing the groups to be compared, an analysis of covariance was applied for both quiz scores and post-test scores, using all of the proposed covariates. The computed t-values of the covariates for both quiz scores and post-test scores are shown in Table XVI.

With 109 degrees of freedom, a covariate, to be significant, should have a t-value of 1.98 (or greater) at the .05 level of confidence or 2.63 (or greater) at the .01 level of confidence. Therefore, for quiz scores the significant covariates were pre-test scores and college grade-point averages; and for post-test scores the significant covariates were pre-test scores, college grade-point averages, and high school grade-point averages.

Next, an analysis of covariance was applied for both quiz scores and post-test scores, using pre-test scores, college grade-point averages, and high school grade-point averages as covariates. This test yielded the covariate t-values shown in Table XVII.

TABLE XII

DATA FOR OFFICE MANAGEMENT 302 CONTROL GROUP

Student Number	Pre- test Scores	Quiz Scores	Post- test Scores	Composite ACT Scores	English ACT Scores	College Grade- Point Averages	High School Grade- Point Averages
01	51	86	59	08	20	2.125	2.444
02	70	94	95	46	81	2.428	3.105
03	76	96	87	31	67	4.000	3.810
04	73	89	82	38	59	2.651	3.953
05	66	90	85	53	81	2.933	3.343
06	82	89	95	54	25	2.521	2.718
07	65	95	80	38	34	1.866	3.417
08	62	90	70	38	67	2.000	3.357
09	73	89	81	69	80	3.708	3.921
10	81	95	91	95	91	3.090	3.600
11	60	81	69	05	27	2.928	2.200
12	67	89	85	25	81	1.875	3.292
13	77	92	92	46	42	3.333	4.000
14	68	90	88	68	81	2.600	3.675
15	65	87	90	15	21	3.357	3.435
16	61	88	80	53	67	3.562	3.860
17	70	91	91	31	59	3.400	3.884
18	77	92	84	75	74	3.215	3.348
19	72	89	81	53	74	3.125	3.545
20	69	92	70	38	34	2.800	2.826
21	62	93	79	51	61	1.928	2.417
22	62	91	76	19	51	3.125	2.675
23	67	88	89	75	88	3.133	3.360
24	76	90	88	54	57	2.294	3.654
25	67	94	89	19	67	2.714	3.326
26	75	90	83	46	92	2.375	3.739
27	76	88	78	75	88	1.750	2.787
28	53	84	82	54	49	1.866	2.450
29	53	82	72	23	27	1.426	2.595
30*	60	87	87			2.555	
31*	69	95	83			2.978	
32*	64	88	83			2.500	
33*	58	87	72			2.519	
34*	62	80	81			1.837	
35*	56	90	76			2.821	

*Students No. 30 through 35 were transfer students and had no ACT scores. Data for these students were added after it was determined that the only significant covariates were pre-test scores and college grade-point averages.

TABLE XIII

DATA FOR OFFICE MANAGEMENT 302 EXPERIMENTAL GROUP

Student Number	Pre- test Scores	Quiz Scores	Post- test Scores	Composite ACT Scores	English ACT Scores	College Grade- Point Averages	High School Grade- Point Averages
01	64	87	78	25	59	2.611	3.366
02	66	81	81	25	59	1.266	2.929
03	75	94	94	61	74	3.615	3.955
04	63	94	79	61	59	3.142	3.147
05	65	89	76	31	59	2.600	2.750
06	65	83	80	11	15	2.116	3.391
07	68	94	86	53	74	2.937	3.660
08	60	85	76	39	49	2.291	3.048
09	64	93	89	38	74	3.571	3.532
10	49	76	68	31	67	1.625	2.864
11	73	92	85	44	79	2.172	2.974
12	73	80	77	31	42	2.590	3.214
13	61	82	75	61	67	1.571	2.787
14	57	89	75	11	20	1.538	2.270
15	66	83	76	46	27	2.187	2.447
16	60	91	79	54	65	1.850	3.234
17	73	92	91	75	80	3.142	3.131
18	71	87	86	19	51	2.461	3.455
19	64	87	80	25	05	2.647	2.676
20	69	90	88	54	32	2.812	3.900
21	58	90	87	61	88	3.800	3.604
22	55	82	77	75	74	2.727	3.750
23	58	90	86	74	64	2.523	3.778
24	61	91	76	25	51	2.687	2.978
25	71	89	86	01	07	3.125	3.000
26	63	85	70	01	13	2.153	2.229
27	55	77	74	08	09	1.454	1.932
28	59	86	83	19	27	2.600	3.617
29	80	94	90	53	88	3.250	3.773
30*	65	82	71			1.750	
31*	57	87	76			2.649	
32*	59	89	80			2.863	
33*	64	88	87			3.120	
34*	65	91	87			3.804	
35*	61	81	81			1.666	

*Students No. 30 through 35 were transfer students and had no ACT scores. Data for these students were added after it was determined that the only significant covariates were pre-test scores and college grade-point averages.

TABLE XIV

DATA FOR OFFICE MANAGEMENT 322 CONTROL GROUP

Student Number	Pre- test Scores	Quiz Scores	Post- test Scores	Composite ACT Scores	English ACT Scores	College Grade- Point Averages	High School Grade- Point Averages
01	68	86	78	46	81	2.500	3.500
02	63	86	74	25	49	1.911	2.083
03	68	90	76	31	59	2.500	3.179
04	65	86	89	38	51	2.230	3.474
05	61	92	68	19	51	1.428	2.410
06	72	81	78	53	81	2.066	2.721
07	78	93	92	54	57	2.978	3.306
08	85	86	79	38	92	2.062	3.149
09	64	85	75	20	39	2.062	2.234
10	70	93	82	46	27	1.736	2.800
11	84	87	82	68	81	2.933	3.325
12	66	84	83	32	57	1.791	2.766
13	80	83	85	82	81	2.214	3.095
14	64	95	79	31	81	2.750	2.771
15	77	86	70	19	21	2.285	2.700
16	81	88	76	82	88	3.600	3.308
17	82	89	80	32	57	2.418	3.275
18	76	85	81	15	27	2.200	3.278
19	66	85	75	32	49	2.104	3.171
20	75	87	86	25	57	2.106	2.897
21	69	90	94	39	40	2.836	3.795
22	77	94	78	80	54	2.586	3.877
23	84	95	87	82	88	3.272	3.919
24	64	84	80	15	10	2.785	2.886
25	74	86	80	53	88	2.133	3.547
26	79	90	91	82	92	2.923	3.310
27	68	90	84	46	81	2.375	2.485
28	74	87	88	46	51	3.529	3.486
29	62	91	84	26	33	2.353	3.079
30	79	89	91	82	57	3.464	3.667
31*	82	89	88			2.881	
32*	63	81	82			2.763	
33*	70	87	90			2.495	
34*	75	93	93			3.135	

*Students No. 31 through 34 were transfer students and had no ACT scores. Data for these students were added after it was determined that the only significant covariates were pre-test scores and college grade-point averages.

TABLE XV

DATA FOR OFFICE MANAGEMENT 322 EXPERIMENTAL GROUP

Student Number	Pre- test Scores	Quiz Scores	Post- test Scores	Composite ACT Scores	English ACT Score	College Grade- Point Averages	High School Grade- Point Averages
01	72	91	88	31	67	3.125	3.489
02	65	87	81	25	27	2.500	2.717
03	73	92	87	53	74	3.666	3.522
04	84	94	84	61	57	3.434	4.000
05	76	94	87	53	74	2.562	3.527
06	74	91	76	25	32	1.288	2.805
07	67	94	78	15	16	2.928	3.186
08	74	89	78	31	74	2.428	3.044
09	81	94	87	53	92	3.421	3.050
10	68	86	74	38	67	2.133	3.300
11	79	93	82	54	86	2.488	2.956
12	60	92	75	53	88	3.266	3.326
13	79	92	83	46	67	2.062	2.976
14	66	90	78	48	87	2.025	2.750
15	65	93	76	31	67	2.071	2.682
16	77	92	86	11	27	3.642	2.659
17	80	94	87	68	74	3.062	3.400
18	78	95	86	76	49	2.661	3.305
19	67	92	78	15	40	1.692	3.238
20	66	89	81	04	21	2.750	2.957
21	76	90	89	25	65	2.791	3.045
22	80	92	86	87	88	2.276	3.563
23	68	87	75	15	27	1.210	2.302
24	74	90	88	75	88	3.600	3.872
25	70	90	87	53	42	2.250	3.250
26	77	97	90	69	80	2.882	3.146
27	64	90	69	09	25	1.764	2.615
28	75	90	80	08	20	2.488	2.289
29	84	95	89	61	59	2.666	3.182
30	70	94	77	08	42	1.125	2.356
31*	81	89	86			2.644	
32*	72	91	89			2.693	
33*	79	92	85			3.012	
34*	87	94	91			2.333	

*Students No. 31 through 34 were transfer students and had no ACT scores. Data for these students were added after it was determined that the only significant covariates were pre-test scores and college grade-point averages.

TABLE XVI

T-VALUES USING ALL COVARIATES

Covariates	Quiz Scores	Post-test Scores
Pre-test Scores	2.1435	3.9851
Composite ACT Scores	0.1866	1.0591
English ACT Scores	0.7882	-0.4516
College Grade-Point Averages	2.1364	2.2367
High School Grade-Point Averages	0.8834	2.7857

TABLE XVII

T-VALUES USING THREE COVARIATES

Covariates	Quiz Scores	Post-test Scores
Pre-test Scores	2.4822	4.4652
College Grade-Point Averages	2.1418	2.2781
High School Grade-Point Averages	1.3553	3.3110

With 111 degrees of freedom, a covariate, to be significant, should have a t-value of 1.98 (or greater) at the .05 level of confidence or 2.63 (or greater) at the .01 level of confidence. Again, the significant covariates for quiz scores were pre-test scores and college grade-point averages; and the significant covariates for the post-test scores were pre-test scores, college grade-point averages, and high school grade-point averages.

As all of the covariates used in this analysis were significant for post-test scores, a test of the significance of the differences in adjusted group mean scores on the post-test scores was made. The adjusted group mean post-test scores in this analysis were:

Office Management 302, Control Group	82.1588
Office Management 302, Experimental Group	82.7803
Office Management 322, Control Group	80.8472
Office Management 322, Experimental Group	81.2450

The t-value for the difference in the two Office Management 302 group scores was 0.46, and the t-value for the difference in the two Office Management 322 group scores was 0.30, both of which are insignificant at both the .05 and .01 levels of confidence. With 111 degrees of freedom, a t-value, to be significant, should be 1.98 (or greater) at the .05 level of confidence or 2.63 (or greater) at the .01 level of confidence. The computations of these t-values are shown in the next section of this appendix.

An analysis of covariance was then applied to both quiz scores and post-test scores, using only pre-test scores and college grade-point averages as covariates. In this analysis, data for students No. 30 through 35 in Tables XII and XIII and data for students No. 31 through 34 in Tables XIV and XV were added. The t-values of the covariates used in this test were all significant as shown in Table XVIII.

TABLE XVIII
T-VALUES USING TWO COVARIATES

Covariates	Quiz Scores	Post-test Scores
Pre-test Scores	3.3347	5.8968
College Grade-Point Averages	4.1221	4.9092

The significance of the differences in quiz scores and post-test scores for both Office Management 302 and Office Management 322 was tested. This test is the one used in the final analysis of the data in Chapter IV. The following t-values were found:

Office Management 302, Quiz Scores	1.92
Office Management 322, Quiz Scores	4.04
Office Management 302, Post-test Scores	0.38
Office Management 322, Post-test Scores	0.18

With 132 degrees of freedom, a t-value, to be significant, should be 1.98 (or greater) at the .05 level of confidence or 2.62 (or greater) at the .01 level of confidence. Therefore, the only significant t-value was for Office Management 322, quiz scores. A computation of these t-values is shown in the next section of this appendix.

The null hypothesis that there was no significant difference among treatments on quiz scores after adjusting with the covariates was tested. The F-value of 6.729 was significant. With 3 and 132 degrees of freedom, an F-value, to be significant, should be 2.68 (or greater) at the .05 level of confidence or 3.94 (or greater) at the .01 level of confidence. There was a difference among treatments on quiz scores after adjusting with the covariates, and this difference is explained by the significant t-value indicating that the difference in quiz scores for the Office Management 322 classes was significant.

The null hypothesis that there was no significant difference among treatments on post-test scores after adjusting with the covariates was tested. The F-value of 0.983 was insignificant. The t-tests on the post-test scores further support this null hypothesis, as neither of the t-values on the post-test scores were significant.

The Analysis of Covariance tables used in the final analysis of the data, Tables XIX and XX, are included for informational purposes. These tables are in the form printed out by the computer.

TABLE XIX

ANALYSIS OF COVARIANCE TABLE FOR QUIZ SCORES

```

*****
SOURCE      DF      YY      SUM-SQUARES (DUE)      SUM-SQUARES (ABOUT)      DF      MEAN-SQUARE
-----
TREATMENT (BETWEEN)  3      388.8750      502.4181      1500.2538      132      11.3656
ERROR (WITHIN)      134      2002.6719
-----
TREATMENT + ERROR (TOTAL)  137      2391.5469      1729.6822      135
-----
DIFFERENCE FOR TESTING ADJUSTED TREATMENT MEANS....  3      76.4761
*****

```

TABLE XX

ANALYSIS OF COVARIANCE TABLE FOR POST-TEST SCORES

	I		I		I		I		I		I
SOURCE	DF	YY	SUM-SQUARES (DUE)	SUM-SQUARES (ABOUT)	DF	MEAN-SQUARE					
	I	I	I	I	I	I					

TREATMENT (BETWEEN)	3	67.2578									

ERROR (WITHIN)	134	6048.7188	2495.6095	3553.1093	132	26.9175					

TREATMENT + ERROR (TOTAL)	137	6115.9766	2483.5195	3632.4570	135						

DIFFERENCE FOR TESTING ADJUSTED TREATMENT MEANS....				79.3477	3	26.4492					

Computation of t-Values

Equation for Computing t-Values

$$t = \frac{\text{difference in adjusted mean scores of two treatments}}{\sqrt{E}}$$

$$E = \left(\frac{1}{N} + \frac{1}{N} + M \right) \times (\text{Mean-Square})$$

Mean-Square is taken from appropriate Analysis of Covariance Table

N = Number of Subjects

M = (difference in pre-test scores for treatment groups x S_1) + (difference in college grade-point averages for treatment groups x S_2) + (difference in high school grade-point averages for treatment groups x S_3)*

S_1 = (difference in pre-test scores for treatment groups x A^{**}) + (difference in college grade-point averages for treatment groups x C^{**}) + (difference in high school grade-point averages for treatment groups x E^{**})*

S_2 = (difference in pre-test scores for treatment groups x B^{**}) + (difference in college grade-point averages for treatment groups x D^{**}) + (difference in high school grade-point averages for treatment groups x F^{**})*

S_3 = (difference in pre-test scores for treatment groups x G^{**}) + (difference in college grade-point averages for treatment groups x H^{**}) + (difference in high school grade-point averages for treatment groups x I^{**})*

* S_3 and all factors using high school grade-point averages are used only in the computation of the t-value for the post-test scores using three covariates.

** These values are found on the appropriate Inverse of the Covariates Cross Product Matrix for Error Table.

Post-test Scores Using Three Covariates

Tables XXI, XXII, and XXIII are used in computing the t-values for the post-test scores using three covariates.

TABLE XXI

VARIABLE MEANS FOR EACH GROUP: POST-TEST SCORES
WITH THREE COVARIATES

Group	Pre-test Scores	College Grade-Point Averages	High School Grade-Point Averages
302 Control Group	68.1379	2.6953	3.2661
302 Experimental Group	64.3448	2.5194	3.1514
302 Control Group	72.5000	2.4710	3.1164
322 Experimental Group	72.9667	2.5419	3.0836

TABLE XXII

INVERSE OF THE COVARIATES CROSS PRODUCT MATRIX FOR ERROR:
POST-TEST SCORES WITH THREE COVARIATES

Covariate	Pre-test Scores	College Grade-Point Averages	High School Grade-Point Averages
Pre-test Scores	0.0002(A)	-0.0005(B)	-0.0010(G)
College Grade-Point Averages	-0.0005(C)	0.0333(D)	-0.0225(H)
High School Grade-Point Averages	-0.0010(E)	-0.0225(F)	0.0608(I)

TABLE XXIII

TABLE OF ADJUSTED MEANS AND STANDARD ERRORS:
POST-TEST SCORES WITH THREE COVARIATES

Group	Treatment Mean	Adjusted Mean	SE Adjusted Mean
302 Control Group	82.4483	82.1588	0.9603
302 Experimental Group	80.9655	82.7803	1.0125
322 Control Group	81.5000	80.8472	0.9569
322 Experimental Group	82.0667	81.2450	0.9674

The computation of the t-value for post-test scores with three covariates in Office Management 302 follows:

- (1) $N = 29$
- (2) Difference in pre-test scores for treatment groups =
 $64.3448 - 68.1379 = -3.7931$
- (3) Difference in college grade-point averages for treatment groups =
 $2.5194 - 2.6953 = -.1759$
- (4) Difference in high school grade-point averages for treatment groups =
 $3.1514 - 3.2661 = -0.1147$
- $-3.7931 \times 0.0002(A) = -.00075862$
 $-0.1759 \times -0.0005(C) = .00008795$
 $-0.1147 \times -0.0010(E) = .00011470$
 $\underline{\hspace{1.5cm}}$
 $-.00055597 = S_1$
- $-3.7931 \times -0.0005(B) = .00189655$
 $-0.1759 \times 0.0333(D) = -.00585747$
 $-0.1147 \times -0.0025(F) = .00258075$
 $\underline{\hspace{1.5cm}}$
 $-.00138017 = S_2$
- $-3.7931 \times -0.0010(G) = .00379310$
 $-0.1759 \times -0.0225(H) = .00395775$
 $-0.1147 \times 0.0608(I) = .00697376$
 $\underline{\hspace{1.5cm}}$
 $.00077709 = S_3$
- (6)

-3.7931	\times	$-.00055597(S_1)$	$=$	$.002108849807$
-0.1759	\times	$-.00138017(S_2)$	$=$	$.000242771903$
-0.1147	\times	$.00077709(S_3)$	$=$	$-.000089132223$
				$.002262489487 = M$
- (7) $(\frac{1}{29} + \frac{1}{29} + .00226249) \times (25.5082)^*$
- $(.06896552 + .00226249) \times (25.5082)$
 $(.07122801) \times (25.5082) = 1.816898324682$
- (8) $\sqrt{1.816898324682} = 1.347924$
- (9) Difference in adjusted mean scores of two treatment groups =
 $82.7803 - 82.1588 = 0.6215$
- (10) $0.6215 \div 1.34792 = .46108077$ or .46

- (11) $t = .46$
- With 111 degrees of freedom, a t-value, to be significant, must be 1.98 (or greater) at the .05 level of confidence or 2.63 (or greater) at the .01 level of confidence. This t-value is not significant at either level of confidence.

*The Analysis of Covariance Table from which this value is taken is not shown in this appendix.

The computation of the t-value for post-test scores with three covariates in Office Management 322 follows:

- (1) $N = 30$
- (2) Difference in pre-test scores for treatment groups =
 $72.9667 - 72.5000 = 0.4667$
- (3) Difference in college grade-point averages for treatment groups =
 $2.5419 - 2.4710 = 0.0709$
- (4) Difference in high school grade-point averages for treatment groups =
 $3.0836 - 3.1164 = -0.0328$
- $0.4667 \times 0.0002(A) = .00009334$
 $0.0709 \times -0.0005(C) = -.00003545$
 $-0.0328 \times -0.0010(E) = .00003280$
 $\underline{\hspace{1.5cm}} .00009069 = S_1$
- (5)
 $0.4667 \times -0.0005(B) = -.00023335$
 $0.0709 \times 0.0333(D) = .00236097$
 $-0.0328 \times -0.0225(F) = .00073800$
 $\underline{\hspace{1.5cm}} .00286562 = S_2$
- $0.4667 \times -0.0010(G) = -.00046670$
 $0.0709 \times -0.0225(H) = -.00159525$
 $-0.0328 \times 0.0608(I) = -.00199424$
 $\underline{\hspace{1.5cm}} -.00405619 = S_3$
- (6)
 $0.4667 \times .00009069(S_1) = .000042325023$
 $0.0709 \times .00286562(S_2) = .000203172458$
 $-0.0328 \times -.00405619(S_3) = .000133043032$
 $\underline{\hspace{1.5cm}} .000378540513 = M$
- (7)
 $(\frac{1}{30} + \frac{1}{30} + .00037854) \times (25.5082)^*$
 $(.06666666 + .00037854) \times (25.5082)$
 $(.06704520 \times (25.5082) = 1.710202370640$
- (8) $\sqrt{1.710202370640} = 1.307747$
- (9) Difference in adjusted mean scores of two treatment groups =
 $81.2450 - 80.8472 = 0.3978$
- (10) $0.3978 \div 1.30775 = .30418658$ or .30
- (11) $t = .30$
- With 111 degrees of freedom, a t-value, to be significant, must be 1.98 (or greater) at the .05 level of confidence or 2.63 (or greater) at the .01 level of confidence. This t-value is not significant at either level of confidence.

*The Analysis of Covariance Table from which this value is taken is not shown in this appendix.

Quiz Scores Using Two Covariates

Tables XXIV, XXV, and XXVI are used in computing the t-values for quiz scores using two covariates.

TABLE XXIV

VARIABLE MEANS FOR EACH GROUP: QUIZ SCORES
WITH TWO COVARIATES

Group	Pre-test Scores	College Grade-Point Averages
302 Control Group	67.0000	2.6678
302 Experimental Group	63.9143	2.5404
322 Control Group	72.5000	2.5119
322 Experimental Group	73.7647	2.5570

TABLE XXV

INVERSE OF THE COVARIATES CROSS PRODUCT MATRIX FOR ERROR:
QUIZ SCORES WITH TWO COVARIATES

Covariate	Pre-test Scores	College Grade-Point Averages
Pre-test Scores	0.0002(A)	-0.0007(B)
College Grade-Point Averages	-0.0007(C)	0.0219(D)

TABLE XXVI

TABLE OF ADJUSTED MEANS AND STANDARD ERRORS:
QUIZ SCORES WITH TWO COVARIATES

Group	Treatment Mean	Adjusted Mean	SE Adjusted Mean
302 Control Group	89.4571	89.5833	0.5834
302 Experimental Group	87.1714	88.0110	0.6140
322 Control Group	88.0294	87.6713	0.5989
322 Experimental Group	91.6176	90.9816	0.6121

The computation of the t-value for quiz scores with two covariates in Office Management 302 follows:

(1) $N = 35$

(2) Difference in pre-test scores for treatment groups =
 $67.0000 - 63.9143 = 3.0857$

(3) Difference in college grade-point averages for treatment groups =
 $2.6678 - 2.5404 = 0.1274$

(4)
$$\begin{array}{rcl} 3.0857 \times 0.0002(A) & = & .00061714 \\ 0.1274 \times -0.0007(C) & = & \underline{-.00008918} \\ & & .00052796 = S_1 \\ 3.0857 \times -0.0007(B) & = & -.00215999 \\ 0.1274 \times 0.0219(D) & = & \underline{.00279006} \\ & & .00063007 = S_2 \end{array}$$

(5)
$$\begin{array}{rcl} 3.0857 \times .00052796(S_1) & = & .001629126172 \\ 0.1274 \times .00063007(S_2) & = & \underline{.000080270918} \\ & & .001709397090 = M \end{array}$$

(6)
$$\begin{array}{rcl} \left(\frac{1}{35} + \frac{1}{35} + .00170940 \right) \times (11.3656) & & \\ (.05714285 + .00170940) \times (11.3656) & & \\ (.05885225) \times (11.3656) & = & .668891132600 \end{array}$$

(7) $\sqrt{.668891132600} = .817979+ = .817980$

(8) Difference in adjusted mean scores of two treatment groups =
 $89.5833 - 88.0110 = 1.5723$

(9) $1.5723 \div .817980 = 1.922174$ or 1.92

(10) $t = 1.92$

With 132 degrees of freedom, a t-value, to be significant, must be 1.98 (or greater) at the .05 level of confidence or 2.62 (or greater) at the .01 level of confidence. This t-value is not significant at either level of confidence.

The computation of the t-value for quiz scores with two covariates in Office Management 322 follows:

(1) $N = 34$

(2) Difference in pre-test scores for treatment groups =
 $73.7647 - 72.5000 = 1.2647$

(3) Difference in college grade-point averages for treatment groups =
 $2.5570 - 2.5119 = 0.0451$

(4) $1.2647 \times 0.0002(A) = .00025294$
 $0.0451 \times -0.0007(C) = \frac{-.00003157}{.00022137} = S_1$
 $1.2647 \times -0.0007(B) = -.00088529$
 $0.0451 \times 0.0219(D) = \frac{.00098769}{.00010240} = S_2$

(5) $1.2647 \times .00022137(S_1) = .000279966639$
 $0.0451 \times .00010240(S_2) = \frac{.000004618240}{.000284584879} = M$

(6) $(\frac{1}{34} + \frac{1}{34} + .00028458) \times (11.3656)$
 $(.05882352 + .00028458) \times (11.3656)$
 $(.05910810) \times (11.3656) = .671799021360$

(7) $\sqrt{.671799021360} = .819084$

(8) Difference in adjusted mean scores of two treatment groups =
 $90.9816 - 87.6713 = 3.3103$

(9) $3.3103 \div .819084 = 4.041468$ or 4.04

(10) $t = 4.04$ With 132 degrees of freedom, a t-value, to be significant, must be 1.98 (or greater) at the .05 level of confidence or 2.62 (or greater) at the .01 level of confidence. This t-value is significant beyond the .01 level of confidence.

Post-test Scores Using Two Covariates

Tables XXVII, XXVIII, and XXIX are used in computing the t-values for post-test scores using two covariates.

TABLE XXVII

VARIABLE MEANS FOR EACH GROUP: POST-TEST SCORES
WITH TWO COVARIATES

Group	Pre-test Scores	College Grade-Point Averages
302 Control Group	67.0000	2.6678
302 Experimental Group	63.9143	2.5404
322 Control Group	72.5000	2.5119
322 Experimental Group	73.7647	2.5570

TABLE XXVIII

INVERSE OF THE COVARIATES CROSS PRODUCT MATRIX FOR ERROR:
POST-TEST SCORES WITH TWO COVARIATES

Covariate	Pre-test Scores	College Grade-Point Averages
Pre-test Scores	0.0002(A)	-0.0007(B)
College Grade-Point Averages	-0.0007(C)	0.0219(D)

TABLE XXIX

TABLE OF ADJUSTED MEANS AND STANDARD ERRORS:
POST-TEST SCORES WITH TWO COVARIATES

Group	Treatment Mean	Adjusted Mean	SE Adjusted Mean
302 Control Group	82.0857	82.6081	0.8978
302 Experimental Group	80.8571	83.0883	0.9450
322 Control Group	82.2941	81.2138	0.9216
322 Experimental Group	82.7353	80.9812	0.9420

The computation of the t-value for post-test scores with two covariates in Office Management 302 follows:

(1) $N = 35$

(2) Difference in pre-test scores for treatment groups =
 $63.9143 - 67.0000 = -3.0857$

(3) Difference in college grade-point averages for treatment groups =
 $2.5404 - 2.6678 = -0.1274$

(4)
$$\begin{array}{r} -3.0857 \times 0.0002(A) = -.00061714 \\ -0.1274 \times -0.0007(C) = \underline{.00008918} \\ \hline -.00052796 = S_1 \\ \\ -3.0857 \times -0.0007(B) = .00215999 \\ -0.1274 \times 0.0219(D) = \underline{-.00279006} \\ \hline -.00063007 = S_2 \end{array}$$

(5)
$$\begin{array}{r} -3.0857 \times -.00052796(S_1) = .001629126172 \\ -0.1274 \times -.00063007(S_2) = \underline{.000080270918} \\ \hline .001709397090 = M \end{array}$$

(6)
$$\begin{array}{l} \left(\frac{1}{35} + \frac{1}{35} + .00170940 \right) \times (26.9175) \\ (.5614285 + .00170940) \times (26.9175) \\ (.05885225) \times (26.9175) = 1.584155439375 \end{array}$$

(7) $\sqrt{1.584155439375} = 1.258632$

(8) Difference in adjusted mean scores of two treatment groups =
 $83.0883 - 82.6081 = 0.4802$

(2) $0.4802 \div 1.258632 = .38152533$ or .38

(10) $t = .38$
 With 132 degrees of freedom, a t-value, to be significant, must be 1.98 (or greater) at the .05 level of confidence or 2.62 (or greater) at the .01 level of confidence. This t-value is not significant at either level of confidence.

The computation of the t-values for post-test scores with two covariates in Office Management 322 follows:

- (1) $N = 34$
- (2) Difference in pre-test scores for treatment groups =
 $72.5000 - 73.7647 = -1.2647$
- (3) Difference in college grade-point averages for treatment groups =
 $2.5119 - 2.5570 = -0.0451$

$$\begin{array}{r} -1.2647 \times 0.0002(A) = -.00025294 \\ -0.0451 \times -0.0007(C) = \underline{.00003257} \\ \hline = -.00022137 = S_1 \end{array}$$

$$\begin{array}{r} -1.2647 \times -0.0007(B) = .00088529 \\ -0.0451 \times 0.0219(D) = \underline{-.00098769} \\ \hline = -.00010240 = S_2 \end{array}$$

$$\begin{array}{r} -1.2647 \times -.00022137 = .000279966639 \\ -0.0451 \times -.00010240 = \underline{.000004618240} \\ \hline = .000284584879 = M \end{array}$$

$$\begin{array}{r} \left(\frac{1}{34} + \frac{1}{34} + .00028458 \right) \times (26.9175) \\ (.05882352 + .00028458) \times (26.9175) \\ (.05910810) \times (26.9175) = 1.591042281750 \end{array}$$

$$(7) \sqrt{1.591042281750} = 1.261365$$

$$(8) \text{Difference in adjusted mean scores of two treatment groups} = \\ 81.2138 - 80.9812 = 0.2326$$

$$(9) 0.2326 \div 1.261365 = .1844034 \text{ or } 1.8$$

- (10) $t = .18$
- With 132 degrees of freedom, a t-value, to be significant, must be 1.98 (or greater) at the .05 level of confidence or 2.62 (or greater) at the .01 level of confidence. This t-value is not significant at either level of confidence.

VITA

Arnola Colson Bose

Candidate for the Degree of

Doctor of Education

Thesis: AN EXPERIMENT TO DETERMINE THE EFFECTS OF IMMEDIATE VERSUS DELAYED KNOWLEDGE OF RESULTS ON INITIAL LEARNING AND RETENTION OF SELECTED RELATED LEARNINGS IN TRANSCRIPTION CLASSES

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