

AN EXPERIMENTAL COMPARISON OF
INDUCTIVE AND DEDUCTIVE METHODS
OF TEACHING CONCEPTS OF LANGUAGE
STRUCTURE

by Malcolm F. Rizzuto

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Education of the University of
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the requirements for the degree of
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CURRICULUM STUDIORUM

Malcolm F. Rizzuto was born April 27, 1931, in East Orange, New Jersey. He received the Bachelor of Science degree in English Education from New York University, New York, New York, in 1957. He received the Master of Arts degree in Guidance and Student Personnel Administration from New York University, New York, New York, in 1956.

After two years of military service, Mr. Rizzuto entered the educational profession in 1957 as a teacher of English. Since that time he has taught and served as a guidance counselor at the junior and senior high school level. At present he is an assistant principal in the Bedford Public Schools, Bedford, New York.

Mr. Rizzuto was married in 1953 and is the father of five children.

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INTRODUCTION

Commensurate with the change from a child and society centered curriculum to a discipline centered curriculum has been a focus on the structural elements of the subjects that comprise the school's offerings. The staggering rate of accumulation of knowledge and the desire to equip the learner with the intellectual power to attack unfamiliar problems in the future have prompted a redefinition of these subjects in terms of concepts, key ideas, principles, and modes of inquiry. Objectives include understanding these structures, and instruction is aimed toward providing the learner stimuli to this end.

The teaching-learning process has been fundamentally altered. The deductive approach of didactic exposition has been challenged by problem solving with emphasis on inductive procedures. Teaching as a telling procedure has been replaced. Students have been encouraged to explore, invent, discover, and create. In a sense, the learner has become more of an active agent in his own learning. For the teacher, the introduction of inductive procedures has meant a marked departure from traditional teaching methods.

In spite of the fundamental alteration of teaching and learning methods, the research evidence concerning effectiveness of the methods employed is meager, and there exists a dearth of controlled classroom experimentation dealing with inductive (discovery) and deductive (didactic expository)

methods. Principles have seemingly been uncritically extrapolated, and claims have not been empirically substantiated. In addition, semantic inconsistencies, incomplete descriptions of the treatments, and lack of replicability characterize the experimentation. Thus, the research in the inductive-deductive hypothesis has resulted in a highly tentative theory of instruction. What remains is a series of hypotheses instead of a body of empirical research.

The position taken here is that principles governing inductive and deductive methods must be examined through applied research which considers the distinctive attributes of teaching and learning as they exist in the classroom setting. Though it is possible to extrapolate principles from laboratory studies, such learnings are qualitatively different and more simple instances. However complex and great the number of influencing variables in classroom experimentation, the discovery of principles which can be generalized from one educational setting to another is not precluded provided that experimental designs are carefully constructed.

If instruction theory is to offer principles which will prescribe learning opportunities that optimize learning what is taught, then experimentation must make available alternatives, each of which attempts to improve learning. Up to now, inductive procedures have been pitted against generally unacceptable and outmoded instructional practices. The

attempt in the present investigation is to optimize both discovery and didactic expository methods in the teaching and learning of concepts of language structure, allowing each a fair chance to influence learning while providing exacting controls so as to elicit reliable data. The specific questions which the research proposes to answer are: (1) which method, the inductive or deductive, will produce significantly higher scores on a recognition and transfer criterion measure administered immediately after termination of instruction and two weeks later, and (2) will there be interaction involving sex, ability, and treatment factors on the same criterion.

In reviewing the research data of the inductive-deductive hypothesis, consideration is given the definitions and terminology used in previous experiments and in the present investigation and selected studies are examined. A summary statement concludes this section of the report.

1. Definitions and Terminology.

One of the most difficult problems of analyzing the results of experimentation in inductive and deductive methods arises because of inconsistent use of adequate terminology and labels to describe the stimuli. For example, what is termed intermediate direction in Kittell's¹ experiment is

¹ J. Kittell, "An Experimental Study of the Effect of External Direction During Learning on Transfer and Retention Principles", in Journal of Educational Psychology, Vol. 48, November 1957, p. 391-405.

apparently more directive than what is described as maximum direction in the experiment by Craig.² Kittell's Intermediate Direction Group was given examples of the principles with directions that a principle was involved as well as a statement of the general rule. In Craig's study the group receiving greater direction was provided a short general statement of the relationship common to each group of items dealing with a verbal problem to direct their discovery. In the study by Gagne and Brown³ the discovery treatment included giving subjects the rules, specific responses to the questions, and a day's reinforcement of the same material that was closely directed the first day.

The inductive method has been used to describe the stimuli, the hypothetical covert behavior of the learner, and his overt responses. Within a given experiment, stimuli presented to learners are sometimes described as the discovery treatment. The learners are termed discovery learners, and their overt responses are termed discovery responses. Wittrock⁴

² R. Craig, "Directed Versus Independent Discovery of Established Relations", in Journal of Educational Psychology, Vol. 47, April 1956, p. 223-234.

³ R. Gagne and L. Brown, "Some Factors in the Programming of Concept Learning", in Journal of Experimental Psychology, Vol. 62, October 1961, p. 313-321.

⁴ M. Wittrock, "Verbal Stimuli in Concept Formation; Learning by Discovery", in Journal of Educational Psychology, Vol. 54, August 1963, p. 183-190.

cautions that this leads to tautological conclusions and advises the use of descriptive label without inferring a causal relationship between stimuli and responses.

In general, the inductive method is equated with such discovery modes of teaching and learning as direct discovery, guided discovery, independent discovery, and intuitive methods. The most significant variable is in each case the amount of help provided the learner during goal directed behavior as he seeks to complete a learning task. As a result of the varied attempts to qualify the treatments, what exactly constitutes an inductive or discovery learning treatment is not always clear, and direct interpretation of results in this area of experimentation is impeded.

Although subsequently treated in detail, inductive teaching may be operationally defined here as the systematic presentation of a structured sequence of specific instances or exemplars from which the learner is to discover and verbalize the principle, rule, or concept. This definition encompasses most of those found in the literature with the exception of two of Hendrix's⁵ components of the inductive method: the non-verbal awareness method (discovery without verbalization) and the incidental method in which generalizations are deduced from an unstructured experiential problem or project.

⁵ G. Hendrix, "Learning by Discovery", in Math Teacher, Vol. 59, May 1961, p. 290-299.

According to Bruner,⁶ in inductive learning the learner rearranges or transforms evidence in a manner that permits him to surpass the restructured evidence to additional new insights. Wertheimer⁷ reiterates this in his conclusion that productive thinking arises from the individual's grouping, centering, and reorganizing the objective properties of a problem situation, thereby moving from an unclear, inadequate relation to a clear direct confrontation of the problem. Implied here is the suggestion that discovery is a kind of covert behavior most likely to occur prior to the learner's first acceptable response. This is Hendrix's non-verbal awareness stage.

Deductive teaching and learning in the present study is operationally defined as the didactic verbal exposition of the principle, rule, or concept which the learner is then to verbalize and apply to instances and exemplars. While most studies have used the deductive method as a contrasting or control variable, a variety of situations have been included under the deductive heading. It has often been termed: rote, directed, directed-detailed, and maximum guidance method. Deductive methods are equated with drill methods in

⁶ J. Bruner, "Act of Discovery", in Harvard Educational Review, Vol. 31, No. 1, Winter 1961, p. 21-32.

⁷ M. Wertheimer, Productive Thinking, New York, Harper and Row, 1959, v-302 p.

Thiele's⁸ study and with didactic expository methods in the investigations of Ray,⁹ and Moss.¹⁰ For Ausubel,¹¹ deductive teaching is the didactic expository method, a situation in which subject content is meaningfully transmitted to the learner by the teacher rather than discovered by the learner. According to Ausubel,¹² the learner is merely required to comprehend concepts meaningfully and to incorporate them into his cognitive structure so as to make them available or functionally reproducible for future use. As the spokesman for reception learning, Ausubel emphasizes that such learning is not necessarily rote in character and can be meaningful though there may not be any non-verbal and problem solving experience. The deductive treatment of the present investigation is based on Ausubel's theoretical formulation of didactic exposition. The learner involved in reception

8 C.L. Thiele, The Contribution of Generalization to the Learning of Addition Facts, New York, Bureau of Publications, Teachers College, Columbia, 1938, viii-84 p.

9 W. Ray, "Pupil Discovery vs. Direct Instruction", in Journal of Experimental Education, Vol. 29, March 1961, p. 271-280.

10 J. Moss, Jr., "The Relative Effectiveness of the Directed-Detailed and the Directed Discovery Methods of Teaching Letterpress Imposition", in Journal of Educational Research, Vol. 57, October 1964, p. 51-55.

11 D. Ausubel, "Learning by Discovery: Rationale and Mystique", in The Bulletin of the National Association of Secondary School Principals, Vol. 45, December 1961, p. 15-38.

12 -----, The Psychology of Meaningful Verbal Learning, New York, Grune and Stratton, 1963, p. 16.

learning was required to understand the concepts as presented by the teacher and to internalize them.

Bruner¹³ further characterizes this method, suggesting that in deductive teaching, the mode, pace, and style is set by the teacher while the learner is essentially a listener.

Although the deductive method in the present study subscribes to many of the characteristics noted above, it does not assume the proportions of the rote or drill method which uses learning materials that are discrete and relatively isolated entities, relatable to cognitive structure in an arbitrary, verbatim fashion.

2. Empirical Research.

To facilitate a review of the empirical research, the experiments are broadly categorized according to their concern for intervening variables, independent variables, and outcome or dependent variables.

The research dealing with the rote-meaningful learning question has often been cited as empirical support for the superiority of inductive methods. The experimental

¹³ Bruner, Op. Cit., p. 22.

designs of Thiele,¹⁴ Swenson,¹⁵ McConnell,¹⁶ and Anderson¹⁷ were basically the same. In each case the generalization method was superior to the rote method except on the criterion of immediate recall. Though not wholly applicable to the inductive-deductive hypothesis, the results of these investigations suggest that operational definitions clearly differentiate rote methods from deductive methods and establish the rational character of the latter.

Hendrix¹⁸ is concerned with un verbalized awareness as the intervening variable and argues its importance for transfer. According to Hendrix, verbalization of discovery has been confused with the advent of discovery itself and claims that correct verbalizations immediately after discovery occur only in rare cases and are relegated to those learners with unusual powers of correctness and precision in language.

¹⁴ Thiele, Op. Cit., viii-84 p.

¹⁵ E. Swenson, "Organization and Generalization as Factors", in Learning Theory in School Situations, Minneapolis, University of Minnesota Press, 1949, p. 9-39.

¹⁶ T.R. McConnell, "Discovery vs. Authoritarian Identification in the Learning of Children", University of Iowa Studies in the Psychology of Learning II, Vol. 9, No. 5, 1934, 1-62 p.

¹⁷ G. Anderson, "Quantitative Thinking as Developed under Connectionist and Field Theories of Learning", in E. Swenson, et al., Learning Theory in School Situations, Minneapolis, University of Minnesota Press, 1949, p. 40-73.

¹⁸ Hendrix, Op. Cit., p. 290-299.

In Hendrix's¹⁹ experiment, the ability to transfer favored the non-verbal discovery group over the deductive. However, this was significant at only the .12 level. For classroom experimentation, this study suggests that teachers might profitably correct responses of the learners and prompt a more deliberate process by motivating pupils to think through the material carefully and to be precise when verbalizing. In the present study, where these tactics were employed, the inductive group was comparable to Hendrix's Group II.

An important construct in discovery learning is the function of motivation as an intervening variable for it suggests another factor to consider when interpreting the research evidence. Kersh²⁰ argues that motivation, specifically competence motivation may be the most useful construct and that meaning may not be the intervening variable most useful in discovery learning. In his investigation he included a questionnaire. More subjects of the guided discovery group reported study of rules after the experiment, but this may possibly be explained by the fact that the experimenter used a tutorial method which may have influenced the subjects to continue using the rules.

¹⁹ G. Hendrix, 'A New Clue to Transfer of Training', in Elementary School Journal, Vol. 48, December 1947, p. 197-200.

²⁰ B.Y. Kersh, 'The Motivating Effect of Learning by Directed Discovery', in Journal of Educational Psychology, Vol. 43, April 1962, p. 65-71.

The suggestions drawn from the empirical research on intervening variables follow: (1) The results of the rote-meaningful learning question are not wholly applicable to the inductive-deductive hypothesis since drill and deductive treatments differ widely. (2) Unverbalized awareness, a construct not directly applicable to classroom experimentation, is significant in its implication for administering inductive treatment. (3) Motivation as an intervening variable is acutely difficult to quantify but serves as one construct for explaining the superiority of inductive procedures where it exists.

The experimentation focussing on the independent variable emphasizes the treatment variable, exhibits in general more exacting controls, and gives less attention to the covert behavior of the learner.

Although the studies to be reviewed generally deal with rules and principles, they are classified according to treatment variable. The studies of Wittrock,²¹ Belcastro,²²

²¹ Wittrock, Op. Cit., p. 183-190.

²² A. Belcastro, "Relative Effectiveness of the Inductive and Deductive Methods of Programming Algebra", in Journal of Experimental Education, Vol. 34, September 1966, p. 77-82.

Kersh,²³ Guthrie,²⁴ Yabroff,²⁵ and Cagne and Brown,²⁶ using programmed material, tended to support the conclusion that deductive methods are superior on initial learning and immediate recall and some form of guided discovery has been more effective on transfer. The use of programmed material permits clear specification and control of the treatment variable.

Another series of experiments on rules and principles grew out of attempts by researchers to study the effects of varying amounts of guidance on discovery learning. The treatment groups were differentiated by specification of hints that were given to discover relational concepts.

Somewhat conflicting inferences were produced by the experimentation of Stacey,²⁷ Craig,²⁸ Craig,²⁹ and Kittell³⁰

23 Kersh, Op. Cit., p. 65-71.

24 J. Guthrie, "Expository Instruction Versus a Discovery Method", in Journal of Educational Psychology, Vol. 58, February 1967, p. 45-49.

25 W. Yabroff, "The Comparative Effects of Inductive and Deductive Sequences in Programmed Instruction", unpublished doctoral dissertation, School of Education, Stanford University, 1963.

26 Cagne and Brown, Op. Cit., p. 313-321.

27 C. Stacey, "The Law of Effect in Retained Situation with Meaningful Material", in E. Swenson, et al., Learning Theory in School Situations, Minneapolis, University of Minnesota Press, 1949, p. 74-103.

28 R. Craig, The Transfer Value of Guided Learning, New York, Bureau of Publications, Teachers College, Columbia, 1953, 65 p.

29 Craig, Op. Cit., 1956, p. 223-234.

30 Kittell, Op. Cit., p. 391-405.

all of which used a verbal relation task. While results favored independent discovery to specification of correct responses prior to discovery in the first investigation, some form of guided or intermediate discovery was superior on the last three. Direction in the form of underlying principles, supplied during discovery apparently promotes transfer and retention.

The studies making use of such highly motivational task variables as coding, card tricks, and puzzles are far removed from the educational setting, and the findings are generally inapplicable to the school setting.

Although Hilgard³¹ and Fergus and Schwartz³² found no difference on recall between deductive and inductive groups, Hilgard found evidence favoring the inductive group in transfer ability. In this study both inductive and deductive (meaningful guides) learned the alphabet better than when they learned by rote memorization.

In Haslerud and Meyer's³³ experiment, seventy-six college students were given two tests involving coding

31 E. Hilgard, R. Irvine, and J. Whipple, "Rote Memorization, Understanding, and Transfer: An Extension of Katona's Card-Trick Experiments", in Journal of Experimental Psychology, Vol. 46, October 1953, p. 288-292.

32 R. Fergus and R. Schwartz, "Efficient Retention and Transfer as Affected by Learning Method", in Journal of Psychology, Vol. 43, 1957, p. 135-139.

33 G. Haslerud and S. Meyers, "The Transfer Value of Given and Individually Derived Principles", in Journal of Educational Psychology, Vol. 49, December 1958, p. 293-298.

problems. Subjects did significantly better on those problems with the rule given. However, the scores on the transfer test were significantly increased for those problems which had been formerly derived, while a significant decrease was noted for those problems where the rule had been given.

In his study, Corman³⁴ selected 255 twelfth grade students. Different information about the principles and methods of solving matchstick problems were presented. His results indicated that highly explicit information was best for higher ability subjects whereas more and less explicit instructions were most effective with less able students.

In Gagne and Smith's³⁵ investigation using a special three circle task, verbalization resulted in superior performance. They concluded that this facilitates discovery of general principles. This suggestion for verbalization exists in the treatments of this study.

The significance of beginnings of classroom research is the conviction of educators that the formulation of an instructional theory must be based in the final analysis on findings using the classroom setting and regular curriculum content.

³⁴ B. Corman, "The Effect of Varying Amounts and Kinds of Information as Guidance in Problem Solving", in Psychological Monographs, Vol. 71, No. 2, Whole No. 431, 1957,

³⁵ H. Gagne and E. Smith, "A Study of the Effects of Verbalization on Problem Solving", in Journal of Experimental Psychology, Vol. 63, January 1962, p. 12-18.

An extensive inquiry training program was conducted by Suchman³⁶ with elementary children. The research produced limited but suggestive results. Though subjects seemed to acquire an inquiry set, additional training was required to produce effective inquiry, and this training was an adjunct to the curriculum. Ray³⁷ found no significant differences on initial recall between treatments. However, the Directed-Detailed groups did not retain as much of what they learned after six weeks, and the Directed-Discovery groups showed to greater advantage on tests of transfer after one and six weeks. It would appear that the didactic instruction of this experiment was not sound pedagogy, and it is this tendency on the part of researchers not to employ a sound deductive method which negates many of the conclusions drawn from classroom experimentation.

Three classroom experiments, all using technical content and similar designs, were performed by Grote,³⁸

³⁶ R. Suchman, "Inquiry Training: Building Skills for Autonomous Discovery", in Merrill Palmer Quarterly of Behavior and Development, Vol. 7, July 1961, p. 147-169.

³⁷ Ray, Op. Cit., p. 271-286.

³⁸ C. Grote, "A Comparison of the Relative Effectiveness of Directed-Detailed and Directed-Discovery Methods of Teaching Selected Principles of Mechanics in the Area of Physics", unpublished doctoral dissertation, University of Illinois, 1960.

Rowlette,³⁹ and Tomlinson.⁴⁰ Grote found that the directed-detailed method was superior to the directed-discovery on the first initial learning test. However, no differences were reported among treatment groups for initial learning following the second instruction session. Rowlette described his directed-discovery method as one involving leading questions and "hints" as contrasted with a directed-detailed procedure involving highly specific instruction. On the basis of initial learning, both methods were found to be equally effective. The directed-discovery method was superior to the directed-detailed method with reference to retention and transfer after twelve days and six weeks of instruction. Tomlinson reported no significant differences in delayed retention and transfer between directed-detailed and guided-discovery learning groups.

A study using English content was conducted by La Rocque⁴¹ who employed a factorial design to study inductive and deductive methods of teaching figurative language. The

³⁹ J. Rowlette, "An Experimental Comparison of Directed-Detailed and Directed-Discovery Methods of Teaching Orthographic Projection Principles and Skills", unpublished doctoral dissertation, University of Illinois, 1960.

⁴⁰ R. Tomlinson, "A Comparison of Four Methods of Presentation for Teaching Complex Technical Material", unpublished doctoral dissertation, University of Illinois, 1962.

⁴¹ G. La Rocque, "The Effectiveness of the Inductive and Deductive Methods of Teaching Figurative Language to Eighth Grade Students", unpublished doctoral dissertation, Stanford University, 1965.

treatment consisted of two detailed lessons. The deductive method showed greater overall effectiveness. This study attempted to apply a rigorous experimental procedure in a classroom setting. The limited treatment, however, is a decided weakness preventing generalizability, and there was apparently no attempt to control "Hawthorne Effect".

The experiments reported here focus on variables that may or may not interact with the treatments. Amidon and Flanders⁴² investigated inductive and deductive procedures with dependent prone subjects. They found that subjects taught by the indirect teacher learned more than those taught by direct methods. However, the teacher of the indirect treatment was apparently more supportive. Osler and Fivel⁴³ studied the effect of age and intelligence on inductive methods of concept attainment. It was concluded that age and intelligence were associated with significant differences in errors to criterion and number of successful subjects. When learners were divided into sudden and gradual learners, it was found that frequency of sudden learners was a function of intelligence, but not of age.

⁴² E. Amidon and N. Flanders, "The Effects of Direct and Indirect Teacher Influence on Dependent-prone Students Learning Geometry", in Journal of Educational Psychology, Vol. 52, December 1961, p. 286-291.

⁴³ S. Osler and M. Fivel, "Concept Attainment: I. The Role of Age and Intelligence in Concept Attainment by Induction", in Journal of Experimental Psychology, Vol. 62, July 1961, p. 1-8.

Though the investigations dealing with the independent variables establish more exacting controls, the simplicity of the materials and learnings involved and their low association value make the research evidence generally unserviceable for educational recommendations. Even the results of classroom experiments are restrictive in their generalizing power for total treatment sequences are usually not long enough to produce cumulative learnings, there is little variation in the samples (in six studies only male subjects participated), and experimental designs are weak.

Nevertheless, the research points up the advisability of clearly specifying treatments by the use of descriptive or operationally defined treatments and carefully manipulating variables to increase generalizing power. The latter is seen in the varied amounts of guidance provided in the learning of relational concepts, the order of the stimuli in experiments with programmed material, and the examination of the interaction of age and ability factors with the treatment variable.

The present investigation incorporated these, operationally defining the treatments, specifying the kind and order of the stimuli in the experimental material, providing guidance through prompts and cues, and examining the interaction of sex and ability and treatment.

The dependent variables are few compared to the outcomes that experimenters claim for discovery methods. One of

the outcomes recently considered is the heuristics of discovery. Stern and Keislar's⁴⁴ experiment was designed to test the hypothesis that young children could be taught strategies which would subsequently improve their ability to "discover". The results showed that subjects taught strategies for problem solving performed significantly better than children who had not been given instruction. However, this advantage was found only with the simpler of the two instructed strategies. In a succeeding study, Stern⁴⁵ found that children taught to use knowledge of results to test one concept at a time scored significantly higher on posttests than did those taught to test multiple hypotheses at once. Verbalization was shown to have no effect with either treatment group. Mental age was an interacting variable only in the acquisition of the multiple-hypotheses strategy.

Experiments such as those above suggest that individuals can learn how to discover the solutions to problems, but the heuristics of discovery do not seem highly generalizable. Using strategies to find solutions to one kind of problem does not mean that the learner has learned discovery in a general sense.

⁴⁴ C. Stern and E. Keislar, "Acquisition of Problem-Solving Strategies in Young Children and Its Relation to Mental Age", in Journal of Educational Psychology, Vol. 58, August 1967, p. 245-252.

⁴⁵ C. Stern, "Acquisition of Problem-Solving Strategies in Young Children and Its Relation to Verbalization", in Journal of Educational Psychology, Vol. 58, August 1967, p. 245-252.

3. Summary.

Although strong claims for inductive teaching and learning are made in educational psychology, a review of the empirical research fails to substantiate these assertions. In place of verifiable evidence is the suggestion that deductive procedures result in greater initial learning and retention, while discovery experience supplemented by guidance in the form of prompts or verbal cues invariably facilitates greater transfer of learning. Completely independent discovery procedures are generally less effective.

The initial impediment in an analysis of investigations was found to be the non-comparability of many studies because of inconsistent use of terminology to describe the stimuli. The inductive method was used to describe the stimuli, hypothetical covert behavior of the learner, and his overt responses. The deductive method was considered rote learning by some researchers and didactic expository by others. In general, the research has been marred by failure to clearly define treatments operationally and to adopt proper controls for such factors as "Hawthorne Effect", post-experimental learning, and practice schedules.

The early experiments concerned with rote versus meaningful learning were considered by some as supportive of inductive methods. This unwarranted extrapolation has

prompted a clear statement of the rational nature of deductive methods.

More relevant to the inductive-deductive hypothesis is the concern for un verbalized awareness as an intervening variable and attention to motivation rather than meaning as the most useful construct in inductive learning.

The more controlled experimentation focussing on the independent or treatment variable has dealt with rules and principles. Studies here have used programmed material, verbal relations, codes, tricks, and puzzles, and regular curriculum content. Investigations taken from the literature on concept learning were found relevant for their assessment of the influences of such interacting variables as age, mental ability, verbalization, and personality.

Heuristics of discovery was the topic under the dependent variable. The findings here suggested that individuals could be taught discovery strategies but these were restricted.

The research evidence in inductive and deductive methods has been extrapolated by educators intent on developing a theory of instruction. The beginnings of classroom experimentation illustrates the awareness of the need to study the nature and conditions of inductive and deductive methods in a distinctive milieu that is qualitatively different and considerably more complex than the laboratory. Although suffering from a series of experimental ills, the classroom with its

use of regular curriculum concepts is a promising field of experimentation. The need is to replace such impediments as: unclear operational definitions of the treatments, failure to control teacher ability and attitude, unsound pedagogy as the control treatment, and limited treatment exposure. It is out of this specific need to provide a paradigm for classroom investigations and to the general problem of providing empirical evidence for the development of instructional theory that the present investigation has evolved.

The experimental design of this study is reported in the following chapter. Included are the specific hypotheses.

Chapter II reports the time period covered by the experiment and administrative details of pupil assignment. This is followed by a general analysis of video-taped recordings of selected experimental lessons.

The results of this investigation are thereupon presented (Chapter III). At the outset the reliability and correlations of the recognition and transfer criterion are reported. After the differences between the control and treatment groups are established, the findings related to the hypotheses are given.

Using the same organization, the final chapter interprets the findings, and brings attention to the limitations of the experiment. Finally, the study is related to others in general terms.

After the brief summary of the investigation, recommendations for further research are made. In addition to supplementary statistical data, the material in the appendix includes the actual inductive and deductive lessons, the concepts of language structure of the experimental lessons, and criterion measure and questionnaire.

CHAPTER I

EXPERIMENTAL DESIGN

The present investigation was performed to determine the effectiveness of inductive (discovery) and deductive (didactic expository) methods of teaching and learning concepts, rules, and principles of the structure of language with eighth grade subjects. Effectiveness was ascertained by the criteria of recognition and transfer of learning. Three factor differences were tested by the use of the recognition and transfer of learning criterion measure. These were method treatment, verbal ability, and sex. An ancillary purpose was to assess subjects' attitudes toward the experimental lessons as demonstrated on an attitude questionnaire.

1. Overview.

The schematic presentation of the basic design of the present experiment noted below (Figure 1) utilizes Campbell and Stanley's¹ code as follows: X represents the exposure of a group to the experimental variable, the effects of which are to be measured. The Xs and Os in the same row apply to the same group. The left to right dimension indicates the temporal order, and Xs and Os vertical to one

¹ D. Campbell and J. Stanley, Experimental and Quasi-Experimental Designs for Research, Chicago, Rand McNally and Company, 1963, p. 13-34.

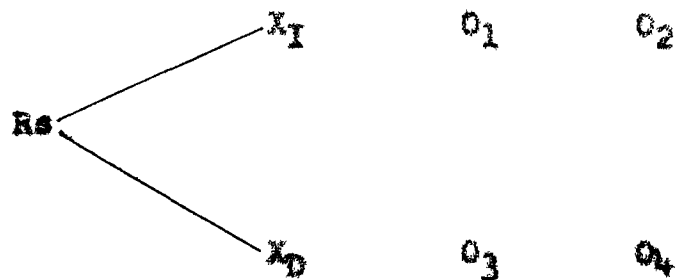


Figure 1.- Basic Design.*

- * R : Stratified random assignment
- X_I : Inductive treatment
- X_D : Deductive treatment
- O₁ and O₃ : Immediate testing
- O₂ and O₄ : Delayed testing

another are simultaneous. The symbol Rs refers to stratified random assignment to separate treatment groups. The decisions concerning the design and a detailed analysis of the variables are subsequently discussed.

As indicated above, the subjects of the experiment were stratified and randomly assigned to the inductive or deductive treatment group, the latter serving as the control. The comparison, in other words, was between the discovery treatment of the inductive group and the specific activity of the didactic expository or deductive methods that filled the same time interval.

Because curriculum practices often vary considerably from year to year, class to class, and teacher to teacher, it seemed an important prerequisite to substantiate that the experimental lessons provided concepts not already learned by the subjects at other times in their school experience. By the provision of a control group that would not be exposed to the experimental treatment and drawing a comparison between the experimental and the control groups, it was possible to demonstrate if a significant amount of learning took place as a result of both treatments and to show the difficulty of achieving on the criterion measure without being in attendance for the experimental treatment. This control group was formed according to the stratified random sampling procedure used for the experimental groups.

After the exposure to the inductive and deductive teaching treatment, which consisted of twenty lessons of forty-five minutes maximum duration and covering a five-week period, all subjects were immediately administered the recognition and transfer criterion measure (C_1 and C_3) and the attitude questionnaire in their regular classes. Two weeks later the experimental groups were administered the delayed testing (C_2 and C_4) consisting of the same measure but excluding the questionnaire. The intent here was to determine if differences on the immediate testing would be substantiated once learning decrement was involved.

The experiment used an analysis of variance for a $2 \times 3 \times 2$ factorial experiment. The analysis of variance model was a fixed effects model.

Three class units of twenty-eight subjects each made up the inductive group and, similarly, three class units comprised the deductive group. Each class contained subjects of both sexes (M, F) at each of three ability levels: below average (B), average (A), and above average (S). The exact breakdown and other statistical data about the sample are presented later. Six teachers were randomly assigned, one to each of the six class units, and taught their classes in a prearranged sequence. Figure 2 illustrates the experimental procedure of assigning teachers and subjects.

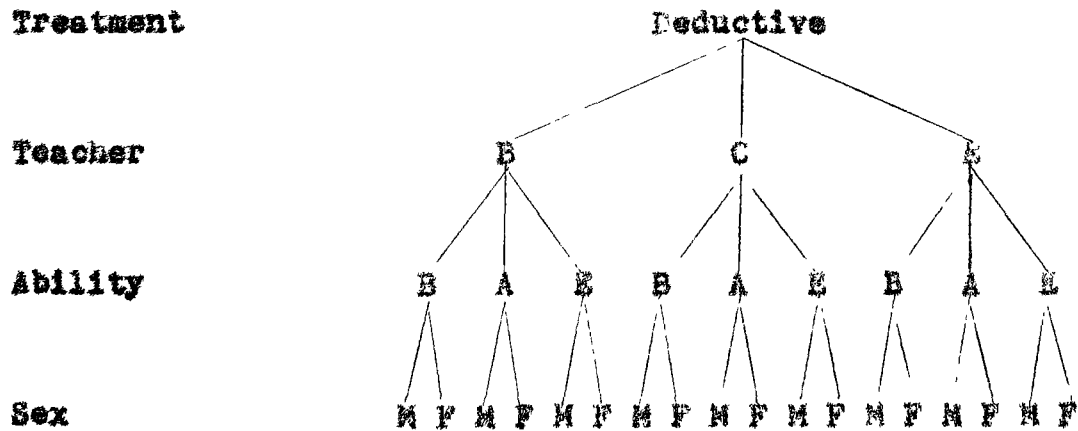
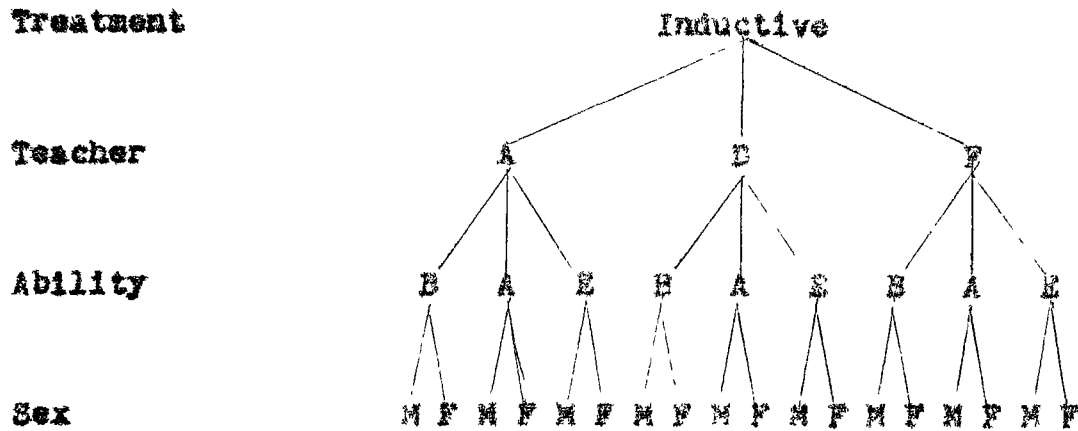


Figure 2.- Pupil and Teacher Assignment.

while the pretest concept is frequently adopted by investigators in education and psychology, assurance of lack of initial bias in this study was obtained through randomization. Certain factors militated against the use of a pretest-posttest procedure. Entirely new subject content was used for which a pretest was inappropriate and, further, it was felt a pretest would be reactive, introducing nomenclature and terminology which in some instances were to be withheld from the learner. This was especially true in some of the inductive lessons. Finally, the reactive arrangement of new class units, normally an after-effect of random assignment, was controlled in this experiment for the class structures are often changed for new units. It was possible therefore both to keep randomization inconspicuous and also to control the sensitizing of the learners to the treatment material.

Each of six teachers from a language arts department totalling thirteen were randomly assigned to teach one of the class treatment units. This number was dictated by the total number of subjects desired for valid statistical analysis and the need to approximate average class size. Having three teachers work with each treatment also lessened the possible influence of such interacting variables as teacher ability and attitude. An earlier decision to have an experimental teacher work with both treatments was abandoned for it seemed unlikely that a teacher could continue to differentiate the

treatments uniformly over the long haul of the experimental period. Also, the day-to-day pressure of changing methods would have been taxing and may have possibly introduced an attitudinal set with the teachers.

To verify adherence to the treatment procedures by the experimental teachers, each was video-taped on two occasions for the entire lesson. (An analysis of these randomly selected tapes appears in Chapter II .) One taping was done during the first two weeks of the experiment and one sometime during the last two weeks. Although each teacher was aware that such taping would occur, none was cognizant of the days on which such taping would take place.

2. Subjects.

Because interaction of method, ability, and sex factors would contribute to the theoretical understanding of inductive and deductive teaching and learning and make possible a more thorough exploration of the generalizations of the findings, subjects were stratified prior to random assignment. For this purpose the converted scores of the verbal subtests of the School and College Ability Test (S.C.A.T.) were used to designate members of the ability by sex cell.

In October 1967, all eighth grade pupils of the Fox Lane Middle School in Bedford, New York, were administered

Form 3A of the S.C.A.T. This was deemed acceptable as an independent measure of developed verbal ability for the present investigation because the verbal subtest involves the examinee's ability to comprehend "sense" of sentences read (Part I) and attach meaning to isolated words (Part II). For example, one item assessing sentence sense reads: "Such courageous [] as the President showed would have been called obstinacy in a lesser man." The choices available are: (A) cheerfulness, (B) reverence, (C) impatience, (D) justification, and (E) determination with (E) as the keyed response. A sample item of Part III in which the examinee selects a word that has the same or most nearly the same meaning as the first word is: PROTRUDE - (F) insult, (G) support, (H) grow large, (J) stick out, (K) butt into with (J) as the keyed response.

The unit on the structure of language, concerned with meaning derived from syntactical and morphological concepts, was directly related to the abilities measured by the verbal section of S.C.A.T. In the manual Form 3A, listed for Grade 8, 9, and 10 examinee groups, was preferred over Form 4 (Grade 6, 7, and 8 examinee groups) because of the advanced level of verbal ability of subjects in the sample. Details of this superiority are discussed below.

That the subjects of the present investigation exceed national averages as far as verbal ability is concerned is evident from Table I which compares local norms, constructed

Table I.-

National and Local Norms of Verbal Section
of School and College Ability Tests.

	National Norms	Local Norms
Median	263	274.3
Upper Quartile	274	283.2
Lower Quartile	254	264.7
Mean	263	273.5
Standard Deviation	14	14.1

from converted scores of S.C.A.T. and based on 330 pupils, to national norms listed in the Manual for Interpreting Scores and the Technical Report. Local norms were based on 171 females and 159 males in grade eight while national norms were based on 4,494 students (sex breakdown not published) in forty-two schools. Of special note is the fact that the local median approximates the 75th %ile of the nationally derived norm.

Local norms provided the intervals of the operationally defined ability levels. Average subjects were those pupils whose converted scores placed them between the 35th %ile and the 65th %ile. Designation of this ability level required a converted score between 269 and 280. In the Educational Testing Service Manual the converted score interval 268-269 corresponds to the 56th-73rd %ile confidence interval, and 280-281 to the 82nd-93rd %ile band. Above average subjects were those whose verbal converted score was 281 or above, a score above the local 65th %ile. Similarly, below average subjects were classified as such if their converted score was below 269, a score below the 35th %ile locally. These operationally defined ability intervals allowed for subjects in ample numbers in each cell for statistical purposes and provided distinct ability ranges to assess interaction effects. The actual final numbers for each method by ability by sex cell are presented in Chapter III where the results are presented.

The milieu from which the sample of the present study was drawn is described in the brief report of the school district and the communities that follows. The Fox Lane Middle School is part of the Bedford Public Schools which centralized thirteen years ago when four small separate school districts in each of four communities joined together. One of the major objections to this move was the extreme sociological differences among the communities.

Mount Kisco, the most heavily populated, is in many respects typical of suburban commuter towns. Most of the men are employed in a variety of white-collar positions. There is some light industry within the community. Bedford Hills is a combination of middle-class residences with a periphery of estates and some low income areas bordering on the urban renewal projects of Mount Kisco. Bedford Village has virtually no industry in the community. There are throughout the village limits many large estates. Other areas maintain strict four-acre zoning and are the homes of executives and junior executives employed in business and professional positions in New York City. Pound Ridge which borders on Connecticut also serves as home to prominent New Yorkers including authors, playwrights, and others involved in the legitimate stage.

The school district is large, 57.4 square miles, and is as diversified as a modern urban renewal to the west and large rolling dairy farms to the east.

The Fox Lane Middle School is a five-building complex which opened in September 1960. The plant, equipped with a government funded dial select and retrieval system emphasizes flexibility. At present 952 pupils are enrolled in the cluster-grouped units of the school. Among the teaching strategies employed are interdisciplinary teaming of teachers, independent study, and the contract system. A communications department is responsible for collecting and disseminating commercially and privately produced video and auditory materials.

The faculty of the Fox Lane Middle School totals sixty-eight including: a principal, three guidance counselors, three head teachers, a school psychologist, a language arts consultant and other paraprofessional and clerical aides. About half of the staff holds graduate degrees. Eighty-five per cent of the faculty has been employed less than ten years by the school district.

The estimated gross expenditure per pupil for 1967-1968 is \$1,521.00. The growth of financial potential is illustrated in the budget figures for 1957, 1961, 1966, 1967 respectively: \$2,263,582.00, \$3,353,760.00, \$5,541,000.00, \$6,123,107.00.

3. Treatment.

The treatments of this investigation were described in the basic principles of the inductive and deductive methods. These became the focus of the training program of the experimental teachers. The principles were reviewed under the following topics: structure of the content of the experimental lessons, the prescriptive role of the teacher, the hypothetical covert behavior of the learner, and the methodological sequence to which each experimental lesson conformed. All of these were subsumed in the operational definitions of the investigation.

The ensuing discussion reiterates the specific operational definitions of each method, describes the overt teacher function, and describes the assumed covert behavior of the learner. The class sequences for each method are then compared. The structure of the material of each method, in the workbooks written for this study, was an important means of differentiating the treatment, and is discussed in the succeeding section.

The inductive method was defined as the presentation of a structured sequence of specific instances or exemplars from which the learner was to discover and verbalize the principle, rule or concept. Inherent in this statement was the presentation of a stimulus situation which provided a body of carefully selected concrete and observable facts that were specific instances of a concept class. In general, this stimuli

was arranged abstractedly, requiring the learner to impose order to the material. Although the teacher's function would normally include selecting and arranging the information to be presented, these were made available in the lesson plans.

At the outset the teacher had only to pose the linguistic problem of the lesson and focus the learners' attention on the problem situation. As the experimental lesson progressed the teacher asked open-ended unanswered questions which prompted and guided pupils in making discoveries. In this sense the teacher interacted with the pupils in the structured situation. When necessary the teacher supplied information, but communication among the learners was emphasized rather than a teacher-student dialog. In essence, the teacher's primary function was that of a catalyst, to ensure that the learners engaged seriously in the process of inquiry and to support and guide them in understanding and communicating their own perceptions to classmates without assuming the stance of an authority figure.

Because of the nature of the stimulus situation and the role of the teacher, the burden of intellectual activity was assumed by the learner. The concepts to be apprehended were supplied by the learner who was self-sufficient, an active participant in his own learning. It was assumed that to a greater or lesser degree each pupil participated in such covert behavior of discovery learning as: hypothesizing,

performing internal trial and error, rearranging the array of information of the stimulus, observing, thinking multiply, and moving from lower to higher order abstractions. Because of the dominant role of the learner, the mode and pace of the lesson was set by him.

The deductive method was operationally defined as the didactic verbal exposition of the principle, rule, or concept which the learner was then to verbalize and apply to instances or exemplars. In this method the stimulus situation was a precise and accurate verbal exposition by the teacher of the substantive concepts to be learned in final form. Inherent in the presentation of potentially meaningful concepts was the teacher's delineation of similarities and differences between related concepts, and explanations, interpretations, clarifications, and illustrations of the concepts.

The teacher's function in the deductive lessons was to transmit the learned material which had been selected and organized developmentally for the experiment. In assuming this vital function, the teacher determined the mode, pace, and style of the lesson. As in the inductive lessons, the teacher was supportive and helped pupils verbalize the concepts. However, in the deductive lessons these concepts were those that had been previously presented by the teacher, not the discoveries arrived at by the learners. The exposition was presented so that concepts could be internalized

meaningfully by the learner. At the conclusion of the lessons the teacher reviewed the salient points.

The learner in the deductive treatment was to comprehend the verbal exposition and grasp the abstractions. He was then to identify and relate and apply these to the instances or exemplars of the exercises. Through verbalizations of the new propositions the learner was able to translate concepts into his personal frame of reference. It was assumed that in the deductive treatment the learner internalized and integrated new meaning into his cognitive structure.

In addition to the differing role of the teacher and the learner of both treatments, class sequence further differentiated the methods. The major steps of the class sequence for each method are now compared. As the initial step of the inductive lesson the teacher presented the linguistic topic framed in a problematic statement. The inherent motivation of problem-solving was controlled in the deductive lessons where teachers similarly introduced the lesson in a problem frame of reference. However, the first step of the deductive lesson provided a conceptual "scaffolding" to use Ausubel's term. This scaffolding was a broad, overview of the entire lesson or series of lessons by the teacher in which the unifying concepts were presented.

The second phase of the inductive lessons was the presentation of instances or exemplars either on the board,

on an overhead transparency or in workbooks. The corresponding activity of the deductive lesson was the didactic verbal exposition considered above. The learners' reaction to the stimulus situation in the first case was a period of silent concentration in which they studied the data, answered questions to help guide discoveries, and recorded their personal conclusions. In the latter case the pupils reacted by applying the previously presented concepts.

Verbalization in the inductive method took the form of individual recitation and class discussions of the discoveries of concepts found by the pupils during which time pupil interaction prompted modification and crystallization of the learners' generalizations. This step in the deductive lessons was a formulation of the concepts in the learner's own words. The application to instances helped clarify these and examples pointed out by the teacher helped to correct inaccurate verbalizations of the concepts.

The inductive lessons concluded with a summary of salient points by the pupils, whereas the teacher assumed this responsibility in the deductive class.

Though the treatments were clearly differentiated throughout the experiment, both were predicated on sound pedagogy. Teachers of both experimental methods were supportive, encouraged pupils to think, and attempted to teach the conceptual content of the lessons thoroughly within the procedures outlined by the experimental methods.

4. Content and Materials.

The treatment lessons, numbering twenty, followed the recommendations of Cronbach² in that they represented a phase of the language arts curriculum actually taught, and the total treatment sequence was long enough to produce cumulative learnings without becoming so long as to be unwieldy and undefinable. The experimental treatment of approximately fifteen hours corresponded to Kersh's³ investigation which used sixteen hours of instruction. In the ensuing paragraphs, details of the actual content and the experimental controls characteristic of the content organization are presented.

The experimental material ensured that subjects of both treatment groups received identical content with which to develop certain concepts of the structure of language, specifically morphological and syntactical concepts. (See Appendix 1 and Appendix 2 for the inductive and deductive lesson plans, respectively.) Separate workbooks for each method and detailed lesson plans written for the investigation were the only sources of the subject matter. These were highly structured and sequential. Through the use of the

2 L. Cronbach, "The Logic of Experiments on Discovery", Stanford University, 1964, p. 86-88. (mimeographed)

3 B.Y. Kersh, "Learning by Discovery: What Is Learned?", in The Arithmetic Teacher, Vol. 11, 1964, p. 226-232.

workbooks it was possible to control any tendency on the part of teachers or learners to depart from the method or content and to ensure that both treatment groups would be given equal opportunities to learn the concepts of each lesson. In addition, the workbooks controlled practice effect, neither group being given any other reinforcement in the way of additional exercises, homework assignments, or study references.

The differentiating nature of the inductive and deductive method was manifested in the organization of the workbook material and in a few overhead transparencies used by the teachers. This material complemented the prescribed role of the teacher described earlier under the treatment variable. The format of each lesson within a particular method was uniform. As such, an analysis of one lesson will suffice in analyzing how the content organization of the workbook material was a further control of method differentiation.

Lesson One developed three characteristics of the morpheme. In the inductive lesson the learner was presented three columns of words with only the directions that Column A consisted of one morpheme and that Column B and Column C were made up of words containing two morphemes. A space was provided for the learner to record his generalizations about what a morpheme was on the basis of these data alone. At this point only one characteristic could be identified. That was: a morpheme is a word or part of a word that has meaning.

Exercise #2 and exercise #3 presented new columns of words to guide the learner to discover the two final characteristics: a morpheme cannot be divided into smaller meaningful parts without violating its original meaning, and a morpheme recurs in different situations with a stable meaning. The entire sequence thus presented a stimulus situation which allowed for a discovery experience.

The deductive workbook reiterated the teacher's didactic exposition by stating succinctly the concepts. In the case of Lesson One the three characteristics of the morpheme were presented before an exercise for which the learners' responses were applications of these concepts to specific examples. Using the same words that comprised the columns of the inductive lessons, the exercises directed the learner to indicate how many morphemes each word contained.

The experimental teachers received specific instructions regarding the use of the workbooks which resulted in further control of the treatment. For example, to ensure that each pupil of the inductive group was involved in the discovery experience, each subject was required to write his own personal discoveries before class verbalization. This procedure prevented subjects from simply waiting for concepts to be derived by other pupils and thus learning deductively from other class members. Also, teachers were instructed to call on all pupils in random fashion after the time interval

during which subjects studied the material. Each learner thus was assured of his right and responsibility for arriving at the important concepts of the lessons.

In the deductive lessons, verbalization of the concepts was held in abeyance until the learners could attempt to apply what they understood the concepts to be in the exercises. Once this was completed, a review of the exercises could reveal misunderstandings and inaccurate interpretations.

The time factor of the lessons was generally controlled. Each lesson was to be completed within the forty-five minute class period with notations made concerning the time remaining if a lesson terminated early. No extra practice or explanations were afforded any class unit that finished prior to the end of the period. The analysis of the time factor was prompted by the fact that researchers like Ausubel⁴ maintain that the time-cost factor in the inductive method is one of the drawbacks of the method. Details concerning the time factor are considered in Chapter II, a description of the actual performance of the experiment.

Introductory remarks, motivational in character, were the same for both treatment groups and stressed the importance of the knowledge of the structure of language and its relationship to reading and writing. In addition, it was

⁴ D. Ausubel, The Psychology of Meaningful Verbal Learning, New York, Grune and Stratton, 1963, p. 151-153.

announced at the beginning of the unit that the work would culminate in an examination of two hours' duration to test understanding and extent of student learning.

The concepts of the experimental unit were predicated on the view of the grammatical system of a language as a multilayered structure formed by word patterns and syntactic patterns. The study of grammar as such is concerned with the recurring formal signals which reveal the structure of words and word groups from which structural meaning is derived in addition to lexical meaning. Among the primary signals are: inflections, derivational suffixes, word order, structure words and stress. Thus, teaching language structure means teaching the patterns of language; word patterns which identify parts of speech and syntactic patterns which combine these patterns into larger structural units to the end that the learner is given a better understanding of the nature of his language and the way it works and to help him use its varied resources in writing and interpreting increasingly mature sentences.

The cumulative and sequential content of the experimental unit proceeded from the simple to the complex, emphasizing structure though not negating the importance of lexical meaning. The usual division of grammar into morphology and syntax was adhered to. (Appendix 3 includes a detailed description of the concepts, instructions to the teachers,

and the sequence of experimental lessons.) Lessons 1 - 8 developed concepts concerning: morphemes, noun paradigms, verb paradigms, comparable paradigms, and word formations. The study of determiners and prepositions in Lessons 9 and 10 developed prerequisite concepts prior to the presentation of syntax. Structures, containing headwords plus modifiers, considered as linguistic units were taught in Lessons 11 and 12 entitled "Noun and Verb Clusters". The final eight lessons considered basic sentence patterns ranging from the relatively simple "Noun-Be Verb-Adjective" to the more complex pattern "Noun-Transitive Verb-Noun-Noun."

The study of structure was particularly suitable for an experiment in inductive and deductive teaching and learning. Generally the structural signals in English are strictly formal matters that can be described in physical terms of form, correlation of these forms, and arrangement. As such, structural grammar is a more easily controlled and manageable content for the discovery experience of the inductive method and the verbal exposition of the deductive method.

The desire for experimental control necessitated the exclusion of such major formal signals as stress, pitch, and juncture. Though these signals reveal word and word group structure, none is a feasible concept to develop. What was desired was the structural analysis of clearly observable features of the language in order to develop an understanding of the intangible relationships that exist.

5. Teachers.

The six experimental teachers were selected from the language arts department of the Fox Lane Middle School. While all thirteen faculty members expressed a desire to become a part of the project, the dictates of scheduling made it unfeasible for one teacher to become an experimental teacher. A random selection was made from among the remaining group and each of the six was assigned an experimental class. A letter designated both the teacher and class unit. The inductive teachers and class units were A, D, F, and the deductive were B, C, and E.

As a group, the experimental teachers were generally well advanced experientially and in matters of education. Each held a Master's degree or the equivalent and all majored in English at the undergraduate level. Experience ranged from three to eleven years, and four of the six teachers were on tenure. Tenure is granted to those staff members who have completed three years of satisfactory teaching within the school district. Each experimental teacher was by choice involved with some form of outside class activity related to the language arts program. Two worked with dramatic groups, three served as advisors to the school newspaper, and one teacher was sponsor of an informal debate club.

For their present teaching programs, each had two classes at two grade levels ranging from grade six to grade

eight. During the training period, which will be discussed in the next section, each continued to administer his own teaching responsibilities. Because of the range of grade levels spanned by the experimental teachers, some naturally found as experimental subjects pupils who were ordinarily in their regular classes.

The teachers were professionally competent as judged by the school administration. It is unlikely that the two non-tenure teachers would not receive permanent status once the probationary period had been served. They exhibited a very positive attitude throughout the training period and good control and sensitivity toward their pupils. A detailed analysis of their classroom teaching is presented later.

The general balance that existed among the six experimental teachers seemed not to be disturbed after their assignment to the experimental treatment group. The results of the random assignment were reviewed with the director of English who affirmed this conclusion. In total teaching experience the inductive teachers had amassed eighteen years while the deductive teachers had amassed twenty-two years, the range in the former being three to ten years and in the latter, three to eleven years of experience. Two males and one female were the deductive teachers, and two females and one male were the inductive teachers.

6. Training and Pretesting.

The training of the experimental teachers and the pretesting of material and content were concurrent and covered a six-week period. Three major objectives were accomplished as a result of independent study, discussions, and practice teaching: the conceptual content and exercises of the lessons were revised, the teachers learned the method and their role in administering the treatment, and the teachers became familiar with the content, workbook materials, and the prescribed sequence. During the preexperimental period one formal meeting was held each week for all teachers, daily discussions with the project director occurred, teachers taught trial lessons within the assigned method, teachers observed one another and private conferences with each teacher provided an analysis of trial lessons.

To pretest the experimental lessons, two seventh grade classes meeting four times a week were selected. To simulate experimental conditions, the pupils were stratified according to sex and ability and randomly assigned to the two class units. Eight trial teaching periods per week were provided for the experimental teachers.

The agenda of the earlier meetings had to do with administrative details. Class lists and teacher plans were distributed, and experimental classes and rooms were assigned. A general review of the chronology of the pretesting and

the actual experiment was accomplished. For a period of about two weeks the teachers studied the plans and descriptions of the teaching treatment. Meetings were then resumed. These dealt specifically with the matter of method. A meeting considered both methods in general terms. Then each group of teachers within a treatment met to consider the specific details of teaching each lesson.

One inductive and one deductive teacher normally assigned the seventh grade began the trial teaching sequence. By the second week two other teachers had had an opportunity to teach the lessons, and by week three all experimental teachers had taught at least five lessons. While a tentative schedule for a minimum amount of practice teaching was presented, the serious engagement of the teachers resulted in a general rotation of observation, teaching, and follow-up conference until the actual experiment. Criticism and suggestions were readily accepted.

The teaching experience was instrumental in revising the lesson sequence, the content of some lessons proving too extensive while others were too limited. Although personal teaching pace differed, resulting in lack of unanimity about lesson length, the selection of a final schedule was adopted quickly. To accommodate period length some exercises were deleted, and in one instance it was possible to combine two decidedly short lessons. (See Appendix 3.)

The time factor was a crucial consideration for the inductive treatment lessons. It became apparent that these lessons were taking longer on the average than the deductive lessons. Although the method accounted for the extended time of most of the trial lessons, it was observed that the inductive teachers were not pacing the lessons properly, allowing the pupils to reflect on the individual instances too long and entertaining tangential questions at the expense of leading subjects to the concepts each exercise was aimed at developing. Continued practice and discussions resolved this problem. In at least one case the time for a lesson was extended and then shortened to its original allotment.

The deductive teachers, structuring the pace of the lessons, did not generally experience difficulty with the timing. One or two lessons ended sooner than expected but the teacher had failed in those instances to write clarifying illustrations on the board as was expected.

The experimental teachers contributed greatly to the refinement of the content of the lessons, and their suggestions were incorporated in the final draft of the experimental lessons. The pretesting of materials showed that some exercises were too difficult for the subjects, and some of the examples used to illustrate the concepts were too sophisticated. Because the teachers made running comments in their plan books, it was a simple matter to gather the suggestions and consider these at the meetings.

In general the orientation period proved extremely valuable. The experimental teachers became more confident in their handling of the material and by the conclusion of the training period their administration of the teaching treatments was in strict conformity with the specifications of the experiment. Although individual differences were noted, the adherence to the methods prevailed throughout the experimental trial. A discussion of video tapes of randomly selected lessons is found in the following chapter.

7. Criterion Measure and Questionnaire.

The criterion test which was constructed for this investigation consisted of a thirty-five item multiple-choice test of recognition (Part I) and a thirty-item multiple-choice test of transfer of learning (Part II). An ancillary questionnaire assessing subjects' attitude towards the completed unit was also administered. The criterion is described in general terms in the ensuing paragraphs, while the statistical data are presented in Chapter III. Appendix 4 contains the criterion measure, answer sheets, and the questionnaire.

The advantage of using the multiple-choice construction of a test of recognition and the fact that recognition is closely correlated to recall as a measure of retention prompted the adoption of a recognition test. From an original pool of eighty test items, thirty-five were selected according

to an outline designed to give appropriate weight to each component. Ten items were concerned with morphological concepts, twenty-two measured recognition of syntactical concepts, and three were of a miscellaneous nature. An attempt was made to grade each item so that the average discriminating power approximated fifty per cent. The results of the administration of the measure to the pre-experimental units brought about the substitution of a few less difficult items and the rewriting of those which were found to be confusing to the examinee.

Eighteen of the thirty-five items were of the traditional multiple-choice variety. That is, each stem was followed by four possible responses from which the subject selected one. Seventeen items deviated slightly from this construction. Instead of each stem being followed by its own particular set of responses, the four responses were the same for each of ten items. In this manner it was possible to test the recognition of basic sentence patterns. Questions 19 - 26 were answered by a choice of sentence patterns one to four while questions 27 - 35 were keyed with a response of one of the patterns five to seven plus a sentence in the passive voice.

In most instances the raw material of the questions was taken directly from the lessons. However, occasionally the recognition of some of the concepts involved examination of examples not drawn directly from the lessons.

Part II of the criterion was comprised of thirty items assessing transfer of learning. The strategy employed in the construction of this part was the use of nonsense material along the same lines that linguists have used Jabberwocky material to illustrate language structure. The subjects had to transfer knowledge of concepts to completely novel language problems in the form of test items. In this sense, transfer of learning was independent of the subject's ability to verbalize the learned concepts. As in Part I, each concept component was weighted appropriately.

The test of transfer section included two distinct constructions. The first group of items consisted of nonsense sentences for which the subject had to designate the particular sentence pattern. The second category of questions involved interpretation of nonsense sentences and required the subject to transfer his knowledge of the concepts of language structure. For these items nonsense material was used in both the stem and in the choices. The examinee was told that one of the nonsense responses was true based on the "sentence". It is important to note that none of the experimental lessons provided nonsense material to illustrate concepts of structure.

As in the retention section, this section of the criterion measure proved to be too difficult with the seventh grade trial group. However, it was not altered too drastically for it was felt that the alternating of experimental teachers

during the trial lessons militated against optimal development by these subjects. Also, the maturity level could account for some of the difficulty.

To enhance the discriminating property of the criterion measure, a tetrachoric correlation coefficient for each section was computed with the recognition and transfer criterion dichotomized at the median. Each item's discriminating power was thus assessed with the result that items not positively correlated with the total score of each section were discarded while those having a high positive correlation were retained.

The criterion measure was validated for content by Mr. John McGinniss, Psychologist, and Mr. Francis Tota, Director of English, Bedford Public Schools, Bedford, New York.

The questionnaire consisted of ten items each stating an attitude which the subject could endorse or reject. It was designed to appraise the subject's attitude about the study of language structure and to determine if this attitude was correlated to membership in a particular treatment group.

The respondent reacted to each statement on a five-point scale ranging from strongly agree to strongly disagree. Five points were given for strong endorsement of a positive statement, four for the next degree of endorsement and so forth. The scoring was reversed for negative statements where the strongest rejection received five points. The subject's

score was the sum of the values of each item. The positive and negative statements were randomly placed in the questionnaire and focussed on: interest in the study of structural grammar, importance of the knowledge of concepts, and difficulty of learning the material.

8. Variables.

The present experiment explored: subject matter in the form of concepts of language structure, method of instruction, a time period of five weeks, type of subjects, and outcome. The treatment variables were the inductive and deductive methods. In addition two organismic variables, one with two levels and one with three levels, were incorporated for analysis of interaction effects. These were sex and verbal ability level (below average, average, above average). The dependent variable was the recognition and transfer criterion measure administered immediately after termination of instruction and two weeks later. Although the conceptual content and the treatment were controlled, the length of the experiment was only partly controlled.

9. Hypotheses.

The specific null hypotheses of the present investigation are based upon the recognition and transfer criterion measure. (Level of significance was $p < .05$) They are:

Hypothesis I.- There will be no significant differences in the scores on the recognition and transfer criterion measure between the subjects taught by the inductive method and those taught by the deductive method administered immediately after the termination of instruction.

Hypothesis II.- There will be no interaction involving method, ability, or sex as determined by the recognition and transfer criterion measure administered immediately after the termination of instruction.

Hypothesis III.- There will be no significant differences in the scores on the recognition and transfer criterion measure between the subjects taught by the inductive method and those taught by the deductive method administered two weeks after the termination of instruction.

Hypothesis IV.- There will be no interaction involving method, ability, or sex as determined by the recognition and transfer criterion measure administered two weeks after termination of instruction.

After an analysis of the actual performance of the experiment in the succeeding chapter, the results of this investigation leading to decisions concerning the acceptance or rejection of the hypotheses are presented.

CHAPTER II

PERFORMANCE OF THE EXPERIMENT

The school milieu as an experimental setting is unique, and this necessitates a description of the actual performance of the experiment. In fulfilling this need, the following discussion considers the timing of the experimental period and administrative details involved in assigning subjects, a general analysis of the video-tape recordings of randomly selected lessons grouped according to method, administration of the criterion measure and questionnaire, and a brief statement concerning the final sample.

The experimental lessons began on Monday, February 26, and continued for five consecutive weeks, terminating Tuesday, March 26. The school year at the Fox Lane Middle School is divided into four ten-week marking periods, and the experimental time period was the third through seventh week of the third marking period. The February recess preceded the experiment and the Easter vacation followed immediately after the administration of the delayed criterion measure.

The decision to perform the experiment at this time was dictated by the following considerations: (a) experimental teachers had to be thoroughly trained in the specific treatment methods, (b) teachers required ample time to study the plans and practice with the material with the non-experimental

seventh grade classes, (c) greater control would be likely if a vacation or holiday period did not intervene, (d) experimental teachers had to conclude existing units in their own language arts classes, and lastly, (e) the sample of pupil learning behavior at this time of the school year was regarded as most typical. Typical in this sense meant that subjects would not be excessively motivated to achieve because of marking period closure or end of term evaluation.

On Thursday, February 15, the regular eighth grade teachers announced to the experimental subjects the class units to which they had been assigned. This announcement was also made the following day as well as on the Monday following the vacation in order to inform any absentees. Inasmuch as team-matching and regrouping of pupils are not unusual procedures, the experimental subjects easily accepted the appearance of a new teacher as well as new classmates when they reported to the new class units.

At the opening session the experimental teachers took care of the necessary administrative and organizational procedures. Class rosters were carefully checked and pupils were assigned seats. In each case a conscious effort was made to randomize placement of pupils so that all sections of the room contained pupils of each ability level. Students were then given the inductive or deductive workbooks written for the experiment. After these procedures were completed, the unit of

study was announced, the general calendar was introduced, and subjects were informed that the unit would culminate with a criterion measure. The reading of the introductory remarks found in the workbooks, which were the same for both treatment groups, concluded the orientation session. This class period was not counted as part of the experimental treatment time.

On Monday, February 26, following the vacation, the experimental lessons began. Those pupils who had been absent for previous announcements were notified before class of their assignment and given workbooks as they reported to class.

During the course of the experiment each teacher was video-taped on two occasions, once during the first two weeks and again during the last two weeks. The experimental teachers were not cognizant of the schedule of tapings.

Through the assistance of Mr. James Carl, technician in the Department of Communication, a General Electric closed-circuit television camera (Model T-4) and microphone were set up to record these experimental lessons. To lessen attention on the filming, the small video-camera was permanently adjusted at the rear corner of the classroom thereby not requiring the presence of the technician in the room during the lessons. Also, the equipment was installed the day or two before to acclimate the pupils.

It was not possible for anyone but the technician to know whether or not the equipment was in operation for the

very small signal light at the back of the camera was concealed. It was the consensus of the experimental teachers that the camera and microphone drew slight attention at the outset of class, and that once class began, the taping went unnoticed.

The general analysis of the experimental lessons below was based on both the first and second video-tapes. They were grouped according to treatment method. When of special concern, the particular experimental teacher is mentioned. In essence this analysis of the twelve video-tapes confirmed that the experimental requirement of method adherence and differentiation was satisfied. Though the methods were controlled, variations among the teachers of each treatment were commonplace. The concepts of the lessons were presented according to the exacting schedule laid down. That is, on any given day each teacher was certain to be teaching the same lesson. Also, the lessons were followed precisely and neither treatment group was afforded additional material beyond that set down in the lesson plans.

Additional comments regarding the experimental lessons are found in Chapter IV when the results are discussed.

1. The Inductive Lessons.

The first inductive lessons under scrutiny dealt with the noun paradigm, comparable paradigm, and prepositions, while the latter group was concerned with sentence patterns. In addition to individual differences among the teachers and reliable adherence to the lesson plans, these lessons were characterized by noticeable pupil participation in the lessons.

Though the teachers used only the material provided in the lesson plans to aid pupils in discovering the concepts, Teacher A and Teacher D provided additional support to their pupils by framing spontaneous questions to direct pupil thinking. However, Teacher F was content to use only those key questions found in lesson plans and seldom deviated from this pattern even though it was evident at times that the learners were having difficulty in arriving at the concept. As a result there were longer periods of silence in Teacher F's lessons than in those of the other inductive teachers.

The inductive subjects adjusted to the discovery strategy of the lessons and were decidedly eager to bring their personal ideas and conclusions to the attention of their peers. It was seen in the initial tapings that the inductive procedures prompted many subjects to attempt to verbalize concepts before all the exemplars had been thoroughly investigated. While the experimental teachers were accepting of the contributions of each pupil, inaccurate statements were

pointed out. In those cases these were turned back to the class for consideration. It seems reasonable to assume that the active involvement of the inductive subjects was due in part to the ready acceptance of their attempts at discovery by the experimental teachers in addition to the intrinsic rewards that may be present when the learner is involved in the act of discovering a concept.

Although an obvious simplification, it is possible to classify the level of students' responses as follows: accurate statements about the series of given exemplars but not actually verbalizations of the concepts, generalizations based on some but not all of the exemplars, incorrect or incomplete verbalizations of concepts, and accurate statements of the concepts which the exemplars were designed to elicit. The comments of the inductive teacher were noteworthy in that they revealed that pupils changed their levels of responses as the experiment progressed. Oftentimes the clearest expressions of concepts came from pupils of lower ability or from those seemingly not involved.

In the earlier lessons, pupils were prone to interrupt at the first sign of an inaccurate statement. Because it was important not to cut off any subjects from participating, the teachers insisted on hand recognition before recitation. This procedure had been determined during the training period. In later lessons when pupils were more accepting of one

another's attempts to deal with the material, the teachers relaxed on this requirement. Teacher B's class was especially active and pupils communicated very well with one another. The insistence on having pupils record their individual discoveries in the workbooks prior to reciting, however, remained in effect throughout the experiment. The inductive teachers moved about the room while pupils studied the exemplars. This regular observation of pupils' attempts at discovery and the fact that all pupils were called upon to read their conclusions ensured that all were involved in inductive learning.

The inductive teachers sought a group responsibility for the discovery of principles. Teacher A regularly prompted pupils to listen to the remarks of other pupils and to react to what had been said. Teacher F continuously used the pronoun "we" in asking questions such as, "What have we said up to now?" and "Do we have any reason to reject that answer?" Teacher D habitually repeated the comments of the pupils to ensure reaction from other members of the class.

The tendency on the part of some pupils to entertain tangential considerations in the early lessons was difficult to control. As such, the concluding exercises of the lesson on the noun paradigm and the preposition were not completed. It became necessary for the inductive teachers to outline the material to be covered during a particular lesson so as to keep pupils moving steadily toward the concepts to be learned.

It was noted later that pupils began to limit irrelevant remarks, quickened their pace, and developed a group cohesiveness. These were attributed to the desire to reach the important concepts of the lessons.

The pressure of time was alleviated during the lessons on sentence patterns. At this point pupils who had a grasp of a particular concept but were having difficulty verbalizing it could be assisted by the teacher or could be called on later after having listened to the recitation of others in the class. Teacher D, in particular, stayed with a concept until a precise statement came forth. It seemed that in a few instances pupils approaching the correct discovery were derailed because they interpreted the teacher's shift to other subjects as a negation of their thinking at that point.

2. The Deductive Lessons.

The initial deductive tapes used for analysis dealt with the noun paradigm, comparable paradigm, and the noun cluster while the final ones were concerned with sentence patterns as was the case with the inductive tapes. Some of the more dominant characteristics of the deductive lessons gleaned from the tapes were: the careful and deliberate expositions of all the experimental teachers, marked improvement in the teachers' exposition from that of the pretest experience with the seventh grade units, the greater percentage of

time during which the teachers verbalized while pupils remained silent and, lastly, replacement of the open-class discussion and reciprocal activity of the inductive classes with a direct student-teacher exchange.

While the expositions were taken directly from the prepared lessons, variations among the experimental teachers existed. For example, Teacher B committed the material to memory, and Teacher C referred to the plans more than Teacher B. In each case the concepts and illustrations used were those provided in the lessons.

Pupils of the deductive method recognized early in the experiment that the teachers would present the concepts completely and for the most part held questions in abeyance until the exposition had terminated. As was prescribed in the class sequence, the teachers asked for questions after their presentation and in all cases responded directly to these queries. Although the explanations were recast in different phrases, the pupil essentially received a review of the sections of the initial exposition. On occasion, Teacher B and Teacher C used the exercise of the lesson to clarify points for pupils who had experienced difficulty. All teachers were observed moving about the room while such exercises were being completed.

The deductive teachers made regular use of the blackboard throughout their expositions, Teacher C and Teacher E

writing the illustrations of the concepts and Teacher E indicating the concept. This provision in the deductive classes of a visual stimuli was also found in the terse statement of the concepts that appeared in the workbooks. It would appear that this stimulus was an advantage for the deductive group that was not afforded the inductive subjects who saw only their own recorded "discoveries". It should be noted, however, that a cursory investigation of the inductive workbooks revealed that some pupils had regularly corrected statements of the concepts when they were inaccurate.

That the deductive method required less time was clearly in evidence. Every lesson was completed, no exercise being lost because of the lack of time. Because of this, exercises were often used by the teachers for further elaboration of the concepts. Teacher E, for example, used the exercise for the lesson on noun clusters for this purpose.

Though not apparent from the tapes, teacher remarks suggested that pupils of the deductive group began to tire of the lessons toward the conclusion of the experiment. Perhaps one pupil's remarks may be the general feeling that existed: "I know I'm learning a lot, but it's boring now."

Further comments regarding the deductive experimental lessons are made in Chapter IV where the findings are discussed.

3. The Administration of the Criterion Measure and Questionnaire.

On Wednesday, March 27, the recognition section of the immediate criterion was administered to all subjects by the experimental teachers. (See Appendix 4 for a copy of the criterion measure and directions for administering the tests.) On the following day the transfer section was administered to the same subjects. The experimental subjects also filled out the questionnaire. Each test was completed during the forty-five minute class period.

The announcements of the tests were made to each class group on the two preceding days. These were written out for the teachers who were also instructed not to make additional remarks. The content of these announcements included the day and length of the tests, informed the subjects that the tests covered the entire unit, and instructed pupils that the work-books could be used for review purposes.

The administration of the tests presented no difficulties. Pencils were provided for pupils who neglected to bring them to the testing, and scrap paper was disseminated. The answer sheet was easily marked. The subject was instructed to completely blacken out the letter of the selected response. He was informed that if any answer was to be changed, the first answer should be cleanly erased. An important reminder was the advisability to take an "educated" guess when the examinee was not certain of the correct answers.

The delayed criterion test was given two weeks later. Though the pupils retained their workbooks during the interim, the unit was thought to be concluded by the subjects. When some pupils asked whether they could be discarded, teachers replied that the forthcoming review of the corrected examination might necessitate reference to them. No further teaching of language structure occurred during the two-week interval. Teachers returned to literature study and pupils were given time for free reading. With the cooperation of all language arts teachers, it was possible to control the influence of incidental teaching during the interval.

Some pupils in both treatment groups were resentful at having to take the tests over. However, this initial resentment quickly abated once the exam began. It is reasonable to assume that the generally competitive milieu of this suburban community motivated subjects to achieve on the second testing. On the following day the delayed transfer test was given. At the conclusion of the examination subjects were informed of their scores on the immediate testing.

Absenteeism did not impede the testing schedule. Only two experimental subjects were absent for recognition section of the immediate testing and they were picked up the following day. No subjects were absent for the first transfer test. The delayed testing found six subjects absent for the recognition part, and of these, four made up the test the following

day. Two pupils were also absent for Part II, but attended school on the last day prior to the vacation and took both parts on this final day.

The marking of the tests was a simple matter. After an attendance check, each paper was scrutinized to determine that only one answer had been marked for each question. In the few instances where subjects had mistakenly blackened in two letters the answer was marked as incorrect. In no case did an experimental subject leave an answer blank. The score for each section of the criterion was the total number of correct responses. The addition of the score for each part made up the total score. The statistical findings and analysis of the results found in the succeeding chapter are based on these data.

4. The Final Sample.

For reason of excessive absence or transfer from the school district, three subjects were dropped from the experiment: the inductive treatment group lost one average male and one above average male subject while the deductive treatment group lost one above average male subject. The final sample upon which the statistical analysis of variance was computed comprised 248 subjects: 83 in the control group, 82 in the inductive group, and 83 in the deductive group. The actual cell breakdown of the two treatment groups is reported in the next chapter.

CHAPTER III

PRESENTATION OF RESULTS

In reporting the statistical results of this investigation, the discussion focusses on the reliability and inter-correlations of the recognition and transfer sections of the criterion measure, differences between each treatment group and the control group, differences between treatment groups dealing first with the immediate criterion measure and then with the delayed, and lastly, a brief report of the results of the questionnaire.

Although it is claimed by some statisticians that departure from the assumptions of normality and homogeneity does not seriously invalidate the F test, an analysis of the verbal ability data which were considered in the random assignment was made. A visual examination of the distribution within groups suggested symmetrical distributions. A test for homogeneity of the variances of the inductive, deductive, and control sample was calculated. This test, Bartlett's¹ (1937) test of homogeneity, gives a statistic approximately distributed as chi square. The obtained value of 2.86 was not significant at the .05 level. A value of 5.99 was required. As a result,

¹ Allen A. Edwards, Experimental Designs in Psychological Research, Holt, Rinehart and Winston, New York, 1950, p. 125-128.

it was concluded that the samples of the present investigation were not heterogeneous in variance.

The statistical computation of the present investigation did not utilize equal cells because the school population did not provide equal number of males and females among the three levels of the ability factor. In addition, absenteeism and transfer during the experimental lessons were further complications resulting in unequal cells. Table II presents the final cell totals for the inductive and deductive treatment groups. It was on these totals that the analyses of variance were computed.

1. The Criterion Measure.

The final form of the immediate criterion measure, from which the raw data of the experiment were derived, yielded a reliability coefficient of .875 for the recognition section of the immediate test and a reliability coefficient of .864 for the transfer section. In both instances the reliability was based on an odd-even split half test for the 165 subjects who comprised the experimental groups. The score-point values for each section of the criterion measure are found in Table III.

The interrelationships that existed between the sections of both the immediate and delayed tests were evidenced by the significant correlations attained. The correlation

Table II.-

Number of Cases in Each Cell in Analysis of Variance of the Two Treatment Groups.

	<u>Inductive Treatment</u>			<u>Deductive Treatment</u>		
	Below	Average	Above	Below	Average	Above
Male	12	12	14	14	12	13
Female	14	16	14	13	17	14

Table III.-
Point Value of Criterion Measure.

Test Section	Possible Score
Recognition	35
Transfer	30
Total Criterion Score	65

between the recognition and transfer sections of the immediate test was .782 and for the delayed was .806. The correlation between the immediate and delayed tests based on the total score was .922. Table IV reports the intercorrelation data which were significantly different from zero at less than the .01 level.

The correlation between verbal ability, based on the School and College Ability Test, and the total score of the delayed criterion test was greater than for the immediate test, the former being .494 and the latter .652. This difference may be attributed to the fact that memory and automatic recall would be more influencing factors on the immediate test, while problem solving or the ability to reason out correct responses would be a requirement on the delayed test where memory or rote responses would be decreased.

Though the correlation between ability and transfer for both tests was greater than between ability and recognition, this difference was not significant. A reasonable assumption, however, would be that verbal ability was more related to transfer of learning than to recognition.

2. The Difference Between Each Treatment Group and the Control Group.

In order to provide evidence that the experimental lessons resulted in substantial learning which could then be studied, a $3 \times 3 \times 2$ analysis of variance was calculated for the

Table IV.-

Intercorrelations Between the Parts of the Immediate and Delayed
Criterion Measures and Verbal Ability for the Subjects of
the Treatment Groups*.

Test Section	2	3	4	5	6	7
1 Immediate Recognition	.782	.953	.871	.803	.882	.436
2 Immediate Transfer		.933	.788	.853	.860	.499
3 Immediate Total			.879	.874	.922	.494
4 Delayed Recognition				.806	.956	.603
5 Delayed Transfer					.943	.642
6 Delayed Total						.652
7 Verbal Ability						

* N = 165

three variables of the immediate test: recognition, transfer, and total score. (The control group was not administered the delayed test.) One factor was the two treatment groups and the control group. The second factor was the ability factor with three levels: below average, average, and above average, and the third was the sex factor. In every case the treatment main effects yielded mean squares that were significant at less than the .01 level. Summaries of these data appear in Appendix 5.

To substantiate that these significant differences in the method variable were attributed to the superiority of the two treatment groups over the control group, Dunnett's² (1955) test for comparisons of treatments with a control was calculated. Table V indicates that in every case the mean scores of the inductive and deductive groups were greater than the control, and these were significant beyond the .05 level.

Having established significant differences between the mean score of the treatments and the control, the hypotheses of the present investigation could be studied. The report of the findings dealing with the four hypotheses considers the main effects and the interaction effects for the: (a) total score of the immediate test, (b) recognition section of the immediate test, (c) transfer section of the immediate test,

2 Edwards, Op. Cit., p. 152-154.

Table V.-

Means and Significant Differences in Means Between the Inductive Treatment and Deductive Treatment Groups and the Control Group Based on Dunnett's Test.

Test Section	Treatment Group	Control	Difference	Significant Value
Inductive Treatment Group				
Recognition	19.68	9.72	9.86* >	1.36
Transfer	15.73	8.89	6.84* >	1.19
Total	35.41	18.61	16.80* >	2.98
Deductive Treatment Group				
Recognition	16.91	9.72	7.19* >	1.36
Transfer	13.09	8.89	4.20* >	1.19
Total	30.01	18.61	11.40* >	2.98

* $p < .05$.

(d) total score of the delayed test, (e) recognition section of the delayed test, and (f) transfer section of the delayed test. A report of an ancillary analysis of variance based on the scores of a questionnaire concludes this chapter.

3. The Difference Between Treatment Groups on the Immediate Criterion Measure.

Hypothesis I was concerned with the question of whether the inductive or the deductive treatments would produce significantly higher scores on the recognition and transfer criterion measure administered immediately after termination of the experimental period. Table VI presents the results of a $2 \times 3 \times 2$ analysis of variance based on the total criterion score with method, ability, and sex as factors. It was observed that the mean square for the treatment main effect was significant at the .01 level. (The .05 level had been specified prior to the experiment as the accepted level of significance.) This treatment main effect corresponded to a comparison of the inductive and deductive treatment groups averaged over the three ability levels and the two sex levels.

It was seen that the mean of 35.41 with a standard deviation of 12.40 for the inductive group was significantly greater than the mean of 30.01 with a standard deviation of 10.71 for the deductive group. Thus, the hypothesis of no significant differences between methods was held untenable.

Table VI.-

Analysis of Variance of the Total Score of the Immediate Criterion Measure Involving Treatment, Ability, and Sex.

Source of Variation	Sum of Squares	d.f.	Variance Estimate	F
Main Effects				
A - Treatment	965.28	1	965.28	13.46**
B - Ability	9899.75	2	4949.87	69.04**
C - Sex	407.13	1	407.13	5.67*
Interactions				
A x B	354.91	2	177.45	2.47
A x C	166.25	1	166.25	2.31
B x C	171.01	2	85.50	1.19
A x B x C	45.41	2	22.70	.31
Within Cells	10969.12	153	71.69	

** $p < .01$.

* $p < .05$.

The subjects in the inductive treatment group were superior to those in the deductive group on the basis of their total score on the immediate test. This conclusion was further supported in each analysis of variance computed for the investigation.

The ability main effect was significant ($p < .01$) as might be expected and reflected the predetermined arrangement of subjects according to levels of ability. This finding led to the hypothesis that significant differences existed between the below average, average, and above average pupils on the basis of the total scores on the immediate criterion. The means for these groups were respectively: 25.57, 31.47, and 42.62. To test the hypothesis, Scheffe's³ (1953) test for multiple comparisons was calculated. Each ability level was compared to each of the others, and in all cases the differences were significant at the .05 level. Table VII reports the means for the ability levels according to method.

The main effect of C represents a comparison between the means of males and females averaged over the treatment and ability levels. Since the sex mean square of the analysis was significant ($p < .05$), it was concluded that under the conditions of this experiment the female mean of 34.01 represents a true superiority over the male mean of 31.93 on the immediate criterion measure. The means for males and females according to method are presented in Table VIII.

3 Edwards, Op. Cit., p. 154-156.

Table VII.-

Mean Total Scores for Immediate Criterion Measure by Treatment
and Ability Level.

	Inductive Treatment	Deductive Treatment
Above Average	46.80	38.29
Average	35.04	28.98
Below Average	24.46	22.72

Table VIII.-

Mean Total Scores for Immediate Criterion Measure by Treatment
and Sex.

	Inductive Treatment	Deductive Treatment
Male	32.95	29.53
Female	37.44	30.59

The fact that the interaction mean square for method and ability or method and sex was not significant indicated that the difference between the means of the inductive and deductive groups was independent of both ability or sex factors. The absence of a significant sex by ability interaction showed that the significant difference between males and females was independent of ability levels, and similarly, the significant difference among the ability levels was independent of the sex factor. Based on these findings, Hypothesis II was held tenable. There were no significant interactions involving method, ability, or sex on the recognition and transfer criterion measure administered immediately after the termination of instruction.

A 2x3x2 analysis of variance based on the recognition section of the immediate criterion measure contributed additional support to the conclusion that Hypothesis I was untenable and that Hypothesis II was tenable. Because the treatment main effect was significant at the .01 level, the inductive mean of 19.68 with a standard deviation of 6.81 was deemed significantly greater than the deductive mean of 16.91 with a standard deviation of 6.06. (See Table IX.) No interaction mean square for the analysis of variance reached a significant level.

While the ability main effect was significant at the .01 level, the mean square for the sex factor failed to reach

Table IX.-

Analysis of Variance of the Recognition Section of the Immediate
Criterion Measure Involving Treatment, Ability, and Sex.

Source of Variation	Sum of Squares	d.f.	Variance Estimate	F
Main Effects				
A - Treatment	241.46	1	241.46	2.29**
B - Ability	2525.62	2	1262.51	48.57**
C - Sex	40.48	1	40.48	1.55
Interactions				
A x B	116.56	2	58.28	2.24
A x C	82.45	1	82.45	3.17
B x C	41.71	2	20.85	.80
A x B x C	31.15	2	15.57	.59
Within Cells	3976.67	153	25.99	

** $p < .01$.

* $p < .05$.

the required F value on the recognition section. Thus, the mean of 18.68 for the female subjects was not significantly greater than the male mean of 17.76.

The absence of any significant interaction effects allowed for an unqualified statement of the superiority of the inductive treatment over the deductive treatment. That is, the superiority of inductive subjects was not dependent on a particular ability level nor did the sex factor play a part in this advantage.

Before proceeding to a discussion of the transfer section, it is interesting to note that the interaction of method and sex factors was significant at the .10 level on the recognition section and this direction was later manifested in the same section of the delayed test. An F value of 3.90 would have been significant at the .05 level.

As can be seen in Table X the treatment, ability, and sex mean squares based on the transfer section of the immediate criterion test were significant at the .01 level.

The treatment mean square corresponded to a comparison of the inductive and deductive methods averaged over the levels of the ability and sex factors. As such, the significant F value affirmed that the mean of 15.73 for the inductive group represented a true difference from the mean of 13.09 for the deductive group. The inductive treatment, it was concluded, resulted in greater transfer of learning than the deductive

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Table X.-

Analysis of Variance of the Transfer Section of the Immediate
Criterion Measure Involving Treatment, Ability, and Sex.

Source of Variation	Sum of Squares	d.f.	Variance Estimate	F
Main Effects				
A - Treatment	241.14	1	241.14	13.14**
B - Ability	2435.32	2	1217.66	66.36**
C - Sex	190.81	1	190.81	10.40**
Interactions				
A x B	78.96	2	39.48	2.15
A x C	14.55	1	14.55	.79
B x C	43.94	2	21.97	1.19
A x B x C	8.71	2	4.35	.23
Within Cells	2807.67	153	18.34	

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

treatment as determined by this section of the criterion measure. This finding permitted still further rejection of Hypothesis I.

Although the ability levels continued to be differentiated on the transfer section, the interaction of method and ability was not significant at the .05 level. In other words, both method and ability factors were independent of one another; the differences between methods were approximately the same regardless of the ability level and the differences among the ability levels were the same within random errors, regardless of the method treatment.

The significant mean square for the sex factor indicated that the difference between the male and female subjects was not attributed to chance but represented a real difference. The advantage of the female subjects, present on the transfer section but not on the recognition section, resulted in the significant mean square for the sex factor based on the total score. On the transfer section the male mean was 13.26 and the female mean was 15.30.

The lack of significant interaction between sex and method and ability and sex gave evidence that the female superiority was independent of method or ability. As such, acceptance of Hypothesis II was supported. Table XI presents the means for males and females by ability and method.

Table XI.-

Mean Transfer Scores for Immediate Criterion Measure by Treatment,
Ability, and Sex.

	<u>Inductive Treatment</u>		<u>Deductive Treatment</u>	
	Male	Female	Male	Female
Above Average	19.57	23.57	16.36	18.07
Average	13.75	15.12	12.75	12.76
Below Average	9.16	12.17	7.92	10.34

On the basis of the $2 \times 3 \times 2$ analysis of variance for the total score, recognition, and transfer sections of the criterion measure administered immediately upon termination of instruction, it was possible to reject Hypothesis I and accept Hypothesis II. The significant mean square for the treatment main effect indicated that the difference in means favoring the inductive method was a real difference. It was concluded that the inductive subjects regardless of ability or sex factors retained more of their learning and could more effectively transfer their learning to the novel stimuli posed by the questions in the form of nonsense material.

The second hypothesis was held tenable for no mean squares for any interaction effects proved significant for any of the three analyses of variance of the immediate test. This result permitted the conclusion that the superiority of the inductive method was independent of ability or sex or ability and sex on the basis of the immediate criterion test.

4. The Difference Between Treatment Groups on the Delayed Criterion Measure.

Hypothesis III dealt with the major question whether the inductive or deductive treatments would result in superior achievement on the recognition and transfer criterion measure administered two weeks after the conclusion of the experimental period. As with the immediate testing, the .05 level was

selected as the significance level. Table III presents the results of a $2 \times 3 \times 2$ analysis of variance based on the subjects' total scores with method, ability, and sex as variables.

Hypothesis III was held untenable because the required F value of 3.9% was reached for the treatment main effect. The comparison of the treatment means averaged over the ability and sex variables showed a significant advantage in favor of the inductive group. This group's mean was 35.25 in contrast to the deductive group's mean of 28.74. It is to be noted that the F values, based on the total score, were greater on the delayed test than on the immediate test in favor of the inductive group. In other words, the superiority of the inductive group was apparently more pronounced on the delayed test. This direction was in evidence on both the recognition and transfer sections.

Though the variables of ability and sex were included in this investigation inasmuch as they contribute to an understanding of treatment differences through interaction, the ability factor as a main effect was analyzed to ascertain if ability levels were actually involved. This was apparent for the ability main effect was significant at the .01 level.

The significant main effect of $\bar{C}$ (sex factor) represented a comparison of male and female subjects averaged over the levels of A and B. Since the value of F of the analysis of variance was significant, it was concluded that the female

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Table XII.-

Analysis of Variance of the Total Score of the Delayed Criterion Measure Involving Treatment, Ability, and Sex.

Source of Variation	Sum of Squares	d.f.	Variance Estimate	F
Main Effects				
A - Treatment	1332.75	1	1332.75	17.86**
B - Ability	987.04	2	493.52	64.16**
C - Sex	534.74	1	534.74	7.14**
Interactions				
A x B	129.12	1	129.12	.66
A x C	336.04	1	336.04	4.41*
B x C	274.01	2	137.00	1.83
A x B x C	133.99	2	66.99	.80
Within Cells	11449.36	143	79.63	

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

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female mean of 33.51 was superior to the male mean of 30.10 based on the total score of the delayed test. These means may be contrasted to the means that resulted on the immediate test for the same groups, respectively: 34.01 and 31.93. The delayed test apparently provided a greater contrast between the sex groups. This point is considered below where the interaction between method and sex is discussed.

Hypothesis IV was concerned with the possible interactions of method, ability, and sex on the delayed criterion measure. The A x B or method by ability was not significant. The fact that this main square was not significant indicated that the difference between the inductive and the deductive groups for the below average subjects was not significantly different from the difference between the means of the treatment groups for the average or above average levels. Table III reports the means between the inductive and deductive groups for each ability level based on the total score for the delayed test.

The presence of the significant method by sex interaction at the .05 level compelled a rejection of Hypothesis IV. However, this was done so with considerable reservation for the A x C interaction did not appear on the transfer section of the criterion measure. The force of the interaction on the recognition section was felt on the analysis of variance based on the total score. Table XIV presents the means for males and

Table XIII.-

Mean Total Scores for Delayed Criterion Measure by Treatment
and Ability.

	Inductive Treatment	Deductive Treatment
Above Average	45.60	37.35
Average	34.10	27.91
Below Average	25.03	20.81

Table XIV.-

Means and Mean Differences for Total Scores on Delayed
Criterion Measure by Treatment and Sex.

	Inductive Treatment	Deductive Treatment	Difference
Male	32.04	28.22	3.82
Female	37.83	29.20	8.63

females for each treatment. It can be observed that the difference between the treatments is considerably greater for female subjects than the difference between treatments for the male subjects. In other words, the magnitude of the difference between the treatments was not the same, within limits of random sampling, for males and females. The nature of this interaction is presented graphically in Figure 3, the original data of which is presented in Table XIV.

It was concluded that the significant superiority of the inductive group over the deductive group was not independent of the sex factor. The inductive treatment allowed for greater achievement by the female subjects than for male subjects.

Table XV summarizes the analysis of variance data for the recognition section of the delayed criterion measure. It shows significant main effects for treatment, ability, and sex. In addition, the A x C or method by sex interaction mean square was significant at the .05 level.

The significant main effect once again favored the inductive group, and as such, Hypothesis III was held untenable. On this section of the test, the mean for the inductive group was 19.44 and the mean for the deductive group was 16.26. As was noted previously, the difference in means between treatment groups was greater on every section and for

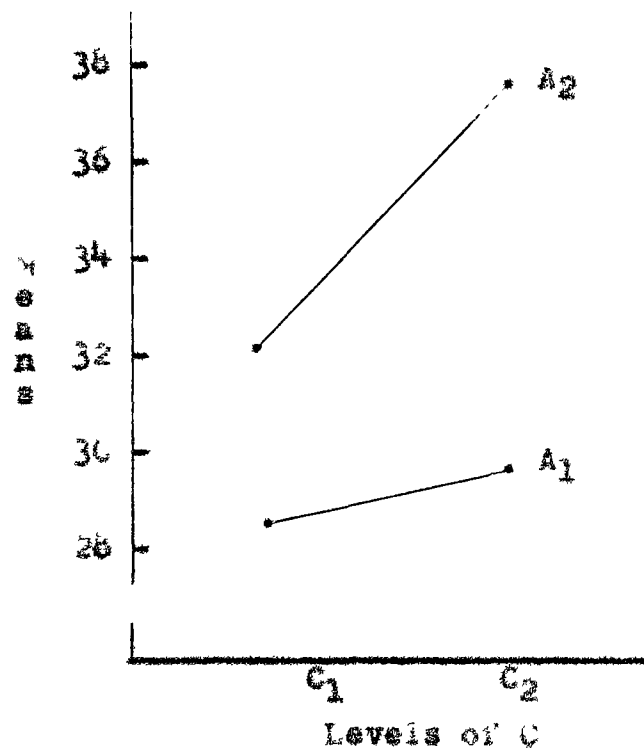


Figure 3.- Means for levels of A at Each Level of C. A_1 and A_2 correspond to the deductive and inductive treatment, respectively. C_1 and C_2 correspond to male and female, respectively. Original data given in Table XIV.

Table XV.-

Analysis of Variance of the Recognition Section of the Delayed
Criterion Measure Involving Treatment, Ability, and Sex.

Source of Variation	Sum of Squares	d.f.	Variance Estimate	F
Main Effects				
A - Treatment	316.74	1	316.74	13.26**
B - Ability	2668.55	2	1334.27	51.60**
C - Sex	181.02	1	181.02	7.00*
Interactions				
A x B	76.24	2	38.12	1.47
A x C	149.08	1	149.08	5.77*
B x C	112.57	2	56.28	2.17
A x B x C	43.26	2	21.63	.83
Within Cells	3751.05	153	24.82	

** $p < .01$.

* $p < .05$.

the total score of the delayed test. The inductive group showed little or no learning decrease while the deductive group showed a distinct loss.

Both sex and ability factors continued to provide significant values of F , and as in the other analyses, females were superior to male subjects, and the three ability levels showed marked differences. Table XVI reports means for the treatment groups for ability and sex factors based on the recognition section of the delayed test.

The $A \times B$ interaction was not significant reaffirming the conclusion that the superiority of the inductive method was independent of ability level. The most forceful interaction, however, occurred on the recognition section of the delayed test. The $A \times C$ interaction, significant on the immediate test at the .10 level, was significant at the .05 level. It is to be observed from Table XVII that the difference in treatment means favoring the inductive group is significantly larger for the female subjects than for the male subjects. The A effect is not independent of the C factor. As a result, Hypothesis IV was rejected. It was concluded that after a delay of two weeks, the inductive superiority in recognition of the concepts of the experimental lessons was significantly a function of the female by treatment interaction.

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Table XVI.-

Mean Recognition Scores for Delayed Criterion Measure by
Treatment, Ability, and Sex.

	<u>Inductive Treatment</u>		<u>Deductive Treatment</u>	
	Male	Female	Male	Female
Above Average	24.57	26.76	29.52	21.50
Average	16.50	19.64	17.60	14.64
Below Average	11.00	17.21	11.35	13.36

Table XVII.-

Means and Mean Differences for Recognition Scores on Delayed
Criterion Measure by Treatment and Sex.

	Inductive Treatment	Deductive Treatment	Difference
Male	17.72	15.10	2.62
Female	21.09	16.41	4.68

The final analysis to be scrutinized is presented in Table XVIII. The significant A mean square indicated that the means for the treatments averaged over the levels of B and C differed significantly. Examination of the means showed that the inductive group mean of 15.67 was superior to the deductive group mean of 12.44 as determined by the transfer section of the delayed test. The significant B factor attested to the ability levels built into the sample. The value of F for the sex factor was significant at the .05 level. The female mean of 14.73 was significantly greater than the male mean of 13.26. On the basis of method main effect, Hypothesis III was held untenable.

The absence of the method by sex interaction was the reason for a cautious rejection of Hypothesis IV. As noted above, the A x C interaction was found on the total score and recognition section. When the criterion was transfer of learning, the superiority of the inductive treatment was independent of sex. That is, the inductive male subjects surpassed their deductive counterparts in approximately the same degree that the female inductive subjects surpassed the female subjects of the deductive group. Figure 4 shows graphically the difference between the significant A x C interaction based on the recognition section and the insignificant A x C interaction of the transfer section.

Table XVIII.-

Analysis of Variance of the Transfer Section of the Delayed
Criterion Measure Involving Treatment, Ability, and Sex.

Source of Variation	Sum of Squares	d.f.	Variance Estimate	F
Main Effects				
A - Treatment	350.74	1	350.74	17.83**
B - Ability	2184.57	2	1092.28	55.55**
C - Sex	93.87	1	93.87	4.77*
Interactions				
A x B	16.51	2	8.25	.41
A x C	35.68	1	35.68	1.81
B x C	39.58	2	19.79	1.00
A x B x C	32.29	2	16.14	.82
Within Cells	3008.10	153	19.66	

** $p < .01$.

* $p < .05$.

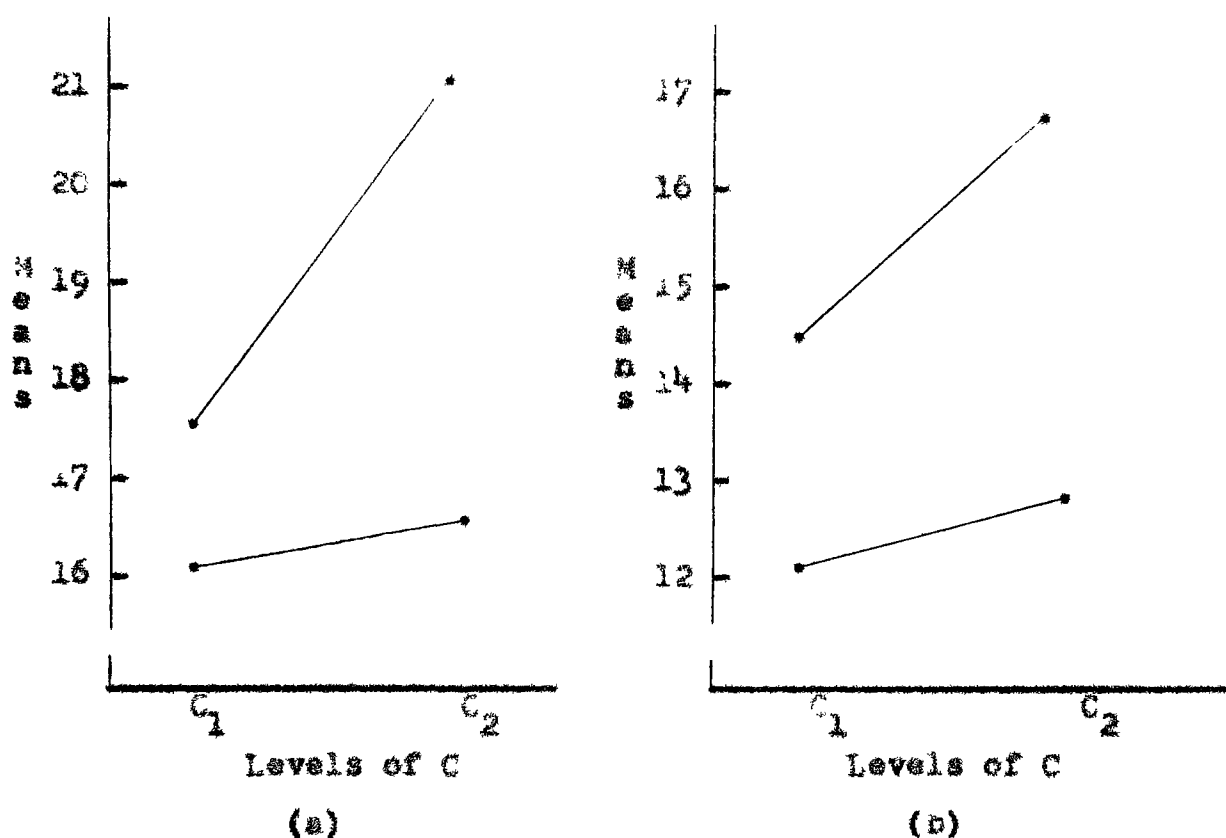


Figure 4.- (a) Means for Levels of A at each Level of C. A₁ and A₂ correspond to the deductive and inductive treatments, respectively. Original data given in Table XVII for recognition scores. (b) Means for Levels of A at Each Level of C. A₁ and A₂ correspond to the deductive and inductive treatments, respectively. C₁ and C₂ correspond to male and female, respectively. Original data given in Table XIX for transfer scores.

Table XIX.-

Means and Mean Differences for Transfer Scores on Delayed
Criterion Measure by Treatment and Sex.

	Inductive Treatment	Deductive Treatment	Difference
Male	14.48	12.08	2.40
Female	16.70	12.76	3.94

On the basis of the $2 \times 3 \times 2$ analyses of variance for the total score, recognition, and transfer section of the delayed criterion test, it was possible to hold Hypothesis III and Hypothesis IV untenable. The significant treatment mean squares on all three analyses indicated that the means favoring the inductive treatment were significantly greater than the deductive. It was concluded that after an interval of two weeks, the inductive subjects retained their superiority over the deductive subjects.

Hypothesis IV was rejected because an interaction involving treatment and sex was noted on the total score and recognition criterion. The rejection, however, was qualified because the interaction did not appear on the transfer portion of the delayed test.

The absence of an A x B interaction indicated that the inductive superiority was true at all ability levels, and the lack of an A x B x C interaction suggested that the method by sex interaction was of the same form for all three levels of B.

5. The Difference Between Treatment Groups on the Questionnaire.

A $2 \times 3 \times 2$ analysis of variance based on the scores derived from a questionnaire was computed, and the summary of this analysis is reported in Table XX. It can be observed that no mean squares were significant for either the main effects or the interaction effects. As such, the mean of

Table XX.-

Analysis of Variance of the Questionnaire Score Involving
Treatment, Ability, and Sex.

Source of Variation	Sum of Squares	d.f.	Variance Estimate	F
Main Effects				
A - Treatment	11.35	1	11.35	1.37
B - Ability	9.83	2	4.91	.59
C - Sex	4.36	1	4.36	.52
Interactions				
A x B	13.67	2	6.83	.82
A x C	1.03	1	1.03	.12
B x C	2.17	2	1.08	.13
A x B x C	8.24	2	4.12	.49
Within Cells	1266.81	153	8.27	

16.09 for the inductive group was not significantly different from the mean of 15.53 for the deductive group. Also, neither ability level nor sex showed significant differences. These findings indicate that subjects' attitudes toward the study of language structure was not dependent on assignment to a particular treatment group as determined by the questionnaire. In addition, neither sex factor nor ability levels operated in the findings.

In general, the sequence of topics used in the present chapter to report the statistical findings is adopted in the following chapter where the findings of the experiment are discussed and conclusions are drawn.

CHAPTER IV

DISCUSSION OF THE RESULTS

The discussion here offers an interpretative analysis of the reported statistical findings organized around the sequence of topics that follows: (1) correlations of the criterion measure, (2) comparison of the control and treatment groups and a restatement of the hypotheses, (3) comparison of the inductive and deductive treatment groups for the immediate criterion, and (4) comparison of the inductive and deductive treatment groups for the delayed criterion. Attention is then drawn to the limitations of the present investigation and, finally, the study is viewed in perspective.

The results of this investigation into the effectiveness of inductive (discovery) and deductive (didactic expository) methods of teaching and learning language structure concepts demonstrated that under the conditions set forth, the inductive method was superior to the deductive. A consistent pattern of superiority was indicated, pervading the recognition and transfer section of both the immediate and delayed criterion measures. The appearance of an interaction involving treatment and sex on the delayed criterion, though qualifiedly accepted, precluded a straightforward interpretation of the treatment main effect on this criterion.

1. Intercorrelations Between the Parts of the Immediate and Delayed Criterion Measure.

The final form of the criterion measure used for both the immediate and delayed tests yielded satisfactory reliability coefficients based on the split-half method for the recognition and transfer sections. Although commercially prepared standardized tests usually publish reliability coefficients beyond the .900 level, it was conceded that the .875 and .864 coefficients obtained for the recognition and transfer sections, respectively, were acceptable and that sufficiently accurate data were derived.

Because the raw data were entirely provided by the testing instrument, a table of correlations was calculated to present evidence of the interrelationships that existed between and among the following: the recognition and transfer sections of both the immediate and delayed tests, the totals of both criteria, and all parts of both criterion measures and verbal ability as measured by the S.C.A.T.

The generally high correlations between the recognition and transfer sections for the immediate and delayed tests, .782 and .806 respectively, indicated that the transfer section did present problems that required knowledge of the concepts that the experimental subjects were asked to recognize on the first section. As such, the transfer section was not judged to be an isolated test of verbal problem solving

for which the learned concepts of the experimental treatment were not relevant.

As was noted previously, the correlation between retention and verbal ability was lower than the correlation between transfer and verbal ability. This lower correlation which existed on both the immediate and delayed tests, suggested that on these particular measures and with the subjects of this experiment, memory was more independent of verbal ability than was transfer of learning. In addition, higher correlations existed between ability and the delayed criterion than for ability and the immediate criterion, the former being .652 and the latter being .494. It was reasonable to assume that in addition to the greater memory capacity required for the delayed criterion, success may have been a function of verbal problem solving. In other words, where memory failed in arriving at certain correct responses, subjects of higher verbal ability arrived at correct choices using the prompts of the question items wisely and thinking through a particular item.

2. Comparison of the Control and Treatment Groups.

To verify learning as a direct result of the treatment and to illustrate the difficulty of achieving on the criterion measure without exposure to the lessons, the control group was formed.

The $3 \times 3 \times 2$ analysis of variance, with one factor the two treatment groups and the control group, another the ability factor, and a third the sex factor, revealed significant main effects for all three factors. The follow-up with Dunnnett's test provided conclusive evidence that the experimental lessons taught new concepts which enabled the experimental subjects to surpass the control subjects who were not afforded the treatments. It was then possible to turn to the important questions of the investigation.

The specific null hypotheses of the present investigation were:

Hypothesis I.- There will be no significant differences in the scores on the recognition and transfer criterion measure between the subjects taught by the inductive method and those taught by the deductive method administered immediately after the termination of instruction.

Hypothesis II.- There will be no interaction involving treatment, ability, or sex as determined by the recognition and transfer criterion measure administered immediately after the termination of instruction.

Hypothesis III.- There will be no significant differences in the scores on the recognition and transfer criterion measure between the subjects taught by the inductive method and those taught by the deductive method administered two weeks after the termination of instruction.

Hypothesis IV.- There will be no interaction involving treatment, ability, or sex as determined by the recognition and transfer criterion measure administered two weeks after the termination of instruction.

3. Comparison of Inductive and Deductive Treatment Groups for the Immediate Criterion Measure.

On the basis of the $2 \times 3 \times 2$ analysis of variance calculated for the immediate testing, it was concluded that Hypothesis I was untenable and that Hypothesis II was tenable. Evidently, within the prescribed limits of the present investigation, subjects of the inductive group surpassed those of the deductive group in recognizing concepts and examples of the concepts that had been introduced in the experimental lessons and in transferring their learnings to solve the problems posed by the transfer section of the criterion which used nonsense material. This superiority of the inductive group for the two sections was carried over to the total score difference which was also significant at the .01 level.

The absence of any interactions on the same analysis permitted an acceptance of Hypothesis II. The inductive method was unqualifiedly superior to the deductive for the advantage was not contingent on either the ability or the sex factor. The explanation of these results offered below is conjectural in some cases and more conclusive in others.

One supposition for the inductive superiority rests in the fact that the treatment period, covering as it did a five-week interval, provided intrinsic rewards for the inductive group not readily available to the deductive subjects. The daily stimulation of discovery experiences may have

accounted for the generally consistent and active involvement of the inductive subjects. On the other hand, boredom seemed to accrue in the deductive classes. Absent from the experiment were extrinsic rewards such as grades since no quizzes or examinations were administered. As such, the deductive subjects could not avail themselves of any outside incentives nor did they receive feedback concerning the extent of their learning. The absence of grades may have frustrated the deductive pupils to a greater degree than the inductive subjects who had daily discovery experiences to suggest progress.

The lengthy treatment period obviously posed a problem of information storage for all subjects. It is conceivable that over the long period of the experiment, the inductive subjects who reduced concepts into their own personal verbal constructs would be more efficient in retrieving these at the time of the criterion administration. At the same time, this unique verbal behavior could also have served to simplify the concepts thus prompting more efficient recall.

In contrast, the deductive subjects were presented the concepts in final form although opportunity was given in class to rephrase the concepts delivered in the expositions. This experience, however, may not have been satisfactory. Certainly, it could not match the inductive experience of regularly recording discoveries of the concepts. The capsule replication of the concepts in the workbook may not have

served as efficient an aid for memory as the personally worded concepts of the inductive subjects. It is also possible that it may have even prompted rote learning, especially among those subjects who had not a complete understanding of the teacher's exposition.

The ability of the inductive subjects to discover for themselves the regularity and relatedness of the language concepts seems another reasonable explanation for their superiority. The lessons were sequential and, generally, concepts were developed on previous learnings. The syntax concepts, for example, incorporated much of the learning of paradigms and clusters. It would appear that the inductive subjects who were continually searching for regular patterns and relationships when dealing with the exemplars of each lesson would exhibit a greater power of understanding the structural concepts of the unit.

An unexpected finding was the fact that the inductive method was superior to the deductive on both the recognition and transfer sections. In general, the deductive procedures have been more effective when the criterion was recall or recognition while the inductive method has resulted in greater transfer of learning. The mean squares for the treatments in this investigation were significant at the .01 level for both sections in favor of the inductive method. One possible explanation for this may exist in the fact that

the recognition section was not rote in nature, requiring subjects to differentiate between closely related concepts and on occasion to enter into problem solving. In addition, the recognition section tested concepts of all the lessons, some having been taught very early in the experiment. As such, achievement on the recognition apparently involved more than memory.

The transfer section resulted in a treatment mean square of 241.14 and an F value of 13.14 which was significant at the .01 level. The respective means for the inductive and deductive method were 15.73 and 13.09. This superiority may be due to three factors: the depth of understanding of the material taught, the ability to manipulate learnings, and the nature of the transfer instrument itself. As was alluded to earlier, success on the test of transfer was dependent on the subject's grasp of the concepts which was assessed on the recognition section. Because the transfer section of the test was specific in character, effectiveness was in no small part determined by the degree to which concepts were understood and retained. The correlations of .782 and .803 between the recognition and transfer sections of the immediate and delayed criterion corroborate this conclusion.

The inductive superiority in the matter of transfer may well have been due to the subjects' more adequate retrieval of their learning and the ability to manipulate

these learnings when faced with the challenge of novel problems. The inductive treatment which required subjects to manipulate data provided experiences of benefit to subjects facing a transfer of learning task.

Lastly, transfer tests are generally inductive in character in the sense that the stimuli are of an unknown nature. For the inductive subject who has had to bring order to the exemplars of the lessons and to reach generalizations based on these, the confrontation with the nonsense material was in keeping with the ambiguity of the stimuli he met daily when first scanning the exemplars. On the other hand, the deductive subjects may have become anxious at having to deal with stimuli that were at once novel and ambiguous, especially since their lessons were regularly precise and clear expositions.

4. Comparison of Inductive and Deductive Treatment Groups for the Delayed Criterion Measure.

What exactly is measured when the same criterion is administered a second time after an interval of two weeks is conjecture. It is conceivable that under the conditions of this experiment and with the particular sample the delayed criterion assessed learning decrement, thoroughness of the subjects' learning, and motivation. The expected amount of learning decrement failed to materialize with the inductive subjects where the difference in the means was .26. The

deductive group mean was 1.36 less than the mean for the immediate. Either a longer interval or a succeeding administration would have produced a more meaningful learning curve. Secondly, the delayed test probably indicated the degree to which a subject had incorporated the concepts into his cognitive structure and how well his learnings were organized within a personal frame of reference to optimize recognition and application of these learnings. Lastly, to a certain extent motivation played a role for achievement on the delayed criterion was in part determined by the subjects' willingness to react to the problem stimuli a second time when the material had lost some of its relevancy and memory loss produced a degree of frustration.

The delayed criterion corroborated the findings produced by the significant main effects of the immediate test. Significant differences for the main effects on the recognition, transfer and total score variables resulted in the rejection of Hypothesis III. It was concluded that the inductive treatment was superior to the deductive in producing greater recognition and transfer of learning two weeks after instruction had terminated. In addition, the inductive superiority, as on the immediate test, could not be attributed to a joint effect with a particular ability level. However, the delayed criterion produced a treatment by sex interaction which resulted in a rejection of Hypothesis IV. This is discussed below.

Examination of the means indicated that the difference between treatment means increased on the delayed criterion. The difference between means, favoring the inductive group was 2.77 for the recognition section of the immediate test. The delayed test produced a greater difference between the two treatments. On this test the difference was 3.25. Similarly, the transfer section of the delayed test produced a difference of 3.26 between the treatment groups, whereas 2.64 separated them on the immediate criterion. The difference in means favoring the inductive group based on the total score was 6.41 for the delayed test and 5.31 for the immediate.

The recognition section of the delayed test produced main effects favoring the inductive group, female subjects, and the higher ability levels. In addition, an interesting interaction of method and sex factors which had reached the .10 level of significance on this section of the immediate test was significant at the .05 level on the delayed test. As a result of this interaction, it was necessary to go beyond the commonly accepted notion that females generally surpass males in learning verbal material at this educational level. Apparently, female subjects accounted for the greater superiority of discovery learning over reception learning when the criterion was recognition. One explanation may lie in the fact that the females of all ability levels were generally less reticent about verbalizing in class and

exchanging ideas during the experimental lessons. It is possible that females, as such, took more advantage of the strengths of the inductive procedures and because of the greater overt involvement with the material, were better able to recognize the concepts with which they had dealt.

On the other hand, the deductive method which essentially required no interaction among the pupils and which focussed on the teacher's exposition was not as effective for the female subjects in particular. It is important to note in this connection that the nonsignificant method by ability by sex ($A \times B \times C$) interaction indicated that the method by sex interaction was of the same form for the separate ability levels.

The recognition section, then, supported the rejection of Hypothesis III, a null hypothesis which averred that no interactions would be produced on the delayed test.

Although the transfer section of the delayed test confirmed the validity of rejecting Hypothesis III, the absence of any interactions on this section was the basis for the tenuous rejection of Hypothesis IV. The F value of 5.77 which had indicated a significant $A \times C$ interaction at the .05 level for the recognition section was 1.81 for the transfer section. This was decidedly below the required F value of 3.90 ($p = .05$).

One possible explanation for the absence of a method by sex interaction is put forth. While the verbalizing experience of female inductive subjects, described above, may have accounted for the superiority on the recognition criterion, it seems reasonable to assume that the covert behavior of discovery learning pervaded the entire inductive group. On the test of transfer where novel stimuli existed, these covert processes were more important influences for learning and, as such, males and females could not be differentiated when their superiority over the deductive counterparts was evaluated.

5. Comparison of Inductive and Deductive Treatment Groups for the Questionnaire.

The $2 \times 3 \times 2$ analysis of variance based on the questionnaire data produced no significant differences. This meant that to the degree to which the attitude scale was actually measuring feelings about the language unit, subjects of the respective treatment groups could not be differentiated. Nor could the ability levels or sexes be differentiated in their attitude about studying the experimental lessons. It is to be noted that the attitude scale was concerned with attitudes about the content. It is conceivable that a scale based on the methods would have produced more meaningful results. Also, the tendency of the respondents to group their replies about the midpoint would serve to negate the possibility of differences appearing.

6. Limitations of the Investigation.

Though the present investigation provided evidence for the acceptance or rejection of the hypotheses under examination, certain limitations obviate a final judgment concerning the effectiveness of the inductive and deductive treatment. For one thing, the development of an instructional theory based on discovery or reception learning requires a broad experimental attack. The present study contributed, it is hoped, in a small way to the accumulating experimental research that will eventually produce an instructional theory suitable to the modern purposes of education. To allow for a more circumspect acceptance of the findings of this experiment and the conclusions arrived at, the limitations are noted. The recommendations for further research, growing in part from these limitations are offered in the final statement of this report.

Certain characteristics of this investigation limit its generalizing power. For example, although there appeared to be no interaction between treatment and method and it was concluded that the inductive superiority was not a function of ability, it must be emphasized that the sample did not provide a cross-section of the ability factor of the universe. Instead, the three ability levels were based on locally derived norms. As was indicated in Chapter I, the median

of the sample was comparable to the 75th percentile, nationally. Also, the stratification of subjects according to ability rested on the verbal section of the S.C.A.T., but one measure of intelligence. Thus, any conclusions relating to method and ability factors would have to be restricted by a statement regarding what is meant by ability or ability level.

Acceptance of the findings must take into account the general milieu of the school and community. Neither the school nor the community was typical, and consideration must be given the description stated earlier. Whether the results would be repeated, other factors being equal, in another setting is questionable. In a milieu where children are urged to question, to become involved in current issues, and to verbalize their ideas and feelings, the inductive treatment would seem to be more effective.

The content of the experimental lessons is still another factor limiting generalizability. It would be erroneous at this juncture to extrapolate from the findings that inductive teaching and learning are the superior procedures for all disciplines, at all the stages of learning in the particular discipline, or to conclude that a combination of the methods is not effective.

Though the formulation of an instructional theory based on one of the methods examined here rests in no small part on the evidence provided by experimentation in the

schools, the inherent limitations of such experimentation outside the laboratory demand a prudent acceptance of the findings. No attempt is made here to describe all the limitations of classroom experiments, but rather to draw attention to those peculiar to the investigation.

The subject's *einstellung* in the form of predisposition to either the inductive or deductive method was a difficult variable to evaluate or control. Two interpretations were likely. If the subjects of this investigation had, as seems likely, an educational background of reception learning, the deductive group would have had an advantage. If this was the case, the superiority of the inductive method takes on added significance. On the other hand, if the subjects' experience was discovery or inductive learning, their predisposition to the inductive treatment necessitates a cautious acceptance of the results. Added to the difficulty involved in assessing the influence of previous educational experience would be the argument that the introduction of a novel method might provide a motivational factor. Such questions as those above point out the complexity of classroom experimentation.

The random selection of teachers and assignment to the experimental groups was deemed a satisfactory procedure in the present investigation. The positive acceptance of teaching assignment and the eagerness with which each teacher entered the training period attest to the adequate control of

such possibilities as teacher-method interaction. Though the administration of the treatment variable was acceptable, certain limitations were possible.

The influence of teacher attitude during the overall experiment was a difficult factor to assess. Though each manifested a professional attitude regarding the treatment, the interjection of subtle attitudes toward either the subjects, content, or methods could not be detected through the analysis of randomly taped lessons.

Another factor was the varying amount of guidance provided by the inductive teachers which was noted earlier. As was indicated, two inductive teachers apparently provided prompts and cues through spontaneous questions, while the third adhered more closely to the questions written in the daily plans. The deductive teachers also varied in their presentation of the treatment. In one case notes were written on the board during the exposition; in another, the lessons were committed to memory and, finally, expositions were repeated with the review of the exercises. Because of the above, it becomes of paramount importance to interpret the results in the light of accompanying operational definitions. As was mentioned in the review of the literature, much of the confusion and difficulty in interpreting empirical research has been due to unclear definitions or descriptions of the treatment.

The method treatments of classroom investigations have seldom been of sufficient duration to influence learning. It was felt that the present investigation corrected this limitation but in so doing perhaps allowed boredom to accrue. This boredom which existed toward the conclusion of the lessons and characterized the deductive groups may have permitted such factors as motivation and attitude to play a disproportionate part in the overall examination of the inductive and deductive methods. This being the case, an acceptance of the superiority of a method necessitates an acknowledgment that such by-products may be inherent in the treatment.

The nature of the criterion of this experiment is a further limitation. It seems that recall would provide a more adequate assessment of what the learner comes away with. Recall, though imprecise, would better determine the extent to which the learner was able to retrieve his knowledge because he would not have access to the large prompts of a recognition criterion. The transfer criterion was also limited because it represented specific transfer of learning. Perhaps, a transfer measure requiring application of concepts to more remote situations would be more appropriate for non-specific transfer is viewed as an important educational objective by most educators today.

In addition to the limitations discussed in this section, the recommendations set forth in the concluding

remarks of this report imply other limitations of the present investigation. For example, the suggestion that there is a need to study the relationship between treatment and personality variables implies that the subjects of this study might profitably have been stratified according to a personality factor as well as ability and sex. Regardless of the limitations enumerated above, the present investigation was felt to contribute evidence on questions advanced in the literature and provide a paradigm for classroom designs. The next section places the investigation briefly in the setting of other empirical research.

7. The Study in Perspective.

The task of placing the present investigation of inductive teaching and learning within the matrix of the total of empirical research is demanding for the general hypothesis has been researched for many years, and in addition, the greater percentage of the studies has occurred outside the classroom. The comparison of findings, similarly, is demanding for the empirical research is fraught with conceptual issues, methodological problems in the experimental designs, and as was considered earlier, inconsistencies in terminology and inadequate operational definitions.

In the theoretical and modern sense, this study seemed to confirm the advantages that accrue in discovery learning

that are professed by its leading advocates. Within the restricted scope and the inherent limitations of this investigation, it was evidenced that material was more readily accessible to the subjects of the inductive group. The intrinsic rewards of discovery motivated the inductive subjects to learn and were responsible for the absence of boredom that existed in the deductive lessons where subjects had not even the usual extrinsic rewards to serve as incentives. Further, the subjects' regular efforts at discovery enabled them to impose form and order on the ambiguous material of the transfer test and to deal more effectively with this material. Lastly, rote learning was lessened. Subjects provided their own generic mediators to organize their learnings and also to reduce the complexity of the learned concepts, making them more accessible.

In relating the present experiment in general terms to the past research, the intervening independent-dependent variable framework is adopted. The treatments as operationally defined here only barely approximate the drill and generalization methods that dealt with the rote-meaningful learning question of the early research. In dealing with

this hypothesis, McConnell,¹ Thiele,² Swenson³ and Anderson⁴ found the generalization superior to the drill approach which emphasized rote memorization and mechanical repetition. Although the findings here agree with these, the earlier studies found drill methods superior on criterion calling for immediate and automatic recall of learning relatively unchanged in form from that provided in the experimental lessons.

Hendrix's⁵ recommendation for the postponement of the spontaneous verbalizations of discovery was not tested. Evidently, the emotionally tinged ejaculations and haphazard statements, and confused generalizations that were in evidence throughout the experiment did not appreciably militate against

1 T.R. McConnell, "Discovery vs. Authoritarian Identification in the Learning of Children", University of Iowa Studies in the Psychology of Learning II, Vol. 9, No. 5, 1934, 1-62 p.

2 C.L. Thiele, The Contribution of Generalization to the Learning of Addition Facts, New York, Bureau of Publications, Teachers College, Columbia University, 1938.

3 E. Swenson, "Organization and Generalization as Factors", in Learning Theory in School Situations, Minneapolis, University of Minnesota Press, 1949, p. 9-39.

4 G. Anderson, "Quantitative Thinking as Developed Under Connectionist and Field Theories of Learning", in E. Swenson, et al., Learning Theory in School Situations, Minneapolis, University of Minnesota Press, 1949, p. 40-73.

5 G. Hendrix, "A New Clue to Transfer of Training", in Elementary School Journal, Vol. 48, December 1947, p. 197-208.

the inductive superiority. The length of the experiment allowed subjects to become trained in the strategy of dealing with exemplars and hasty conclusions were tested by the subjects prior to verbalization. Hendrix's hypothesis concerning un verbalized awareness would seem to remain a question reserved for the laboratory setting.

Though motivation was not investigated per se, it was felt that the achievement motivation referred to by Kersh⁶ was relevant to this investigation. It was concluded that in the absence of the usual incentives of marks, intrinsic motivation was an important construct.

This experiment was more related to those focussing on independent variables since this category emphasized the treatment variable and gave less attention to the covert behavior of the learner. Also, the treatments were operationally defined, and criterions included transfer to new but similar problem situations.

6 B.Y. Kersh, "Adequacy of Meaning as an Explanation for the Superiority of Learning by Inductive Discovery", in Journal of Educational Psychology, Vol. 49, October 1958, p. 282-292.

The use of programmed material by such researchers as Wittrock,⁷ Belcastro,⁸ and Kersh,⁹ in order to provide a clearer specification of the treatment variable, gave rise to the accompanying workbooks utilized in this study. In addition, it was possible to have greater control of the treatment variable. The superiority of deductive programs on the criterion of immediate recall conflicts with the findings here, but there is agreement in that inductive methods were most effective on transfer of learning. As in the Yabroff¹⁰ experiment, no method by ability interaction was noted.

7 M. Wittrock, "Verbal Stimuli in Concept Formation; Learning by Discovery", in Journal of Educational Psychology, Vol. 54, August 1963, p. 183-190.

8 A. Belcastro, "Relative Effectiveness of the Inductive and Deductive Methods of Programming Algebra", in Journal of Experimental Education, Vol. 34, September 1966, p. 77-82.

9 Kersh, Op. Cit., p. 282-292.

10 W. Yabroff, "The Comparative Effects of Inductive and Deductive Sequences in Programmed Instruction", unpublished doctoral dissertation, School of Education, Stanford University, 1963.

The experimentation of such researchers as Craig,¹¹ Stacey,¹² and Kittell¹³ dealt with relational concepts in which varying amounts of guidance were provided. In the classroom milieu this guidance was provided by the presentation of exemplars, carefully constructed questions of the lessons, and the spontaneous cues provided by the teachers. No attempt, however, was made to quantify the cues given the learner. In both instances guided discovery generally produced greater retention and transfer.

The question of variables interacting with the treatment received attention in the Amidon and Flanders¹⁴ study of inductive and deductive methods with dependent-prone subjects. Though the interaction of treatment and personality factors represents a future need for research, the present study sought evidence concerning treatment by ability and treatment by sex interaction.

11 R. Craig, The Transfer Value of Guided Learning, New York, Bureau of Publications, Teachers College, Columbia University, 1953.

12 C. Stacey, "The Law of Effect in Retained Situation With Meaningful Material", in E. Swenson, et al., Learning Theory in School Situations, Minneapolis, University of Minnesota Press, 1949, p. 74-103.

13 J. Kittell, "An Experimental Study of the Effect of External Direction during Learning on Transfer and Retention Principles", in Journal of Educational Psychology, Vol. 48, November 1957, p. 391-405.

14 E. Amidon and N. Flanders, "The Effects of Direct and Indirect Teacher Influence on Dependent-Prone Students Learning Geometry", in Journal of Educational Psychology, Vol. 52, December 1961, p. 286-291.

The superiority of the inductive method found in the present study was not found in the long-term study by Suchman¹⁵ who reported no difference in conceptual growth in science. More recent classroom studies have used short treatment periods, in some cases less than one hour of instruction. The conclusions are varied and seem to agree and conflict with the finding of this investigation. Grote¹⁶ and Moss¹⁷ reported no differences; Rowlette¹⁸ found discovery superior on retention and transfer, whereas LaRocque¹⁹ showed deductive methods to be superior overall. For the most part the treatments seemed inadequate in length. In agreement with this study was the absence of treatment by ability interactions. The sex by method interaction reported

15 R. Suchman, "Inquiry Training: Building Skills for Autonomous Discovery", in Merrill Palmer Quarterly on Behavior and Development, Vol. 7, July 1961, p. 147-169.

16 C. Grote, "A Comparison of the Relative Effectiveness of Direct-Detailed and Directed Discovery Methods of Teaching Selected Principles of Mechanics in the Area of Physics", unpublished doctoral dissertation, University of Illinois, 1960.

17 J. Moss, Jr., "The Relative Effectiveness of the Direct-Detailed and the Directed-Discovery Methods of Teaching Letterpress Imposition", in Journal of Educational Research, Vol. 57, October 1964, p. 51-55.

18 J. Rowlette, "An Experimental Comparison of Direct-Detailed and Directed Discovery Methods of Teaching Orthographic Projection Principles and Skills", unpublished doctoral dissertation, University of Illinois, 1962.

19 G. LaRocque, "The Effectiveness of the Inductive and Deductive Methods of Teaching Figurative Language to Eighth Grade Students", unpublished doctoral dissertation, Stanford University, 1965.

here was not reported by LaRocque, the only classroom study where female subjects made up part of the sample.

The extension of criteria to include such dependent variables as the heuristics of discovery would seem the next step in experimentation. Cronbach²⁰ reviews the outcome variables that have received little attention, contending that the dependent variables are few compared to the outcomes that spokesmen claim for discovery methods.

The concluding statement attempts to summarize tersely the present investigation and avers those recommendations for future research including the need stated above to study the heuristics of discovery.

²⁰ L. Cronbach, "The Logic of Experiments on Discovery", Stanford University, 1964.

SUMMARY AND RECOMMENDATIONS

1. Summary.

The present investigation to determine the effectiveness of inductive (discovery) and deductive (didactic expository) methods of teaching and learning concepts, rules, and principles of the structure of language was conducted with 248 subjects attending the Fox Lane Middle School in Bedford, New York.

The subjects of the experiment were stratified according to sex, and verbal ability levels determined by local norms derived from the verbal section of the School and College Ability Test. The subjects were then randomly assigned to the control or treatment groups. The comparison of the actual experiment was between the discovery treatment of the inductive group and the didactic expository treatment of the deductive group. The control group was not exposed to the treatment and served to verify learning as a direct result of the treatment.

The treatments which consisted of twenty lessons of forty-five minutes' duration each and spanning a five-week period were administered by six teachers each of whom held a graduate degree and had undergone an extensive training period. The experimental teachers had been randomly selected and assigned to the particular class unit. Inductive and

deductive workbooks were written specifically for the experiment. Upon termination of the experimental lessons, all subjects were administered a criterion consisting of a recognition and transfer section. In addition, they completed a questionnaire to determine their attitudes regarding the content of the lessons. This was an ancillary purpose, not related to the hypotheses of the experiment.

It was hypothesized that there would be no significant differences in the mean scores of the subjects taught inductively and those taught deductively ($p < .05$) and that there would be no interaction involving treatment, ability level, and sex factors on either the immediate or delayed criterion measures. The independent variables were treatment, verbal ability, and sex; the dependent variables were the immediate and delayed criterion measures of recognition and transfer of learning. A three-way analysis of variance design was used to test the difference between the means.

2. Results.

A $3 \times 3 \times 2$ analysis of variance for the recognition and transfer sections and the total score of the immediate criterion and subsequent calculation of Dunnett's test provided evidence of the superiority of treatment groups over the control group ($p < .05$) and verified learning as a direct result of the experimental lessons.

A. The Immediate Test.

Main Effects.-

1. The inductive method was superior to the deductive method on the recognition and transfer criterion measure for the total score at the .01 level of significance, and the absence of any interactions involving treatment, ability, or sex allowed for a straightforward interpretation of the main effect.
2. The significant F values for ability on the same criterion variables and subsequent calculation of Scheffe's test verified the distinct ability levels established for the experiment.
3. The female subjects of the experiment obtained higher mean scores for the transfer section ($p < .01$) and the total score ($p < .05$).

Interactions.-

1. No significant interactions were reported for either the recognition or total score variables of the criterion measure.
2. The treatment by sex interaction approached significance ($p < .10$), a direction that became significant on the delayed test.

B. The Delayed Test.

Main Effects.-

1. The inductive method was superior to the deductive method on the recognition and transfer criterion measure for each section and the total score at the .01 level of significance. However, a treatment by sex interaction precluded a straightforward interpretation of this finding.
2. The female subjects of the experiment obtained higher mean scores than the male subjects for the recognition section ($p < .01$), transfer ($p < .05$), and the total criterion variable ($p < .01$).

Interactions.-

1. Though no treatment by ability interaction was noted, an interaction involving treatment and sex was significant at the .05 level for the recognition and total score variables.
2. The treatment by ability by sex interaction was not significant indicating that the treatment by sex interaction was of the same form for ability.

3. Conclusions.

As a result of this investigation, the following hypothesis failed to be rejected at the .05 level:

1. There will be no interaction involving treatment, ability or sex as determined by the recognition and transfer criterion measure administered immediately after the termination of instruction.

The following hypotheses were rejected at the .05 level:

1. There will be no significant differences in the scores on the recognition and transfer criterion measure between the subjects taught by the inductive method and those taught by the deductive method administered immediately after termination of instruction.
2. There will be no significant differences in the scores on the recognition and transfer criterion measure between the subjects taught by the inductive method and those taught by the deductive method administered two weeks after termination of instruction.
3. There will be no interaction involving treatment, ability, or sex as determined by the recognition and transfer criterion measure administered two weeks after termination of instruction.

4. Interpretations.

1. Within the prescribed limits of the present investigation, subjects of the inductive method were superior to those of the deductive method in recognizing concepts and examples of the concepts and in the matter of transferring their learning to the problems posed by the nonsense material. This superiority, evidenced on the immediate criterion, was corroborated on the delayed test where the difference was more pronounced.
2. Though no interaction existed on the immediate test, the inductive method was found to be more effective

with female subjects when the criterion variables were recognition and total scores. This interaction was of the same form for all ability levels.

5. Recommendations.

Naturally, the primary recommendation to be made concerning empirical research is a sharpening of the experimental designs presently adopted to provide more meaningful data and to allow for replication of the experiments. It is this basic inadequacy of not being replicative which pervades the research literature. More controlled experiments would allow researchers to manipulate variables while holding others constant thereby exploring more fully the inductive-deductive hypothesis. The compilation of the empirical findings could then eventually be crystallized into an instructional theory.

The recommendations set forth include the need for controlled experimentation manipulating the subjects of experiments according to age, ability, and personality; the content, structure, and administration of the treatment; the dependent or outcome variables.

The independent-dependent prone personality factors would provide an excellent hypothesis to bring to classroom experimentation in inductive and deductive methods. A question answered might be: What is the likelihood that

inductive methods would be more effective for the independent-prone learner and deductive methods for the dependent-prone pupil who seemingly would require more structure and less of the ambiguity of the former. The styles of thinking are further personality factors to investigate. It would be valuable to know if the linear thinker who examines separate lines of possibilities in a sequential plan would be more amenable to didactic expository procedures than the intuitive thinker who is capable of examining spontaneous combinations. The reverse question is also pertinent.

Varying the age variable in further experiments is important because of the differences in reasoning processes and subjects' dispositions to the treatments. The latter were discussed earlier as einstellung effect. Though discovery procedures are thought to be of greater value at those age levels where verbalizing ability has not been fully developed, no classroom experiments have investigated this hypothesis.

Closely related to the age variable is the ability factor. While considerable speculation exists that inductive methods are of greatest value with higher ability levels and deductive methods with those learners of lesser ability, substantial evidence has not come forth. The present study, in fact, negated this claim. The need, then, is to vary the ability factor using different measures to define ability

level. It would be profitable, also, to use quantitative and performance measures as well as verbal ability to establish intelligence.

Attention to the teacher variable and possible interaction involving teacher and treatment would provide invaluable data. When considering discovery and reception methods, teacher personality, attitude to the method, and prior training are variables to be considered when interpreting the findings. Consider the inductive method in the hands of a rigid and somewhat autocratic teacher or the inductive method used by a teacher whose only teaching experience has been essentially didactic exposition. Such circumstances suggest the need for control and manipulation of the teacher variable.

As was suggested earlier, there is a need to vary the content used in experimentation for apparently too much has already been generalized from the meager research evidence. Of the recent experiments using regular curriculum materials, the greater percentage has used technical content with male subjects, and but one study has used language arts as the content area. As such, there is a need to examine the methods in other disciplines and at various levels within a discipline. It is conceivable, for example, that skills might be taught more effectively and economically by deductive methods while concepts might best be developed inductively.

Just as some laboratory experiments have used varying amounts of guidance in studying discovery learning, attempts should be made to quantify the cues and prompts given to the learner in the classroom. It would then be possible to study the interaction of degree of guidance and the variables described above.

As Cronbach contends, the claims for discovery methods have greatly surpassed the dependent variables that have been included in the experimentation. Because educational goals are multidimensional in nature, many outcome variables should be available for evaluation. Heuristics, the ability to solve varied problems of a subject as a result of the discovery experience previously undergone by the learner, is such an outcome variable in need of research. With the shift from content acquisition to learning of problem solving processes as an educational objective, heuristics of discovery becomes an outcome variable in its own right. Similarly, attitude about learning is important. To what degree does a method foster concentration and voluntary efforts toward learning is a recommended question for investigation. Lastly, an attempt could be made to assess how strongly subjects adhere to discovered principles when contradictory cues are evident. In other words, do discovered principles carry the same authority as those presented by the teacher in didactic exposition.

In a sense, the manipulation of variables as the basis for recommendations for experimentation is an attempt to substantiate the proper place and function of the methods under examination. To the extent that evidence is provided along the lines of the variables described, will an overall and pervasive instructional theory be established.

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APPENDIX 1

THE INDUCTIVE LESSONS

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Introduction to the Lessons

At this very moment each of you has a command of English grammar. This ability to select the exact forms of words and place them in patterns and arrangements which express the meanings you wish to convey, however, is done unconsciously, with little awareness on your part.

We are going to study, in this unit, the structure of this language that you use so easily. This situation is like that of a skillful automobile driver who is going to begin a course in auto mechanics. The big difference, however, is that our language is much more complex a machine than any car you could buy. When we complete the unit, you should have a better idea of what makes our language go.

There are three levels of structure on which we can describe our language:

1. The first or lowest is simply speech sounds. This is called phonology. Language is oral. Writing is a visual symbolization.

2. The next level has to do with meaningful forms made from speech sounds. This part generally deals with words and their meaningful parts. The area is called morphology.

3. The top level considers the ways in which words are arranged to form sentences. Here we have the study of syntax.

During the next few weeks we will consider morphology and syntax. The workbooks will accompany the classwork. Use this workbook for class exercises, homework, and review purposes. The worksheets will be your text.

At the conclusion of the unit there will be a two-hour exam covering all of the work studied in class.

MORPHOLOGY SECTION

Morphemes

We first turn our attention to the study of the internal structure of words, known as morphology. Before we can examine the structure of words we must become acquainted with a unit called the morpheme. The three exercises that follow will help you to explain what a morpheme is. Each exercise will help you discover a new characteristic about the morpheme.

Exercise No. 1.

Study the words below. The words in Column A consist of one morpheme; those in Columns B and C are made up of two morphemes.

Column A	<u>Contain two morphemes</u>	
	Column B	Column C
play	nightclub	replay
date	handshake	antedate
hygiene	lighthouse	weaken
able	planeload	unable
mahogany	strikeout	cheaper
capsize	cupboard	impossible
movie	cubbyhole	inactive
person	overhead	manly
principal		

Given this information, what is a morpheme?

Concept here is: A morpheme is a word, or part of a word that has meaning.

The next exercise will provide more information about what a morpheme is. Notice that "capsize" has been used again.

Exercise No. 2.

Study the words below. The words in Column A contain one morpheme and those in Column B have two.

Column A

portable

capsize

pillage

ambush

barracks

cutlet

Column B

roommate

handkerchief

lighthouse

spacecraft

newsstand

soybean

Question: Based on this new information, can you describe still another characteristic of a morpheme?

Concept: A morpheme cannot be divided into smaller meaningful parts without violating its original meaning, changing the original meaning.

A third characteristic of the morpheme can be deduced from the exercise below.

Exercise No. 3.

Study each group of words, all of which contain a common morpheme.

<u>daydream</u>	<u>bedbug</u>	<u>lighthouse</u>	<u>inconsistent</u>
<u>daylight</u>	<u>bedroom</u>	<u>lightmeter</u>	<u>incorrect</u>
<u>daybed</u>	<u>bedside</u>	<u>lightyear</u>	<u>indefinite</u>
<u>rename</u>	<u>newspaper</u>	<u>brighten</u>	
<u>reclean</u>	<u>newsboy</u>	<u>straighten</u>	
<u>recolor</u>	<u>newsreel</u>	<u>widen</u>	

Questions:

1. What are the common morphemes of each group?
2. What can you say about the meaning of the common morpheme? (The meaning of the common morpheme is stable; it doesn't change in the new situation.)
3. What may then be a third characteristic of all morphemes?

Review: What are the three characteristics of a morpheme that we have discovered from the preceding exercises? Write these.

1. It is a word or part of a word that has meaning.
2. It cannot be divided into smaller meaningful parts without changing its meaning.
3. It has a stable meaning.

Morphemes are of two kinds, free and bound. See if you can discover the difference between the two while doing the following exercises.

Exercise No. 4.

Here is a list of bound morphemes. Can you join them to some free morphemes to make words? [Pupils given bound morphemes.]

FM	BM	FM	BM
1. SPEAK__	er	5. DELIVER__	y
2. KING__	dom	6. __PLACE	re
3. SELECT__	ive	7. WALK__	ed
4. IDOL__	ize	8. __DONE	un
		9. BOOK__	s

Question: What are the differences between the free morphemes that you added and the bound morphemes given you?

Concept: Free morphemes can be spoken alone and have meaning; a bound morpheme must be attached to one or more morphemes to form a word. Also, the bound morphemes give the principal meaning in each word. These morphemes that give the primary meaning are called bases.

Exercise No. 5.

Look at the following group of words and underline the base morpheme, the morpheme that is most important in each word.

<u>lighten</u>	<u>Bostonian</u>
<u>enlighten</u>	<u>prewar</u>
<u>friendship</u>	<u>subway</u>
<u>befriend</u>	<u>falsify</u>

The bases in the following words are slightly different from the bases in the words of the exercises above. Indicate what each base means and decide how they are different from the bases above. (They are like bound morphemes. They must be attached to other morphemes to have meaning. Yet they are bases because they are the most important morpheme of each word.)

Exercise No. 6.

(The underlined morpheme is a bound base.) Write the meaning of these bases. Below write the way they are different from the morphemes above.

- | | |
|--|---------|
| 1. <u>audience</u> , <u>audible</u> , <u>auditory</u> | [hear] |
| 2. <u>suicide</u> , <u>patricide</u> , <u>matricide</u> | [kill] |
| 3. <u>oral</u> , <u>oration</u> , <u>oratory</u> | [speak] |
| 4. <u>aeroplane</u> , <u>aquatic</u> , <u>aquarium</u> | [water] |
| 5. <u>mortuary</u> , <u>mortal</u> , <u>immortal</u> | [death] |
| 6. <u>pendulum</u> , <u>suspenders</u> , <u>impending</u> | [hang] |
| 7. <u>manual</u> , <u>manicure</u> , <u>manuscript</u> | [hand] |
| 8. <u>eject</u> , <u>inject</u> , <u>reject</u> , <u>project</u> | [throw] |

Question: What would be a good term for the underlined?

Review concept of bound base.

Inflectional Paradigms - Noun Paradigm

In continuing the study of the structure of words (morphology) we will consider the paradigm. You will recall from the previous lesson that many words contain two morphemes one of which conveys the primary meaning and the other adds a quality that gives the word more meaning.

The morpheme containing the primary meaning is sometimes called the stem. In this word group what elements are stems and what are added morphemes? (ahead, behead, header, headlong, headship, heady, subhead)

The set of words having the same stem is called a paradigm. Each word in the above group has a distinct and apparent meaning because every morpheme that is added to the stem is distinctly different.

Questions:

1. Although the words have the same stem, do they mean the same?

2. What changes their meaning?

But take a group of words like those underlined in the following sentences:

Exercise No. 1.

1. The doctor flew his plane to Detroit.

2. The doctor's plane flew to Detroit.

3. The doctors flew their plane to Detroit.

4. The doctors' plane flew to Detroit.

What is the stem of each underlined word.

What morpheme has been added?

What does the additional morpheme mean?

Exercise No. 2.

Add a form of the word duck in the blanks in the sentences below.

1. The [duck] landed in its nest.
2. The [ducks'] nest was their only home.
3. The [duck's] discolored beak was its only flaw.
4. The [ducks] went smoothly on their way.

Can you explain how you decided on the particular answers?

What key word signaled the correct answer in each sentence?

Unfortunately, there are certain complexities in our language in regards to plural nouns and possessives. Each of the three exercises below will bring to your attention principles of which you should be acquainted.

Exercise No. 3.

Fill in Chart I.

<u>Stem</u>	<u>Singular Possessive</u>	<u>Plural</u>	<u>Possessive and Plural</u>
1. carpenter	[carpenter's]	carpenters	[carpenters']
2. brother	[brother's]	brothers	[brothers']
3. cloud	[cloud's]	clouds	[clouds']
4. table	[table's]	tables	[tables']
5. woman	[woman's]	women	[women's]

1. Can you state a principle about how to form possessives of singular nouns? [Add 's]

2. What pattern do you notice in the formation of plurals? [Usually add s; exception woman is changed to women.]

3. What conclusion can you come to regarding the formation of possessive plurals? [Usually add apostrophe after s; exception women's.]

Exercise No. 4.

Fill in Chart II.

<u>Stem</u>	<u>Singular Possessive</u>	<u>Plural</u>	<u>Possessive and Plural</u>
1. sheep	--	sheep	[sheep's]
2. cattle	--	cattle	[cattle's]
3. wheat	--	wheat	[wheat's]
4. police	--	police	--

1. What new difficulties are presented by this chart? [No singular possessive form; plural form the same as the stem; add 's for plural possessive - same as singular of Chart I.]

2. What statements made concerning Chart I will probably need to be changed? [Do not have to add g to have plural form of some nouns; plural possessive doesn't have to be s but is sometime 's.]

Exercise No. 5.

For the last exercise use the underlined words of the following sentences to fill in as many spaces as you can.

1. His pajamas were lost in the laundry.
2. The scissors are in the drawer.
3. Jack's trousers were stained with coffee.
4. Have you seen my new pliers?

Chart III

<u>Stem</u>	<u>Singular Possessive</u>	<u>Plural</u>	<u>Possessive and Plural</u>
1. pajamas	--	[pajamas]	[pajamas']
2. scissors	--	[scissors]	[scissors']
3. trousers	--	[trousers]	[trousers']
4. pliers	--	[pliers]	[pliers']

1. What new complication has arisen? [All nouns are in plural form.]

2. How is Chart III different than Chart II, and in what respect is it the same? [They form plural possessive by adding 's.]

Review all concepts illustrated by charts.

Noun Plurals

From the last two charts you are able to see further the difficulties met by someone learning to speak English. That is, the difficulty of knowing whether a noun is singular or plural. Take for instance, the sentence, "I like your hair." Is "hair" singular or plural?

Each group of sentences contains a clue that will help you determine if the noun is singular or plural. Study each group and try to explain what substitution could be made for the noun to test if it is singular or plural.

Exercise No. 6.

- A. The boys went swimming. [they]
- B. The telephones rang. [they]
- C. The houses stood next to each other. [they]
- D. The Chinese came home. [he]
- E. Where did you hang my trousers. [them]
- F. We caught bass today. [them]

[Each could be substituted for by a pronoun.]

Exercise No. 7.

- A. We saw many fish glide by.
- B. Those sheep went to graze.
- C. Fifteen men stood next to each other.
- D. My scissors lost their sharpness.
- E. He shot both quail on the wing.
- F. The hunters saw few deer this season.

[Noun number may be signaled by modifiers: many, those, their, fifteen, both, few.]

Exercise No. 8.

- A. Measles is a contagious disease.
- B. Oats is his best crop.
- C. Molasses tastes good.

[When a noun is tied to the verb, its number is sometimes shown by the verb form.]

Exercise No. 9.

- A. The sheep changed its direction upon returning.
- B. The sheep changed their direction.
- C. The wheat lay on its side.
- D. The trousers lost their press.

[The noun's number may be signaled by the pronoun referent: their, its, their.]

Noun Possessive

Up to this point we have considered the morpheme s as it signals plurality and the use of the apostrophe and s to show possession.

This lesson is concerned with not how possessives are created, but when to use them and what they actually mean.

The word possessive obviously means possession or ownership. When we say, "John's hat" we are clearly talking about the hat that John owns. But when we say "Shakespeare's portrait" we mean the painting of Shakespeare's face not a picture owned by him. First of all, he does not possess it, and if he did own it at one time, he's no longer in a position to claim it.

Here are groups of sentences which contain possessive forms, but signify something other than mere possession in all but one case. Try to discover the relationship between the possessive noun and the one that follows. (Take each group separately.) Discuss.

Exercise No. 10.

A. John's hat flew off his head.

Ann's present was carefully wrapped.

What became of the pirate's treasure?

[POSSESSION]

B. A cowboy's walk is like a swagger.

The man's attitude was disgraceful.

The scenery's beauty overwhelmed him.

[CHARACTERIZATION OR DESCRIPTION]

C. Shakespeare's sonnet appeared in the book.

Franklin's Autobiography is still being read today.

The Beatles' music is slowly going out of fashion.

[ORIGIN]

D. There's an hour's wait to get a seat.

A dollar's worth of candy, please.

It's only a stone's throw from the house.

[MEASURE; TIME, VALUE, SPACE]

E. The robber's escape caused people to stay at home.

Willie Mays' catch was the highlight of the game.

The judge's decision was final.

[SUBJECT OF AN ACT]

F. Jim's punishment was deserved.

The movie's critics were more bitter than ever.

The defendant's accuser pointed his finger
directly at him.

[OBJECT OF AN ACT]

Exercise No. 11.

Using the letters of the above groups, indicate the relations between the underlined possessive and its following noun.

1. We missed the other car by a hair's breadth. [D]
2. A wren's song floated through the window. [C]
3. They were playing children's games. [B]
4. The police provided for Richard's protection. [F]
5. The boy's jump saved his life. [E]
6. The moon's beams were brilliant that night. [C]
7. Willard's arrival was a surprise. [E]
8. He had never done a day's work. [D]
9. She met Dickie's father. [A,C]
10. She was irritated by Bob's bragging. [E]

(H.B.) No mention has been made of using the "of" phrase to show the possessive form. If it is explored indicate no hard or fast rule. In general, the possessive form is used with animate nouns (dog's leg) and the of phrase with inanimate (leg of the table).

Verb Paradigm

The next set of forms to be studied is the verb paradigm. Verbs have three, four, or five forms, and these help us to identify this word class in communication.

Inflection refers to the changes in the form of the verb in order to indicate a change in number or tense. In discussing these inflections or changes, we will refer to the following groups of words:

I	II	III	IV	V
learn	learns	learned	am learning	has learned
return	returns	returned	is returning	had returned
march	marches	marched	are marching	have marched
fix	fixes	fixed	was fixing	having fixed
choose	chooses	chose	were choosing	has chosen
set	sets	set	be setting	had set

Compare the first two columns of words.

What's the same about them?

What's different about them?

What does the s in Column II signify?

Exercise No. 1.

Here are some sentences with a word omitted in each.

Fill in the blanks with appropriate verbs from Columns I or II.

1. (learn) He [learns] to play the piano by himself.
2. (return) She [returns] home at five o'clock.
3. (march) The scouts [march] in every July Fourth parade.
4. (fix) We [fix] flat tires at the garage.
5. (set) The waiters [set] the table every day.

6. (fix) Because of his training, Sam [fixes] any kind of clock or watch.
7. (return) They [return] on the commuter train from New York.
8. (march) After drilling, the platoon [marches] back to the barracks.
9. (set) You may remember that you [set] the carton on the floor.

How did you know when to fill the spaces with verbs from Column I?

From Column II?

Make a list of which words determined your choice of verbs.

Which of these words caused you to pick a verb from Column I?

What do these words have in common?

Which words caused you to pick a verb from Column II?

What do these words have in common?

Exercise No. 2.

Fill in the blanks with appropriate nouns or pronouns.

1. _____ return the equipment to the supply room each day when I finish.
2. The _____ learns how to paint.
3. _____ chooses to remain at home.
4. Every year _____ returns for the celebration.
5. When the _____ sets, it will be cooler.

Which words governed your selection of nouns and pronouns?

What conclusion can you draw about the characteristics of verbs that go with singular nouns and the characteristics of verbs that go with plural nouns?

Compare the words in Column III with those in Column I.

How are they the same?

How are they different?

What does the difference signify?

Exercise No. 3.

Fill in the blanks in these sentences with the appropriate nouns and pronouns as you see fit. (Past tense does not influence choice of nouns or pronouns.)

1. [They] fixed Jack's motorboat together.
2. Because of their loyalty [they] marched despite the heat.
3. [He] returned by himself.
4. The [sailor] set the sail for his voyage.
5. The [boys] chose the representative of their committee.

How did you know whether to use singular or plural nouns and pronouns in filling in the blank spaces?

How did the verbs affect your choice?

What conclusion, then, is to be made about choice of nouns and the past tense of verbs?

[Verbs are not influenced by choice of nouns.]

Compare Columns III and IV.

What differences do you see?

In what ways are they similar?

Compare the difference in time represented by the "ings" and the "eds" of Columns III and IV.

Exercise No. 4.

Fill in the blanks with appropriate words:

1. [I] am learning to type.
2. [He, She, It] is returning from camp.
3. While the [boy] was fixing the sink, a pipe broke.
4. The students were unruly, even though [we] were choosing the class president.
5. When he gets a hit, [he] will be setting a new record.

Which words determined your answers?

Did the "ing" word affect your choice of noun or pronoun?

What conclusion can you make about the relation of nouns and pronouns to the use of the present participle form of a verb?

In addition to governing the number of the noun or pronoun, does the auxiliary have any other function in the sentence?

Exercise No. 5.

Fill in the blank spaces with appropriate auxiliaries.

1. The boy [was] fixing his car yesterday when I saw him.
2. Plans are that the soldiers [will be] marching up Broadway to City Hall.

3. While the students [were] choosing a president, the faculty was taking a coffee break.
4. He tells me that he [is] returning the book because he already owns a copy.

What clues in each sentence help you to determine which auxiliaries to use?

As we have seen in the questions following Exercise No. 4, the auxiliary is related to the number of the noun or pronoun. Based on conclusions to be drawn from Exercise 5, what other role do auxiliaries have in a sentence?

(The intent of this question is similar to the earlier question about the function of auxiliaries in a sentence.)

Exercise No. 6.

Using the phrases shown in Column V as a sample of another kind of auxiliary and verb, fill in the blanks with appropriate words.

1. Finally, the boys [have] learned to sing on key.
2. Jack [has] returned the kick-off 80 yards when it was called back.
3. The critics [have] chosen Joan's picture for first prize.
4. Although Maria [has] fixed the lunch, no one is here to eat it.
5. She [had] set her hair before going out.

What words governed your choice of auxiliaries?

Explain how you chose each one.

What generalization can be made about the relation between nouns and pronouns and the past participle form of a verb?

Finally, compare Column V with the other four columns. Which one seems most similar to Column V?

What similarities do you see?
[Time]

What differences?

Exercise No. 7.

Each of these sentences contains one of a group of words that sometimes act like auxiliaries. Underline these words. What special shades of meaning are suggested by the auxiliary and verb?

Time:

1. I can go with you to the movies. _____
2. I could go with you to the movies. _____
3. Claudia may learn to speak French. _____
4. Claudia might learn to speak French. _____
5. At the bell you shall come out fighting. _____
6. At the bell you should come out fighting. _____
7. Henry will eat the drumstick first. _____
8. Henry would eat the drumstick first. _____
9. I must hand in the paper soon. _____
10. I ought to hand in the paper soon. _____

(Shades of meaning):

1. futurity
2. possibility
3. probability
4. permission, necessity

Exercise No. 8.

1. George does have lots of money.
2. I do mean it.
3. Mr. Owens does have your car.

4. They do enjoy going to the opera.
5. The airplane did have trouble with its landing gear.

Explain what the function of each underlined word is in each sentence.

Would the meaning of each sentence change if the underlined words were eliminated? Would there be any other changes?

In what way(s) is the word do like an auxiliary?

One final matter that we must consider is how these auxiliaries may move around within a sentence.

Exercise No. 9.

First underline with one line all the auxiliaries (and words that act like auxiliaries in the sentences below:

1. I shall wait for you.
2. You sought to have done better.
3. Helen should have been working.
4. The elephant has been injured.
5. The cat was lying in a heap.
6. They could have come by plane.
7. You might have mowed the grass shorter.
8. She can do a good job.
9. The chairman has been told.
10. They had studied the map carefully before their trip.

Now turn all the sentences into questions, e.g. "Shall I wait for you?"

What happens to auxiliaries when they are used in questions?

What if there is more than one auxiliary? Which goes where in the question? What happens to the verb?

Comparable Paradigm

Exercise No. 1.

1. July was a hotter month than June.
2. The smaller trees are spared from the woodsman's axe.
3. I've never seen anyone prouder than she.
4. This route is much longer than the other one.
5. Do these clothes really look whiter?

What do the underlined words have in common?
(Adjectives, one syllable base, same endings.)

What do the endings signify?
(Comparative degree.)

Exercise No. 2.

1. The boy's saddest moment came when his report card arrived.
2. The water reached its lowest level at noon.
3. The crime took place on the blackest night of the summer.
4. It was the dimmest bulb in the chandelier.
5. Buick has the smoothest ride.

What do the underlined words have in common?
(Adjectives, one syllable base, same endings.)

What do the endings signify?
(Superlative degree.)

Based on Exercises 1 and 2, what generalizations can you make about how to form comparatives and superlatives?

1. Comparative is formed by adding er to the one syllable adjective.

2. Superlative is formed by adding est to the one syllable adjective.
3. Comparative is formed when two nouns are being compared to each other.
4. Superlative is formed when one noun is being compared to an indefinite number of nouns.

Exercise No. 3.

Fill in the comparative and superlative forms of the following adjectives:

Group A

- | | |
|----------------------------|-------------------------|
| 1. ugly [uglier, [ugliest] | 6. peppy [ier] [iest] |
| 2. lovely [ier] [est] | 7. angry [ier] [iest] |
| 3. happy [ier] [est] | 8. healthy [ier] [iest] |
| 4. dirty [ier] [est] | 9. lively [ier] [iest] |
| 5. dusty [ier] [est] | 10. funny [ier] [iest] |

Now do the same for these words:

Group B

- | | |
|--------------------------|--------------------------|
| 1. rotten -- -- | 6. honest [more] [most] |
| 2. common [er] [est] | 7. mellow [er] [est] |
| 3. cruel [er] [est] | 8. pleasant [er] [est] |
| 4. foolish [more] [most] | 9. quiet [er] [est] |
| 5. handsome [er] [est] | 10. severe [more] [most] |

What do all the words in both Group A and Group B have in common? (Adjectives, two syllables)

What difference do you notice between the two groups?
(Group A words end in ly and y.)

Based on the evidence in Exercise No. 3, how would you alter, or add to the generalization you made after Exercises 1 and 2?

(Some two syllable adjectives follow the pattern of one syllable adjectives, especially those ending in ly and y. Teachers might offer some three syllable adjectives to see how they fit the rule, e.g. beautiful, casual, glamorous. They don't. Adjectives which do not conform to the er, est pattern are preceded by more and most.

Exercise No. 4.

Write sentences using the comparative and superlative forms of the following one-syllable adjectives:

1. good
2. well
3. bad
4. much

In light of the evidence from Exercise No. 4, how might you alter the generalization you made after Exercises 1 and 2?

(Not all one-syllable adjectives form comparison by adding er and est to the original adjective.)

Exercise No. 5.

1. Bill often went to see Mike in the hospital.
2. The Indian had already built the fire when the hunters returned.
3. He tapped her gently on the shoulder.
4. Who is ahead in the ballot tabulation?
5. I stood near the President during the ceremony.
6. Tensing, the Sherpa guide, climbed upward toward the summit.
7. The explorer gazed far across the water.

8. The fox jumped quickly over the lazy dog.

9. On ship one bunk is placed above another.

10. The reporter arrived too late to cover the story.

What do all the underlined words have in common?
(all adverbs)

Now try writing the comparative and superlative forms of each of the underlined words.

- | | |
|-------------------------------|-----------------------------|
| 1. often [oftener] [oftenest] | 6. upward -- -- |
| 2. already -- -- | 7. far [farther] [farthest] |
| 3. gently -- -- | 8. quickly [ier] [iest] |
| 4. ahead [more] [most] | 9. above [more] [most] |
| 5. near [er] [est] | 10. late [later] [latest] |

Using evidence from Exercise No. 5, what new conclusion can be drawn about forming comparatives and superlatives?

(Some adverbs of one or two syllables follow the er, est pattern for adjectives. Some follow the more, most pattern. Others may not be used as comparatives.)

Now that we have seen that ER and EST are morphemes that may be added to most adjectives of one or two syllables (and only to a few adverbs), we have one means to distinguish adjectives from other form classes.

Exercise No. 6.

In the blanks write A (adjective) or NA (non-adjective to label the capitalized word in each phrase:

- | | |
|-------------------------|-------------------------|
| 1. the LIGHT plane [A] | 6. that CLAY pot [NA] |
| 2. the NIGHT plane [NA] | 7. her RED sofa [A] |
| 3. a STRANGE idea [A] | 8. a DULL book [A] |
| 4. his STEEL file [NA] | 9. a BOUND volume [NA] |
| 5. a GLASS vase [NA] | 10. my CLOSE friend [A] |

Word Formation

Throughout the lessons on nouns, verbs, and adjectives we have been dealing largely with words that have a distinct characteristic. That is, they are words which contain a stem, or base, and may have one or more morphemes attached to them.

Now we shall look at a group of words which are structured quite differently.

Exercise No. 1.

A. Clipping

What common bond unites all these words?

Group A

- | | |
|----------|----------|
| 1. ad | 6. memo |
| 2. gas | 7. Fred |
| 3. frat | 8. telly |
| 4. photo | 9. Tom |
| 5. taxi | 10. Phil |

The next group of words seems similar to those in Group A, but there is a distinct difference. Can you spot it?

- | | |
|----------|-----------|
| 1. pike | 6. Beth |
| 2. bus | 7. Bert |
| 3. cello | 8. wig |
| 4. coon | 9. mine |
| 5. Gene | 10. phone |

What general trend of word formation can you state, based on the words in Exercise No. 1:
(clipping fore 'n aft)

Which words have been clipped here?

1. Amerindian
2. maitre d'
3. Eurasian
4. newsboy
5. medicare

B. Acronymy

Another way that we create words is illustrated by this group:

Wac

UNESCO

Loran

DDT

AWOL

VIP

Nabisco

Socony

How were these words formed?

Can you think of a reason why words like these came into being?

C. Blending

Still another way words are formed is shown by these words:

Brunch

Smog

Motel

Electrocute

splatter

Describe this method of word formation.

Which words were combined to create these words?

Give the blends that result from fusing these words:

1. happening and circumstance _____
2. automobile and omnibus _____
3. escalate and elevator _____
4. blare or blow and spurt _____
5. squall and squeak _____

Determiners

Explain the meaning of each of the newspaper headlines shown here:

1. POLICE RAID GATHERING
2. COMPLETE FACULTY AT FOX LANE
3. RULE BOOK NOT OBSCENE
4. CLEAN MODEL HOUSE
5. UNION DEMANDS INCREASE

Underline all the nouns in these headlines.

(Mass confusion will probably prevail; someone will say eventually that the meanings are ambiguous, so it's impossible to underline the nouns.)

Why do all these headlines have more than one meaning?

(Nouns could be adjectives and verbs, modifiers could be verbs.)

What words could be added to the headlines to eliminate the ambiguity?

Rewrite the headlines to make them clearer.

In the headlines you've just written, underline the nouns.

How do you know they are nouns now, whereas you didn't recognize them before?

(There are key words that tell you a word is a noun.)

Make a list of all the words that help you to know which words are the nouns.

(Words that have the function of signaling the presence of nouns are called determiners; that is, they determine that a noun or its equivalent must follow.

Exercise No. 1.

Underline the determiners in the following sentences and write N over the noun that they announce or signal.

1. The chair stood on the porch.
2. The fish swam upstream.
3. He smashed his car.
4. Your wheel lost its hubcap somewhere on the highway.
5. Her heel got caught in a crack in our driveway.
6. The old, red-brick gymnasium was torn down.
7. These golden apples came from our worm-ridden orchard.
8. Tom's thumb pulled out a plug.

9. The cat ate Barbara's goldfish.

10. The United States government sent some wheat to the starving people of India.

How many different determiners are there in these ten sentences?

What kinds of words in addition to articles may be used as determiners?

Based on this exercise, can you draw a conclusion about the positions of determiners relative to nouns?

(Determiners precede nouns; if the noun has modifiers, the determiners precede them, too.)

Exercise No. 2.

Underline the determiners in these sentences:

1. These hats are mine.
2. The hats are mine.
3. Does this wrench belong to you.
4. Does your wrench work properly?
5. When that man arrives, please give him your key.
6. When my partner arrives, please give him this.
7. John's doctor is out of town.
8. I prefer Elizabeth's.
9. I can't tell Jim's tennis shoes from his.

Cross out all the nouns in the sentences.

Do any of the sentences still communicate thought or ideas? Which?

Based on this observation, can you generalize about another function of some determiners?

(Some determiners can function in place of nouns, e.g. this, that, these, those, the possessives of a name, as in "I prefer Elizabeth's," and the possessive pronoun, as in "I can't tell Jim's tennis shoes from his.")

Exercise No. 1.

In the blanks write a D (determiner) or NS (noun-substitute) to show the category of the capitalized word.

1. Do you like MY new hat? [D]
2. Do you like THIS? [NS]
3. Have you A match? [D]
4. THESE fellows are my new teammates. [D]
5. THESE are my new teammates. [NS]
6. We did not disturb GEORGE'S room. [D]
7. ITS roots grew under the pavement. [D]
8. Have you seen OUR formal? [D]
9. THIS cold is invigorating. [D]
10. SMITH'S house is for sale. [D]
11. HIS is the best plan. [NS]
12. Where are THE red phlox you planted? [D]
13. THAT deep pool is a good place for trout. [D]
14. Jack has AN interest in grinding rocks. [D]
15. YOUR slip is showing. [D]

Prepositions

Exercise No. 1.

Fill in the blanks in each sentence with one word:

1. The car stopped [at] the station.
2. He came [from] the farm.
3. These roses are [for] you.

4. The chimpanzee [in] the cage was yawning.
5. The lad stood [on] a barrel.
6. I've reached my limit and Frank has reached the end [of] his.
7. The electrician came [to] Sam.
8. John's horse fractured its leg [in] the fall.
9. The buttons [on] these dresses need sewing.
10. Foundations [for] houses should be concrete.

How would you describe the words that you inserted in the blanks?

What function do they seem to play between the words that come before and the words that come after?

Exercise No. 2.

In this exercise the prepositions are underlined. You fill in the blanks with whatever words may fit.

1. Of all the [boys] in the room, Howard is the tallest.
2. The ball rolled under the [fence].
3. Parachutes made of [silk] work best.
4. George sat between the two large [trees].
5. Beyond the blue [flower] there is a green one.
6. That was very kind of [you].
7. What can I add to [that] to make it complete?

What characteristic is similar about all the words you used to fill in the blanks?

Can you fill in any words that are not nouns, pronouns, or noun-substitutes?

What, then can we conclude about prepositions and their relation with nouns, pronouns, and noun-substitutes that follow.

(Nouns, pronouns and noun-substitutes follow prepositions; sometimes with determiners, sometimes without, forming a tight unit.)

Exercise No. 3.

In which sentences is the underlined word a preposition?

1. The swimmers waited below.
2. The swimmers waited below the dam.
3. She liked to sit near.
4. She sat near the window.
5. The paint bucket fell off the porch.
6. The paint bucket fell off.
7. The refreshments came after.
8. The refreshments came after the program.
9. I haven't seen him since.
10. I haven't seen him since yesterday.

How can you tell which words are the prepositions?

What are the underlined words that are not prepositions?

How can you tell?

Exercise No. 4.

1. During accidents, the picnic will begin at eleven.
2. There will be a smoker following dinner.
3. She is only following her orders after all.
4. May I have a conference regarding my examination?

5. He was regarding the newcomer with curiosity.
6. Considering the time, we had better stop now.
7. The entire squad, including the water boy, will make the trip.
8. I am including damage to my window in the bill.
9. The store will be closed weekends, beginning Saturday.
10. He was vague concerning the details.

What form class do all the underlined words look like?

Why do they look that way?

Which verb tense do the underlined words seem to belong to?

Do all the underlined words meet all the specifications for present participle form of the verb?

Which ones do?

Which do not?

What is the function in the sentence of those words which do not have the qualification to be verbs?

Exercise No. 5.

Underline ing prepositions in the following sentences with a single line, verbs with two lines.

1. Considering your loss, the bill will not be sent.
2. I am including a box of chocolates in the package.
3. Assuming the accuracy of the report, action must be taken at once.
4. A camel was following along behind the caravan.
5. We will delay the papers, pending the arrival of the contract.

SYNTAX SECTION

Up to this point we have examined systematically the morphemic structure of English. Now we shall see how words are combined into larger structures such as phrases, clauses, and sentences. This is called syntax. The syntax of English is very complex. In the next series of lessons we will consider the main outlines of English syntax under the following topics: noun clusters, verb clusters, sentence patterns. (Develop on the board.)

Noun Clusters

FLY

What form class is this word?

How can you tell?

What could you add to the word so that no one could mistake it for anything but a noun?
(Add a determiner.)

When we add determiners or descriptive words to a noun, the noun expands into what we may call a noun cluster.

Add a word to the noun cluster the tulips that tells what color the tulips are.
(The yellow tulips)

What does the word yellow (or red, etc.) do to the meaning of the noun cluster, the tulips?
(Changes it. modifies it. makes it more specific.)

Why did you put the modifier yellow where you did?
(Sounds better.)

Add a second modifier indicating size.
(The little yellow tulips)

What can we conclude about the place of single word modifiers in relation to the noun in noun clusters?

(They go between the determiner and the noun.)

What form class are the words that are placed between the determiner and the noun in a noun cluster?

How can you tell?

Suppose, now, that you want to indicate the location of the yellow tulips. What could you add to the noun cluster the little yellow tulips?

(In the garden)

What does the prepositional phrase in the garden do to the meaning of the noun cluster the little yellow tulips?

(Modifies it.)

How is the modifier in the garden different in structure from the modifier yellow?

(Word group vs. single word.)

(Preposition, determiner, noun vs. adjective.)

Based on this observation, what can we conclude about the position of word-group modifiers in relation to the noun in a noun cluster?

(Word-group modifiers follow the noun.)

The phrase the little yellow tulips in the garden, you will notice, contains two nouns. Which is the most important noun, the headword?

If we were to modify the headword still more, with the phrase which were gaily blooming, where would we put this modifying phrase?

(Somewhere after the headword.)

(A precocious student may raise the question somewhere along the way that word-group modifiers may precede the head, too, as in "the black and white-striped zebra." Such a word-group, however, has the effect of a single adjective.)

Exercise No. 1.

Underline the headword in the following clusters:

1. The fence.
2. The old fence
3. That new aluminum fence
4. The fence between the houses
5. The old fence which was painted green
6. The old fence between the houses which was painted green
7. A worn-out putter
8. My worn-out putter lying in the attic
9. A used car, broken down by abusive driving
10. The children's swings in the park which were in use all day long

Exercise No. 2.

Make each list of words into a noun cluster and underline the headword.

1. Table, the small, study
2. European, any, opera, great
3. Somber, evening, that sky
4. My, shoes, roommate's, tennis, dirty
5. Linen, white handkerchiefs, the, other, all
6. Soft, a, on the head, pet
7. Hard, a, which, staggered him, blow
8. Ski, that, lying in the basement, broken
9. With a lame leg, a, who was walking on crutches, junior
10. The, in the front row, whose books he was carrying, girl

Exercise No. 3.

Here is a series of perfectly good sentences, with the headword capitalized. Expand the headword with modifiers before, after, or both before and after. Then underline the noun clusters.

Example: The LOCK was broken.

Expanded: The rusty lock on the front door was broken.

1. SAILBOATS are beautiful to watch.
2. They sailed under the BRIDGE.
3. He makes JEWELRY.
4. The player under the basket is my BROTHER.
5. I gave the CAT a dish of milk.
6. Her mother buys CHAIRS at auctions and refinishes them.
7. CAMPING is not always fun.
8. She makes POTTERY on her wheel at home.
9. It is good exercise to do long cross-countries on SKIS.
10. The doctor remains in his OFFICE till five.

Based on the foregoing exercises, what generalization can be made about substituting noun clusters for single nouns in a given sentence?

(Positions in the sentence occupied by nouns can also be occupied by noun clusters.)

Verb Clusters

ARRIVED

What form class is this word?

What clues does it contain that make you think so?

Exercise No. 1.

Here are some phrases all of which consist of some form of the HEAD verb ARRIVE, plus other words and word groups. Each item may be called a verb cluster.

Group A
(Adverbs)

Group B
(Auxiliaries)

Group C
(Phrases)

soon arrived

did not arrive

arrived on time

arrived late

has arrived

arrived in the morning

arrived today

will be arriving

is arriving at the
station

Based on the evidence to be found in these groups, what can be said about the kind of words and phrases which cluster around head verbs?

Group A?

Group B?

Group C?

Exercise No. 2.

Underline the head in these verb clusters.

1. Stepped lightly
2. Stepped into the room
3. Quickly stepped in
4. Stepped where he was told
5. At once shouted to the crowd to stand back
6. Without hesitation shouted for help
7. Were watching for the signal
8. Had been eaten by the cat
9. Would have driven to the fair
10. Spoke loudly

Exercise No. 3.

Here are some verb clusters. Can you notice a connection between the heads and words in the cluster that didn't exist between the heads and words in the clusters in the previous exercise?

1. built a scooter
2. built his son a scooter
3. seemed gloomy and dejected
4. elected George a member of the fraternity
5. became president of his class

Exercise No. 4.

Underline the head of these verb clusters.

1. sold his last semester's books
2. sold me his last semester's books
3. appeared happy in his new job
4. always chose Sally chairman of the dishwashing committee
5. still remained the best candidate
6. cheerfully gave a handsome contribution
7. never paid his bills on time
8. at once called his uncle a brick
9. often was weary after his workout
10. soon returned the book he had borrowed

Exercise No. 5.

In these sentences draw a line between the noun cluster and the verb cluster. Then underline the noun head and draw a circle around the verb head.

1. The red pony in the pasture galloped along the fence.
2. Many students attended the Christmas party.
3. The senior who sells the most tickets will be honored at the prom.
4. The pipes in the classroom pounded noisily.
5. The choir in the loft sang the last hymn softly.

Based on this exercise, what generalization can you come to regarding how complete sentences may be made?

Exercise No. 6.

Add a verb cluster to each of these noun clusters, making complete sentences.

1. The tiny leak in the hose _____
2. The canoe that he wanted _____
3. The pie _____
4. The steaming apple pie _____
5. The passenger in the front seat who was watching the speedometer _____

Add a noun cluster to introduce each of the following verb clusters, making complete sentences.

1. later regretted his decision. _____
2. came after his dog when school was over. _____

3. will soon return to college. _____
4. always seemed to have a complaint to
make. _____
5. merrily swung the heavy pack on his back
to begin the long hike. _____

Sentence Patterns

We do not speak English by merely stringing words together in some random fashion. Instead, we carefully arrange our words, for the most part unconsciously, into patterns. In English we use a limited number of basic patterns and many sub-patterns. It will now be our purpose to examine the basic sentence patterns of English. Any sentence you construct will probably be based on one of these patterns.

Pattern No. 1

1. FOOD	2. STRONG	3. AM	4. TAN
GOOD	ARE	I	THEY
IS	POLICE	BRAVE	WERE
		VERY	FROM THE SUN

Make a sentence from each of three words:

1. [Food is good.]
2. [Police are strong.]
3. [I am very brave.]
4. [They were tan from the sun.]

How did you know in which order to place the words?

What are the form classes of the words in each sentence?

How can you tell the noun is a noun?

How can you tell the adjective is an adjective?

How are the verbs in each sentence related?

If the verbs mean the same thing, why are they all different words?

Can you think of three other sentences that make use of the same pattern of noun, verb, adjective as these? Can you think of other verbs which fit this pattern?

(seems, feels, looks, appears, becomes, grows, remains, tastes, smells, sounds, gets)

We may call the structure of this sentence Pattern 1 and we may write it as a formula:

Noun BE Adjective (N BE ADJ)

Exercise No. 1.

Do these sentences follow pattern 1? Superimpose the formula on each sentence.

1. The man was short.
2. My mother is very angry.
3. Those soldiers are extremely valiant.
4. The green umbrellas are the most popular.
5. The boats at the pier were very rusty.

How would you describe the function of the words that you did not label?

What kind of words were used to modify the adjectives?

Exercise No. 2.

Take the adverb very. In which sentences can very modify the word after the verb?

1. The toy is expensive.
2. The party was later.
3. The light is dim.
4. The car is inside the garage.
5. This door is brown.

(In this exercise "very" may fit only structurally; whether we may say "brown" or "very brown" is not the issue.)

Based on this exercise, can you devise a means to tell whether the third element in a sentence that seems to follow Pattern 1 is truly an adjective?

Exercise No. 3.

Apply this test to see which of these sentences belong to Pattern 1. Write "1" after such sentences.

1. The box is large. [1]
2. The box is here. [-]
3. My mother is kind. [1]
4. My mother is out. [-]
5. The boys were busy. [1]
6. The boys were upstairs. [-]
7. The dahlias have been lovely. [1]
8. The party must have been enjoyable. [1]
9. The party was afterward. [-]
10. The car is inside. [-]

Exercise No. 4.

Now that you have devised another method (in addition to the comparative test) for determining whether a word is an adjective, fill in the blank spaces in these sentences with appropriate adjectives:

1. The _____ food is very _____.
2. The _____ soldiers are severely _____.
3. My father's _____ dog is often _____.
4. Their fantastically _____ house was badly _____.

Based on the evidence in this exercise, can you make another generalization about the use of adjectives?

(They appear before nouns in a Pattern 1 sentence.)

Pattern No. 2Exercise No. 1.

The pingpong table is downstairs.

The game will be at three o'clock.

Your sister's truck is here.

The fullback was down on the five-yard line.

Their date is tomorrow.

In what respect are these sentences similar to Pattern 1 sentences?

(Noun, linking verb.)

In what respect are they different?

(Adverb in place of adjective.)

We may call the structure of these sentences Pattern 2 and we may write them as a formula:

Noun BE Adverb (N BE ADV)

Exercise No. 2.Group A

here
there
up
down
in
out
inside
outside
upstairs
at the movies
in the house

Group B

yesterday
today
now
then
later
after
at noon
in an hour

What essential meaning do the words in Group A share?
(Suggest place.)

What essential meaning do the words in Group B share?
(Suggest time.)

Now let's use some of these words and phrases in Pattern 2 sentences:

1. The picnic is today.
2. Your brother is at the movies.
3. The concert will be in an hour.
4. Their coats are inside the closet.
5. I am up in the attic.

To how many of the underlined words and phrases can the "very" test, which we used in Pattern 1 sentences, be applied?
(None.)

To how many of the underlined words and phrases can the "slot" test, which we used in Pattern 1, be applied?
(None.)

Now, then, can we test a sentence to see whether it is a Pattern 2 sentence?
(Ask "where?" and "when?" or substitute "there" or "then" in place of the word(s) being tested.)

Exercise No. 3.

After each sentence place a number 1 or 2 to identify the pattern it conforms to.

1. The picknickers were gay. _____
2. The batter is tall. _____
3. The batter is inside. _____
4. They are on the lawn. _____
5. Our appointment is now. _____
6. The meeting will be in an hour. _____
7. The dean is in. _____
8. The dean is benevolent. _____
9. The bunks are below. _____
10. Your house is in the woods. _____

Pattern No. 3Exercise No. 4.

1. The girl is the winner.
2. The heart is a pump.
3. My brother is a doctor.
4. She had never been an honor student.
5. Harry is my favorite uncle.

What form class are the underlined words?

How can you tell?

What structural pattern do these sentences follow?

We may call the structure of these sentences Pattern 3 and we may write them as a formula:

Noun BE Noun (N BE N)

Exercise No. 2.

This is she.
 It's me.
 It was they.
 That is mine.

In what ways do these sentences differ from those in Exercise No. 1?

(Pronouns substitute for nouns.)

In what ways are they the same.
 (Linking verb.)

Even though the sentences use pronouns, they may still be designated Pattern 3 sentences.

What is the relation between the two nouns (or pronouns) in Pattern 3 sentences?

(They are one and the same.)

Because they refer to the same person or thing, we add a superscript to the formula:

N^1 BE N^1

This is done to differentiate two nouns which are not the same person or thing.

Exercise No. 3.

Indicate the pattern of each sentence by the numbers 1, 2, or 3.

1. Sandy must have been the culprit. _____
2. The dinner was over. _____
3. The dinner was tasty. _____
4. The dinner was a feast. _____
5. The Indians were the winners. _____
6. My cousin is a fool. _____
7. My cousin is proud. _____

8. The policeman may be wise. _____

9. The policeman may be there. _____

Pattern No. 4

Exercise No. 1.

1. Cigarettes burn.
2. Airplanes fly.
3. The dog barks.
4. Our porch sags.
5. Your roof leaks.

What are the form classes of the words that make up these sentences?

In what way are the verbs in these sentences different from the verbs in Patterns 1, 2, 3?
(Not linking verbs.)

We may call the structure of these sentences Pattern 4 and we may write them as a formula:

Noun Intransitive Verb (N InV)

(An intransitive verb is one which cannot be followed by a noun or pronoun.)

Exercise No. 2.

1. The cats purr.
2. The students study.
3. The houses deteriorate.
4. The vases break.
5. The visitors depart.

In these Pattern 4 sentences do you see a quality that all the nouns have in common?
(plurals)

How can you tell they are all plurals?

Now change all the nouns to the singular form.

What changes have taken place in the nouns?
(Dropped "s".)

considering the evidence in Exercise No. 2, what generalization can you come to about singular nouns and their verbs and plural nouns and their verbs.

THE HEIGHT OF THE BUSHES VARIES.

What is the noun cluster in this sentence?

Of what structural units does the noun cluster consist?
(determiner, noun, prep. phrase.)

Considering the form of the verb, which of the two nouns in the sentence governs the form of the verb?

Based on this example, what generalization can be made about a noun cluster and its relation to the verb of a sentence?

Exercise No. 3.

Below each sentence write the headword and the verb to which it is joined.

1. The purposes of the training make me eager to begin.

2. The leader of the trainees selects a deputy.

3. One among the flock of swans maintains guard.

4. The difference between the two men appears when they are at a game.

5. The troublemakers on the squad were hard to locate.

Pattern No. 5 (Introduced by contrasting with No. 4)

Exercise No. 1.

Compare the two sentences in each pair.

1. a. They finished last.
b. They finished the race.
2. a. He hammered fast.
b. He hammered the nails.
3. a. She drove to town.
b. She drove the car.
4. a. The students studied at the library.
b. The students studied history at the library.
5. a. The girls wrote.
b. The girls wrote it.

What differences do you notice between the sentences in each pair?

(The sentences marked a do not have a noun or pronoun following the verb.)

What pattern does a form? What pattern does b form?
(N INV) (N¹ TrV N²)

How may we write the formula for b?

How may we indicate the second noun does not mean the same as the first?

The teacher questions at this point. (The sentences marked a do not contain a noun following the verb while those sentences marked b do. Therefore, the designation of the verb in the N - INV pattern is intransitive; in the N¹ - TrV - N² pattern it is transitive.)

Exercise No. 2.

Fill in the blanks with appropriate pronouns.

1. They finished [it].
2. He hammered [them].

3. She drove [it].

4. The students studied [it] at the library.

Are these sentences more like those marked a in Exercise No. 1 or more like those marked b? [b]

What differences are there?

[Pronouns replace nouns.]

Is there any basic difference in structure? [No]

We may call the verbs in sentence pattern N - TrV - N transitive verbs, as opposed to intransitive verbs, which appear in Pattern 4 sentences.

Based on your completion of Exercise No. 2, what is a means for determining whether a verb is transitive or intransitive?

[If you can substitute a pronoun for what follows the verb, it is transitive.]

Exercise No. 3.

After each sentence write the pronoun you can substitute for the capitalized noun.

1. The salesman sold THE CAR. [it]
2. Both soldiers saluted THE COLONEL. [him]
3. Mrs. Grundy grew ROSES every year. [them]
4. At the desk we met THE NURSE. [her, him]
5. The chauffeur repaired THE TIRE. [it]
6. Mrs. Hooper injured HER ANKLE. [it]
7. The collision broke the WHEEL. [it]
8. I met YOUR SISTER. [her]
9. The veterinarian carried THE DOG. [it, her, him]
10. We trimmed THE BUSHES. [them]

Sentences such as these which make use of transitive verbs comprise another sentence pattern (#5). Can you write the formula for Pattern 5?

[Noun Transitive Verb Noun] [N TrV N]

Considering the nouns in Pattern 5 sentences, what subscripts might you add to the formula?

[N¹ TrV N²]

Exercise No. 4.

In this exercise you are to distinguish between transitive verbs, intransitive verbs, and the verb BE. After each sentence place a TrV, InV or BE to label the verb. In the second blank write the number of the sentence pattern.

1. The center PASSED the ball to the quarterback.
[InV] [5]
2. I'll PASS.
[InV] [4]
3. The sheriff WAS the leader of the posse.
[BE] [3]
4. The sheriff was LEADING the posse. [InV] [4]
5. Who is LEADING now? [TrV] [5]
6. The dean MADE an important announcement.
[TrV] [5]
7. The announcement may BE helpful to you.
[BE] [1]
8. The firm SENT a form letter to all its customers.
[TrV] [5]
9. The driver TURNED sharply. [InV] [4]
10. The driver TURNED the car around. [TrV] [5]

Exercise No. 5.

Both Group A and Group B consist of sentences containing transitive verbs.

Group A

1. The waitress poured the coffee.
2. The maid opened the window.
3. Most young people like dancing.
4. We chose the mountains for our vacation.
5. Jim has never read King Lear.

Group B

1. The coffee was poured by the waitress.
2. The window was opened by the maid.
3. Dancing is liked by most young people.
4. The mountains were chosen for our vacation.
5. King Lear has never been read by Jim.

Is there any difference in meaning between the sentences in Group A and their corresponding sentences in Group B?

In the change from A to B what happens to the headword in each sentence?

[Put into prepositional phrase with by at the end of the sentence.]

In the change, what happens to the noun that follows the verb?

[Becomes the headword.]

What happens to the form of the verb?

[Changes to past participle plus form of BE.]

Sentences of the type in Group A may be called active sentences; those in Group B, passive sentences.

Do you notice a difference in emphasis between active and passive sentences?

Exercise No. 6.

Put the following active sentences into passive form.

1. The tourists burned wood in the fireplace.
-

2. The shepherd counted his sheep.

3. We began the game at four o'clock.

4. The Smiths built a new house on the river.

5. The nature club spotted a pilested woodpecker.

Exercise No. 7.

These sentences contain transitive verbs in the passive form. For each verb underline the BE auxiliary once and the past participle twice. Then change the sentences to the active form. In cases where there is no BE phrase, you will have to supply a subject.

1. The rat was killed by the terrier.

2. The pancakes were turned by the cook.

3. Much corn is raised in Iowa.

4. An early folk tune was heard.

5. The dishes were washed.

Exercise No. 8.

Now try putting these sentences, containing transitive verbs, into the passive form.

1. The key fits the lock.
2. Joe resembles his father.
3. I beat my friend.
4. The settlement suited Mr. Jacobs.
5. This means war.

What conclusion can you draw about changing active sentences into passive ones, considering your experience with this exercise.

[Can't always be done.]

Pattern No. 6Exercise No. 1.Pattern 5 sentences

1. He sold a ticket.
2. She bought a dress.
3. The sergeant found a rifle.

Pattern 6 sentences

1. He sold the student a ticket.
2. She bought the daughter a dress.
3. The sergeant found the recruit a rifle.

What differences do you notice between Pattern 5 sentences and Pattern 6 sentences?

In Pattern 6 sentences what is the function of the first noun after the verb?

[Indirect object]

What is the function of the second noun?

[Direct object, receiver of the action.]

What is the relationship of these two nouns?

Exercise No. 2.Group A

1. He assigned Jack the toughest job.
2. The spaniel brought his master the stick.
3. The librarian found me the pamphlet.

Group B

1. He assigned the toughest job to Jack.
2. The spaniel brought the stick to his master.
3. The librarian found the pamphlet for me.

What differences do you see between the sentences in Groups A and B?

[Indirect object turned into prepositional phrase in B.]

Based on these differences what can you see as a means to distinguish the indirect from the direct object in Pattern 6 sentences?

[Indirect object may be made into prepositional phrase using prepositions to and for.]

Exercise No. 3.

Replace the indirect object in each of the following Pattern 6 sentences with a prepositional phrase.

1. Susie fed the baby robins some juicy worms.
2. Her mother sent her a new laundry box.
3. Their dentist presented her father the bill.

How would you represent Pattern 6 sentences with a formula?

[N TrV N N]

How many nouns with different meanings appear in Pattern 6 sentences?

[Three]

Add the appropriate superscripts.

[N¹ TrV N² N³]

Pattern No. 7Exercise No. 1.

1. The players chose Harry captain.
2. I thought him a conformist.
3. The critic found the painting a forgery.
4. Tim proved himself a leader.

In what ways do these sentences resemble a Pattern 6 sentence?

[Noun, transitive verb, 2 objects]

In what ways are these sentences different from a Pattern 6 sentence?

[The two objects refer to the same person.]

Does the word Harry (sentence #1) meet these qualifications?

Why?

Does the word captain (sentence #1) meet these qualifications?

Why?

Although these sentences are similar to Pattern 6 in many respects, they may be designated Pattern 7. How might Pattern 7 be written as a formula?

[N TrV N N]

How can we differentiate this formula from that of Pattern 6?

[N¹ TrV N² N²]

Exercise No. 2.

Identify the following items as Pattern 6 or Pattern 7 sentences.

1. She played him a record [6]
2. We appointed George the committee chairman. [7]
3. You threw us a curve. [6]
4. The student body selected Arabella the beauty queen. [7]

5. The faculty chose Sieverson the head counselor. [7]
6. We found her a sandwich. [6]
7. She fed him the pabulum. [6]
8. The dealer sold me an air mattress. [6]
9. The city elected Mouchy mayor. [7]
10. He named his new boat Belle. [7]

Exercise No. 3.

Group A

Bally painted the kitchen yellow.
The reviewer thought the movie bad.
The best proved him fit.

Group B

I supposed Harold outside.
The groom thought the wedding tomorrow.
She thought him upstairs.

In what respect are the sentences in Group A different from Pattern 7?

[Adjectives replace the second noun following the verb.]

In what respect are the sentences in Group B different from Pattern 7?

[Adverbs replace the second noun following the verb.]

If these two types of sentences are to be considered only variations of Pattern 7, rather than individual patterns by themselves, how might we alter the formula for Pattern 7 sentences?

$$N^1 \quad TrV \quad N^2 \quad \left(\begin{array}{l} N^2 \\ Adj. \\ Adv. \end{array} \right)$$

The flexibility to be found in Pattern 7 raised the legitimate problem of why comparable flexibility is not given to sentences using linking verbs (Patterns 1, 2, and 3), so that they, too, might be considered variations of a single pattern. The difference lies in the emphasis. The adjective, adverb or noun that follows a linking verb conveys the meaning of the sentence, since it modifies the headword. In Pattern 7 sentences the terminal word or phrase merely modifies the direct object.

APPENDIX 2

THE DEDUCTIVE LESSONS

APPENDIX 2

THE DEDUCTIVE LESSONS

Introduction to the Lessons

At this very moment each of you has a command of English grammar. This ability to select the exact forms of words and place them in patterns and arrangements which express the meanings you wish to convey, however, is done unconsciously with little awareness on your part.

We are going to study, in this unit, the structure of this language that you use so easily. This situation is like that of a skilful automobile driver who is going to begin a course in auto mechanics. The big difference, however, is that our language is much more complex a machine than any car you could buy. When we complete the unit, you should have a better idea of what makes our language go.

There are three levels of structure on which we can describe our language:

1. The first or lowest is simply speech sounds. This is called phonology. Language is oral. Writing is a visual symbolization.

2. The next level has to do with meaningful forms made from speech sounds. This part generally deals with words and their meaningful parts. The area is called morphology.

3. The top level considers the ways in which words are arranged to form sentences. Here we have the study of syntax.

During the next few weeks we will consider morphology and syntax. The workbooks will accompany the classwork. Use this workbook for class exercises, homework, and review purposes. The worksheets will be your text. At the conclusion of the unit there will be a two hour exam covering all of the work studied in class.

MORPHOLOGY SECTION

Morphemes

We first turn our attention to the study of the internal structure of words, known as morphology. Before we can examine the structure of words, we must become acquainted with a unit called the morpheme.

A morpheme is a small unit of language that meets three criteria or tests:

1. It is a word, or a part of a word that has meaning.
2. It cannot be divided into smaller meaningful parts without violation of its meaning.
3. It recurs in different situations with a relatively stable meaning.

Let us examine the word handshake that contains two morphemes (hand and shake), comparing these two morphemes to the criteria above.

First of all we recognize that each is a word or part of a word and can be found in any dictionary. Second, neither can be divided without changing the meaning. For example, we can get smaller meaningful forms from hand such as and and an but these do not have the same meaning as hand. Lastly, the morpheme hand has relatively the same meaning in other situations. (Examples are: handwriting, handmade, handkerchief, handcuff.) Shake meets all of the above criteria also. It is a word or part of a word, cannot be divided into smaller meaningful parts and is stable. (Same meaning in shaker, shaking, shake the tree.)

As a second example let us compare the morpheme bright with the word brighten (make light). In sound the only difference between the two is the added en of brighten, and in meaning the difference is the added sense of "make" in brighten. The en then is also a morpheme. Why?
(1) It is part of a word that has meaning. (2) It cannot be changed into smaller meaningful units. (3) And it recurs with the same meaning in such words as cheapen, darken, deepen, and soften (to make cheap, to make deep, to make soft).

Exercise No. 1.

After each word write a number showing how many morphemes it contains. Refer to the three criteria whenever you are not sure.

- | | |
|-----------------|------------------|
| 1. play [1] | 11. keeper [2] |
| 2. replay [2] | 12. able [1] |
| 3. date [1] | 13. unable [2] |
| 4. antedate [2] | 14. manogany [1] |
| 5. weak [1] | 15. rain [1] |
| 6. weaken [2] | 16. rainy [2] |
| 7. hygiene [1] | 17. cheap [1] |
| 8. man [1] | 18. cheaply [2] |
| 9. manly [2] | 19. cheaper [2] |
| 10. keep [1] | 20. capsize [1] |

Exercise No. 2.

Write the meaning of the underlined morphemes.

- | | |
|-----------------------------|------------------------------|
| 1. <u>antedate</u> [before] | 6. <u>keeper</u> [one who] |
| 2. <u>replay</u> [again] | 7. <u>unable</u> [not] |
| 3. <u>manly</u> [like] | 8. <u>rainy</u> [marked by] |
| 4. <u>cheapest</u> [most] | 9. <u>impossible</u> [not] |
| 5. <u>inactive</u> [not] | 10. <u>malfunction</u> [bad] |

Morphemes are of two kinds, free and bound. A free morpheme can be said alone with meaning. For example, in reply to "What are you going to do now?" you might answer, "Eat." Eat is a free morpheme.

A bound morpheme, unlike the free, cannot be said alone with meaning. It is always attached to one or more morphemes to form a word.

What are the underlined morphemes of the last exercise? [Bound.] Why? [They cannot be spoken alone with meaning.]

Exercise No. 3.

Underline with one line the bound morpheme and with two lines the free morpheme.

- | | |
|-----------------------------|--------------------------------|
| 1. <u>speaker</u> | 6. <u>pre</u> <u>view</u> |
| 2. <u>king</u> <u>dom</u> | 7. <u>deliver</u> <u>y</u> |
| 3. <u>idol</u> <u>ize</u> | 8. <u>un</u> <u>done</u> |
| 4. <u>select</u> <u>ive</u> | 9. <u>re</u> <u>new</u> |
| 5. <u>dream</u> <u>ed</u> | 10. * <u>inter</u> <u>vene</u> |

(N.B.) * Inter vene is an example of a word consisting of two bound morphemes.

A morpheme that conveys the principal meaning in a word is called the base. In the following words the bases have been underlined. Most of the bases in English are free morphemes.

womanly

endear

failure

Exercise No. 4.

Underline the bases in the following words:

- | | |
|----------------------|--------------------|
| 1. <u>lighten</u> | 6. <u>unlikely</u> |
| 2. <u>enlighten</u> | 7. <u>prewar</u> |
| 3. <u>friendship</u> | 8. <u>subway</u> |
| 4. <u>befriend</u> | 9. <u>falsify</u> |
| 5. <u>Bostonian</u> | |

All the bases in the preceding exercise are free bases. That is they have meaning when spoken alone (free), and they also give the primary meaning of the word (base).

Bound bases are those morphemes that give the principal meaning but cannot be spoken alone with meaning. Many of the bound bases in English come from Latin and Greek.

Exercise No. 5.

The underlined morpheme is a bound base. Write the meaning of these bases.

1. audience, audible, auditory [hear]
2. suicide, patricide, matricide [kill]
3. oral, oration, oratory [speak]
4. aquaplane, aquatic, aquarium [water]
5. mortuary, mortal, immortal [death]
6. pendulum, suspenders, impending [hand]
7. manual, manicure, manuscript [hand]
8. eject, inject, project [throw]

Inflectional Paradigms

Noun Paradigm

In continuing the study of the structure of words (morphology) we will consider the paradigm. You will recall from the previous lesson that many words contain two morphemes of which one conveys the primary meaning and the other adds a quality that gives the word more meaning.

The morpheme containing the primary meaning is sometimes called the stem. In this word group - ahead, behead, header, headlong, headship, heady, subhead - the stem is obviously head. However, each word has its own distinct meaning because each of the morphemes that is added to it is

distinctly different. A paradigm is a set of words having the same stem.

Now we will consider other noun paradigms.

Here is an example of a noun paradigm, but the morphemes added to the stem are much alike.

doctor doctor's doctors doctors'

The stem is obviously doctor. Notice the additional meanings you get from the endings. The 's shows ownership, the s tells us of the plural form, and the s' indicates plural form and possessive.

(Ask for a sentence using each form above.)

Now look at the following four sentences:

1. The duck landed in its nest.
2. The ducks' nest was their only home.
3. The duck's discolored beak was its only flaw.
4. The ducks went smoothly on their way.

What is the stem of the underlined words?

What morphemes have been added?

What additional meaning is added to the stem?

If the underlined words had been omitted, how would you know which word of the paradigm to use in each sentence?

(Develop chart with pupils as lesson proceeds.)

Unfortunately, there are certain complexities in our language in regards to plural nouns and possessives. Let us review some principles of which most of you are acquainted.

In most cases we form the possessive by adding 's to the stem; s to form the plural and s' to form the possessive and plural. Example: carpenter's, carpenters, carpenters'.

Exercise No. 1.

Fill in the chart.

<u>Stem</u>	<u>Singular Possessive</u>	<u>Plural</u>	<u>Possessive Plural</u>
brother	[brother's]	[brothers]	[brothers']
cloud	[cloud's]	[clouds]	[clouds']
table	[table's]	[tables]	[tables']
woman	[woman's]	[women]	[women's]

However, some nouns like those below do not have a singular form. These words are already in the plural form and would form the possessive and plural by adding 's.

Exercise No. 2.

Fill in the chart.

<u>Stem</u>	<u>Singular Possessive</u>	<u>Plural</u>	<u>Possessive Plural</u>
sheep	--	[sheep]	[sheep's]
cattle	--	[cattle]	[cattle's]
wheat	--	[wheat]	[wheat's]
police	--	[police]	--

Lastly, there are some nouns that end in s that also do not have a singular form. Some examples are: (These words, already in the plural, form the possessive by simply adding the '.)

Exercise No. 3.

Fill in the chart.

<u>Stem</u>	<u>Singular Possessive</u>	<u>Plural</u>	<u>Possessive Plural</u>
pajamas	--	pajamas	pajamas'
scissors	--	scissors	scissors'
trousers	--	trousers	trousers'
pliers	--	pliers	pliers'
barracks	--	barracks	barracks'

(Review chart.)

Noun Plurals

From the last two sections of the chart you are able to see further the difficulties met by someone learning to speak English; the difficulty of knowing whether a noun is singular or plural. Take, for instance, the sentence, "I like your hair." Is hair singular or plural?

There are three useful tests to be used in deciding if a noun is singular or plural.

1. A noun is singular if you can substitute: he/him, she/her, it, this, or that. It is plural if you can substitute: they/them, these, or those. Tell what words could be substituted for the underlined words and indicate if they are singular or plural.

Exercise No. 4.

1. What did they do with the molasses? [sing.] [it]
2. Why doesn't she call the police? [plural] [them]
3. Jack likes to fish for trout. [plural] [them]
4. The summons came in the mail. [sing.] [it]

2. A second clue in deciding if a noun is singular or plural is given by a modifier like several, many, this/that, these/those, or by the pronoun that refers to it such as his/her, its, their. Look at these examples:

- a. We saw many fish swimming under the bridge.
- b. In returning, the sheep changed its direction.
- c. In returning, the sheep changed their direction.

Exercise No. 5.

Circle the modifier or pronoun that tells if the noun is singular or plural.

- a. My scissors lost their sharpness.
- b. He shot both quail on the wing.
- c. That news delighted her.
- d. The hunters saw few deer this season.

3. A third clue in deciding if a noun is singular or plural is given by the form of the verb. In the sentence, "Measles is a contagious disease." is indicates that measles is singular. In the sentence, "The goods are on the way" are tells us that goods is plural.

Exercise No. 6.

Underline the verb which also tells whether the noun is singular or plural.

1. The Chinese was preparing the dinner.
2. Oats is his best crop.
3. The bass are biting today.
4. The species has become extinct.

Noun Possessive

Up to this point we have considered the morpheme s as it signals plurality and said little about the use of the ' and s to show possession.

This part of the lesson is concerned not with how possessives are created, but when to use them and what they actually mean.

The word possessive obviously means possession or ownership. When we say, "John's hat" we are clearly talking about the hat that John owns. But when we say "Shakespeare's portrait", we mean the painting of Shakespear that happens also to be a portrait. First of all, he does not possess it, and if he did own it at one time, he's no longer in a position to claim it.

The possessive form of a noun can indicate six different relationships: (Explain with the use of examples)

1. possession or belongingness - John's hat
Johnny's home
2. description - a cowboy's walk
men's coats
3. origin - Franklin's Autobiography
Beatles' music
4. measure (time, value, space) - an hour's wait
a dollar's worth
5. subject of an act - robber's escape
- judge's decision
6. object of an act - Jim's punishment
the defendent's accuser

Exercise No. 7.

Using the numbers corresponding to the relationships above, indicate the relation shown between the underlined possessive and its following noun.

1. We missed the other car by a hair's breadth. [4]
2. A wren's song floated through the window. [3]
3. They were playing children's games. [2]
4. The police provided for Richard's protection. [6]
5. The boy's jump saved his life. [5]

6. The moon's beams were brilliant that night. [3]
7. Willard's arrival was a surprise. [5]
8. He had never done a day's work. [4]
9. She met Dickie's father. [3] [1]
10. She was irritated by Bob's bragging. [5]

N.B. No mention has been made of using the "of phrase" to show the possessive form. If it is explored, indicate that there is no hard and fast rule. In general the possessive form is used with animate nouns (dog's leg) and the of structure with inanimate nouns (leg of the table).

Verb Paradigm

The next set of forms to be studied is the verb paradigm. Verbs have 3, 4, or 5 forms and these forms help us to identify this word class in communication. Inflection refers to the changes in the form of the verb in order to indicate a change in number or tense. In discussing these inflections or changes we will refer to the following groups of words:

I	II	III	IV	V
<u>Stem</u>	<u>3rd Person Singular</u>	<u>Past</u>	<u>Present Participle</u>	<u>Past Participle</u>
learn	learns	learned	am learning	has learned
return	returns	returned	is returning	had returned
march	marches	marched	are marching	have marched
fix	fixes	fixed	was fixing	having fixed
choose	chooses	chose	was choosing	has chosen
set	sets	set	be setting	had set

1. Regular verbs have four inflected forms. The singular form is developed by adding s or es to the stem. The stem or plain form is used when the subject is more than one.

- a. He learns to play the piano by himself.
- b. They return home at five o'clock each evening.

In sentence (a) the singular (one) subject he requires the form ending in s (learns). In sentence (b) the plural subject they requires the unchanged form return which is the stem.

Exercise No. 1.

Fill in the blanks with the correct verbs from Column I or II.

1. The scouts [march] in every July Fourth parade.
2. She [returns] home at five o'clock.
3. We [fix] flat tires at the garage.
4. The waitress [sets] the table every day.
5. Because of his training, Sam [fixes] any kind of clock or watch.
6. They [return] on the commuter train from New York.
8. You may remember that you [set] the carton on the floor.

(N.B.) The last sentence requires the explanation that you is either singular or plural but always takes the plural form of the verb.

Exercise No. 2.

Fill in the blanks with the appropriate nouns or pronouns.

1. [They] return equipment to the supply room each day.
2. The [child] learns to paint
3. [He] chooses to remain at home.
4. Every year [Tom] returns for the celebration.
5. When the [sun] sets it will be cooler.

2. The past form of regular verbs is generally developed by adding the inflection ed to the stem or plain form. Examples of these forms are found in the verbs learned, returned, marched of Column III. These are the most usual. The past tense, however, takes on numerous forms. Some of these are: chose and set (above), apt, led, began, built, and swore.

With the past tense (which indicates that an action was completed in the past) the form does not change regardless of the number of the subject. For example, the past tense learned is used for either the singular subject pupil or the plural subject pupils. (The pupil learned; the pupils learned.)

Exercise No. 3.

Complete the sentences below. What determined the word (noun or pronoun) you would fill in the blank.

1. [They] fixed Jack's motorboat together.
2. Because of their loyalty, [they] marched despite the heat.
3. [He] returned by himself.
4. The [sailor] set the sail for his voyage.
5. The [boys] chose the representative to their committee.

3. Column IV represents the present participle form of the verb, the -ing form. It combines with forms of be (auxiliary or helping verbs) to make verb phrases. Whereas the past tense indicates that an action was completed in the past, the present participle indicates that an action is happening or was happening in the past but not completed. Contrast: I marched, I am marching, and They were marching.

It is important to note that it is the auxiliary which agrees with the subject and gives the time and the verb itself does not change. As such, am agrees with I and were agrees with they, marching remaining the same. Also, the auxiliary indicates time; am marching (action happening in the present); were marching (action happening in the past).

Exercise No. 4.

Fill in the blanks with appropriate words.

1. [I] am learning to type.
2. [He] is returning from camp.
3. While the [plumber] was fixing the sink, a pipe broke.
4. The students were unruly, even though [they] were choosing the class president.
5. When he gets a hit, [he] will be setting a new record.

Exercise No. 5.

Fill in with appropriate auxiliaries. Notice that your answers are determined by other clues in the sentence as well as the number of the subject.

1. The boy [was] fixing his car yesterday when I saw him.
2. Plans are that the soldiers [will be] marching up Broadway to City Hall.
3. While the students [were] choosing a president, the faculty was taking a coffee break.
4. He tells me that he [is] returning the book because he already owns a copy.

4. The past participle is presented in Column V. It most frequently ends in ed. The past participle is used with the auxiliary has, had, have, having to make verb phrases.

Once again the auxiliary agrees with the subject in number and gives the time of the action, the verb remaining fixed in every case.

The first exercise below indicates that the auxiliary agrees with the subject and the verb remains unchanged.

Exercise No. 6.

Fill in the blanks with the appropriate auxiliary.

1. Finally, the boys [have] learned to sing on key.
2. Jack [had] returned the kick-off 80 yards when it was called back.
3. The critics [have] chosen Joan's picture for first prize.
4. Although Maria [has] fixed the lunch, no one is here to eat it.
5. She [had] set her hair before going out.

While we are on verbs, it will be convenient to look at a small group of words, ten in all, that associate with verbs and are called modal auxiliaries. They are:

can	could
may	might
shall	should
will	would
must	had to
ought to	should have

These modal auxiliaries give verb stems special shades of meaning. In the first four pairs the second member may on occasion serve as the past tense of the first member. (Example: could can serve as the past tense of can.) To express the past tense of must we would say had to, and for the past tense of ought to, one uses should have plus a past participle.

Some of the special shades of meaning expressed by these auxiliaries are: futurity (future action, an action that will happen), possibility (an action could or could not happen), probability (no certainty but the likelihood of an action), permission and necessity (a pressure exerted on to have an action occur). Cite examples here.

Exercise No. 7.

Each of the sentences contains modal auxiliaries. Underline these words. Also, be prepared to tell what special shade of meaning (above) is suggested by the modal auxiliary and verb.

1. I can go with you to the movies.
2. I could go with you to the movies.
3. Claudia may learn to speak French.
4. Claudia might learn to speak French.
5. At the bell you shall come out fighting.
6. At the bell you should come out fighting.
7. Henry will eat the drumstick first.
8. Henry would eat the drumstick first.
9. I must hand in the paper soon.
10. I ought to hand in the paper soon.

In addition to these ten auxiliaries, there are other words that we may call quasi-auxiliaries. They are be, do, and have. The auxiliaries be and have have been discussed; the auxiliary do is a special case. It is used for questions, negatives and emphatic affirmations.

examples: Do you think so? (Question)

She does not believe it. (Negative)

I do mean it. (Emphasis)

Study the use of do in the following sentences. In every case the meaning of the sentence would not change if the quasi-auxiliary were omitted. However, the use of do gives emphasis to the verb. Note that the auxiliary changes depending on the subject, and the stem remains the same.

One final matter that we must consider is how the auxiliaries (and words that act like auxiliaries) may move around within a sentence.

When a sentence is turned into a question the auxiliary is placed before the subject. For example, the sentence, "I shall wait for you." becomes "Shall I wait for you?" and "The net was lying in a heap." becomes "Was the net lying in a heap?"

When there is more than one auxiliary the modal auxiliary precedes the subject and the others follow. For example, "The boy should have been spanked for his misdeed" becomes "Should the boy have been spanked for his misdeed?"

Exercise No. 6.

Underline all the auxiliaries and then turn all the sentences into questions.

1. You ought to have done better.
2. Helen should have been working.
3. The elephant has been injured.
4. They could have come by plane.
5. You might have mowed the grass shorter.
6. She can do a good job.
7. The chairman has been told.
8. They had studied the map carefully before their trip.

Comparable Paradigm

The comparable paradigm consists of the following forms:

<u>Stem</u>	<u>Comparative</u>	<u>Superlative</u>
sweet	sweeter	sweetest

The comparative is formed when two nouns are being compared to each other; the superlative is formed when one noun is being compared to an indefinite number of nouns. The paradigm (er and est form) is followed by these groups:

1. nearly all one syllable adjectives, e.g. hot, small, proud, smooth, low;
2. some two syllable adjectives, especially those ending in -ly and -y, e.g. lovely, funny, polite.

Other adjectives and adverbs usually take a preceding more or most instead of the inflections er and est.

Exercise No. 1.

Here is a list of one and two syllable adjective. Write the comparative and superlative forms, -er and -est, of those that you would inflect this way. Write more and most in the spaces of those adjectives that do not conform to the above forms.

<u>Stem</u>	<u>Comparative</u>	<u>Superlative</u>
angry	angrier	angriest
hot	hotter	hottest
healthy	healthier	healthiest
honest	more	most
severe	more	most
proud	prouder	proudest
dim	dimmer	dimnest
quiet	quieter	quietest
dirty	dirtier	dirtiest
stupid	more	most
foolish	more	most
small	smaller	smallest

lively	livelier	liveliest
sad	sadder	saddest
cruel	crueler	cruellest
solid	more	most
dusty	dustier	dustiest
low	lower	lowest
black	blacker	blackest
bitter	more	most

There are some adjectives (see below) that do not follow the comparable paradigm. They are good, well, bad, and much.

Exercise No. 2.

Write sentences using the comparative and superlative forms of the following one-syllable adjectives:

1. good
2. well
3. bad
4. much

Some adverbs of one or two syllables follow the -er, -est pattern of adjectives and some follow the most, most pattern. Others may not be used as comparatives. For example:

1. He came near (er, est) the lion's cage.
2. He came late (er, est) to the party.

But already may not be used as a comparative.

Exercise No. 3.

Below is a list of sentences with adverbials of one and two syllables underlined. Write out the comparative and superlative forms of each underlined word. Write no if the word may not be used to indicate a comparison.

1. Bill often went to see Mike in the hospital.
[oftener, oftenest]
2. The Indian had already built the fire when the hunters returned. [no]
3. He tapped her gently on the shoulder. [no]
4. Who is ahead in the ballot tabulation? [no]
5. I stood near the President during the ceremony.
[nearer, nearest]
6. The guide climbed upward toward the summit. [no]
7. The explorer gazed far across the water.
[farther, farthest]
8. The fox jumped quickly above the lazy dog.
[quicker, quickest]
9. On ship one bunk is placed above another. [no]
10. The reporter arrived too late to cover the story.
[later, latest]

Now that we have seen that the er and est inflection may be added to most adjectives of one or two syllables (and only to a few adverbs), we have one way to distinguish adjectives from nouns in the position of modifier preceding a noun. In the cluster a stone fence, stone is not an adjective because we would never say, "a stoner fence" or "the stonest fence."

Exercise No. 4.

In the blanks write A (adjective) or NA (non-adjective) to label the underlined word.

- | | |
|----------------------------|------|
| 1. the <u>light</u> plane | [A] |
| 2. the <u>night</u> plane | [NA] |
| 3. a <u>strange</u> idea | [A] |
| 4. his <u>steel</u> file | [NA] |
| 5. a <u>glass</u> vase | [NA] |
| 6. that <u>clay</u> pot | [NA] |
| 7. her <u>red</u> sofa | [A] |
| 8. a <u>dull</u> book | [A] |
| 9. a <u>bound</u> volume | [NA] |
| 10. my <u>close</u> friend | [A] |

Word Formation

Throughout the lessons on nouns and verbs, and adjectives we have been dealing with words that have a distinct characteristic. That is, they are words which contain a stem or base and may have one or more morphemes attached to them. Remember, we call a set of such words a paradigm.

We shall now look at three common ways by which words have been formed in the past and are still being formed: clipping, acronymy, and blending.

A. Clipping

Clipping means cutting off the beginning or end of a word or both, having a part stand for the whole. The result is called a clipped word. Some examples are: lab, exam, math, plane, and phone. Clipping the end of the word is more common than the front. Some examples may be reviewed.

Exercise No. 1.

Give the original words from which these clipped words were formed:

- | | |
|------------------------|----------------------------------|
| 1. ad [vertisement] | 13. coon [rac] |
| 2. gas [oline] | 14. Gene [Lu] |
| 3. photo [graph] | 15. Beth [Eliza] |
| 4. frat [ternity] | 16. Bart [Al] |
| 5. taxi [cab] | 17. wig [peri] |
| 6. memo [randum] | 18. mime [panto] |
| 7. Fred [erick] | 19. phone [tele] |
| 8. Tom [as] | 20. cello [violin] |
| 9. Phil [lip] | 21. newsboy [newspaperboy] |
| 10. telly [television] | 22. medicare [medical care] |
| 11. pike [turn] | 23. Amerindian [American Indian] |
| 12. bus [omnibus] | 24. Eurasian [European Asian] |
| | 25. maitre d' [hotel] |

B. Acronymy

Acronymy is the process whereby a word is formed from the initials or beginning parts of a series of words. In some cases the initials are pronounced such as in M.P. (military police). In other cases, the initials and/or beginning segment are pronounced as the spelled word would be. For example, NATO (North Atlantic Treaty Organization) is pronounced nato and radar (radio detecting and ranging) as radar.

Exercise No. 2.

Pronounce these acronyms and write their originals. Decide if you are pronouncing the initials or the word as spelled out. Why do you suppose acronyms came into being?

1. WAC [Spell - Women's Army Corps]
2. UNESCO [Spell - U.N. Educ., Sci., and Cult. Org.]
3. Loran [Spell - long-range navigation]
4. DDT [Init. - dichlorodiphenyltrichloroethane]
5. AWOL [Both - Absent Without Leave]
6. VIP [Init. - very important person]
7. NABISCO [Spell - National Biscuit Company]
8. SOCONY [Spell - Standard Oil Company of New York]
9. MC [Init. - master of ceremonies]
10. GI [Init. - galvanized iron]
11. ALCOA [Spell - Aluminium Co. of America]

C. Blending

Blending is the fusion of two words into one, usually the first part of one with the last part of another, as in brunch from breakfast and lunch. The resultant blend partakes of both original meanings.

Exercise No. 3.

Give the originals of these blends.

1. smog [smoke-fog]
2. telecast [television-broadcast]
3. motel [motor-hotel]
4. electrocute [electro-execute]
5. splatter [splash-spatter]

Exercise No. 4.

Give the blends that result from fusing these words.

1. happening and circumstance [happenstance]
2. automobile and omnibus [autobus]
3. escalate and elevator [escalator]
4. blare or blow and spurt [blurt]
5. squall and squeak [squawk]

Determiners

With the subject of word formation we concluded the section on English morphology. But before beginning the next section, syntax, we will study two small classes of words, determiners and prepositions.

A determiner is a word that patterns (goes with) a noun. It precedes the noun and serves as a signal that a noun is soon to follow, just as an auxiliary signals that a verb is coming.

Example: the gymnasium

If the noun has modifiers, the determiner precedes them, too.

Example: the old gymnasium
the old, red-brick gymnasium

The absence of a determiner to signal a following noun will sometimes produce ambiguity or confusion. For example, study the following newspaper headline:

UNION DEMANDS INCREASE

We do not know how to interpret "increase" because a signal is absent. An auxiliary would show that it is a verb. (UNION DEMANDS WILL INCREASE). A determiner would tell us it is a noun and also clear up the meaning. (UNION DEMANDS AN INCREASE) (Provide a second similar explanation using: RULE BOOK NOT OBSCURE.)

The following is a list of important determiners:

a/an	my	this
the	our	that
her	their	these
his	your	those
its	John's (possessive form)	

Exercise No. 1.

Underline the determiners in the following sentences and write N over the noun that they signal or announce:

1. ^NThe ^Nchair stood on ^Nthe porch.
2. ^NThe fish swam upstream.
3. He smashed ^Nhis car.
4. ^NYour car lost ^Nits hubcap somewhere on ^Nthe highway.
5. ^NHer heel got caught in ^Na crack in ^Nour driveway.
6. ^NThe old, red-brick gymnasium was torn down.
7. ^NThose golden apples came from ^Nour worm-ridden orchard.
8. ^NTom's thumb pulled ^Na plum.
9. ^NThe cat ate ^NBarbara's goldfish.
10. ^NThe U.S. Government sent ^Nsome wheat to ^Nthe starving people of India.

Six of the determiners may also be used in place of a noun, that is, as a noun substitute.

Example: That will be enough.

I prefer Elizabeth's.

What can you do with these.

I can't tell Jim's tennis shoes from his.

Exercise No. 2.

In the blanks write a (D) or NS to show the category of the capitalized word. (Determiner or noun substitute.)

1. Do you like MY new hat? [D]
2. Do you like THIS? [NS]
3. Have you A match? [D]
4. THESE fellows are my new roommates. [D]
5. THESE are my teammates. [NS]
6. We did not disturb GEORGE'S room. [D]
7. ITS roots grew under the pavement. [D]
8. Have you seen OUR formal? [D]
9. THIS cold is invigorating. [D]
10. SMITH'S house is for sale. [D]
11. HIS is the best plan. [NS]
12. Where are THE red phlox you planted? [D]
13. THAT deep pool is a good place for trout. [D]
14. Jack has AN interest in grinding rocks. [D]
15. YOUR slip is showing. [D]

Prepositions

Prepositions are words like of, in and to which are usually followed by a noun, pronoun, or noun substitute called object of the preposition. With the noun they form a tight unit.

Example: George was tired of them.

George sat between the two teachers.

He likes the filling in the sandwich.

English has a small group of prepositions of which the most frequently used ones are:

at	of
by	on
for	to
from	with
in	

Those in greatest use are in order of frequency of, in, to.

Some of our two-syllable prepositions are:

under	below	before
between	after	above
often	about	except

Exercise No. 1.

Fill in the blanks in each sentence with a preposition and draw a line under the object of the preposition.

1. The car stopped [at] the station.
2. He came [from] the farm.
3. These roses are [for] you.
4. The chimpanzee [in] the cage was yawning.
5. The lad stood [on] a barrel.
6. I've reached my limit and Frank had reached the end [of] his.
7. The electrician came [to] Sam.
8. John's horse fractured its leg [in] the fall.
9. The buttons [on] these dresses need sewing.
10. Foundations [for] houses should be concrete.

11. [Of] all the pupils in the room, Howard is the tallest.
12. The ball rolled [under] the bleachers.
13. Parachutes made [of] silk work best.
14. George sat [between] the two large desks.
15. [Beyond] the blue sky there is a green one.
16. That was very kind [of] you.
17. What can I add [to] it to make it complete?

Some of the words we have been dealing with can be either prepositions or adverbs. Look at the differences in the use of the underlined word in each pair of sentences. Explain.

Prep. The child looked up the stream.

Adv. The child looked up.

Prep. The refreshments came after the program.

Adv. The refreshments came after.

Exercise No. 2.

In which sentence is the underlined word a preposition? Write P over the preposition and A over the adverb.)

1. The swimmer waited below. [A]
2. The swimmers waited below the dam. [P]
3. She liked to sit near. [A]
4. She liked to sit near the window. [P]
5. The paint bucket fell off the porch [P]
6. The paint bucket fell off. [A]
7. She looked up. [A]
8. She looked up the stream. [P]
9. I haven't seen him since. [A]
10. I haven't seen him since yesterday. [P]

In addition to the prepositions already mentioned, there is in English a group of -ing prepositions which have a verb as a stem. Here are some of the more common ones:

assuming
beginning
pending
regarding
succeeding

Examples:

Considering your ^Nloss, the bill will not be sent.

Assuming the ^Naccuracy of the report, action must be taken at once.

We will delay the papers, pending ^Narrival of the contract.

Notice that the -ing prepositions look like the present participle form of the verb that we have studied before. However, the present participle is joined to the verb BE to form verb phrases. Study these two sentences. Which underlined word is a preposition and which is part of the verb phrase?

Prep. There will be a dance following the dinner.

Verb. She is only following orders.

Exercise No. 3.

Underline the -ing prepositions once and the -ing verbs twice.

1. Barring accidents, the picnic will begin at eleven. [Prep.]
2. There will be a game following the parade. [Prep.]
3. Tom is really following the manager's instructions. [Verb]
4. May I have a conference regarding my examination? [Prep.]

5. He was regarding the newcomer with curiosity. [Verb]
6. Considering the time, we had better stop now. [Prep.]
7. The entire squad, including the water boy, will make the trip. [Prep.]
8. I am including the damage to my window in the bill.
[Verb]
9. The store will be closed weekends, beginning Saturday. [Prep.]
10. He was vague concerning the details. [Prep.]
11. I am including a box of chocolates in the package. [Verb]
12. A camel was following along behind the caravan.
[Verb]

SYNTAX SECTION

Up to this point we have examined systematically the morphemic structure of English. Now we shall see how words are combined into larger structures - phrases, clauses, and sentences. This is called syntax. The syntax of the English sentence is very complex. In the next series of lessons we will consider the main outlines of English syntax under the following topics: noun clusters, verb clusters, and sentence patterns.

Noun Clusters

A noun cluster consists of a noun and all the words and word groups that belong with the noun and cluster around it. (Grouped with the noun.) The noun itself is called the headword or head, and the other words and word groups are modifiers of the noun.

Examples: the tulip

the yellow tulip

the yellow tulip in the garden

the yellow tulip in the garden which was
gaily blooming

In these examples tulip is the headword. Notice that the determiner the and the single word modifier yellow precede the headword and that the word group modifiers in the garden and which was gaily blooming follow the headword.

Exercise No. 1.

Underline the headword in the following clusters. Study the position of single word and word-group modifiers. (N.B. These are not complete sentences.)

1. the fence

2. the old fence

3. the new aluminium fence

4. the fence between the houses

5. the old fence which was painted green
6. the old fence between the houses which was painted green
7. a worn-out putter
8. my worn-out putter in the attic
9. a used car, broken down by abusive driving
10. the children's swings in the park which were in use all day long

Exercise No. 2.

Make each list of words into a noun cluster and underline the headword.

1. table, the small, study
2. European, any, opera, great
3. somber, evening, that sky
4. my, shoes, roommate's, tennis, dirty
5. soft, a, on the head, pat
6. linen, white handkerchiefs, the, other, all
7. hard, a, which staggered him, blow
8. ski, that, lying in the basement, broken
9. with a lame leg, a, who was walking on crutches, junior
10. the, in the front row, whose books he was carrying, girl

Most sentence positions which are occupied by nouns can also be occupied by noun clusters. For example:

Boys often build dams in the spring.

(Small) boys (who are not in school) build dams in the spring.

Jim wanted a car.

Jim wanted a (new) (sports) car (with wire wheels)
(which would have a fast getaway).

Exercise No. 3.

Expand the capitalized nouns by adding modifiers before, after or before and after. Then underline these noun clusters.

Example: The LOCK was broken.

The rusty lock on the front door was broken.

1. SAILBOATS are beautiful to watch.
2. They sailed under the BRIDGE.
3. He makes JEWELRY.
4. The player under the basket is my BROTHER.
5. I gave the CAT a dish of milk.
6. Her mother buys CHAIRS at auctions and refinishes them.
7. CAMPING is not always fun.
8. She makes POTTERY on her wheel at home.
9. It is good exercise to do long cross-countries on SKIS.
10. The doctor remains in his OFFICE till five.

Verb Clusters

A verb cluster consists of a verb and all the words and word groups which belong with the verb and cluster or gather around it. The verb itself is called the headword. The other words are called: auxiliaries, modifiers, and complements of the verb. For example: (Examples consider only auxiliaries and modifiers, not complements.)

soon arrived (modifier - adv.)

arrived late (modifier - adv.)

soon arrived at the station (adv., mod. phrase)

arrived just as the train came in (mod. clause)

was waiting at the door (aux., mod. phrase)

may have been stolen by the cashier (aux., mod. phrase)

Exercise No. 1.

Underline the headword in these verb clusters. These clusters contain auxiliaries and modifiers.

1. stepped lightly
2. stepped into the room
3. quickly stepped in
4. stepped where he was told
5. at once shouted to the crowd to stand back
6. without hesitation shouted for help
7. were watching for the signal
8. had been eaten by the cat
9. would have driven to the fair
10. would speak loudly

We have said that complements cluster about verbs in addition to auxiliaries and single word or word-group modifiers. (See exercise above.) Some verb clusters contain complements. These are words in the verb cluster that are connected with the verb. For example, each of the five verb clusters contain complements (words that complete the meaning of the verb).

1. built a scooter
2. built his son a scooter

3. seemed gloomy and dejected
4. elect George a member of the fraternity
5. became president of the class

Exercise No. 2.

Underline the headword of these verb clusters. Write over the complement.

1. sold his last semester's books [books]
2. sold me his last semester's books [me, books]
3. appeared happy in his new job [happy]
4. always chose Sally chairman of the dishwashing committee [Sally, chairman]
5. still remained the best candidate [candidate]
6. cheerfully gave a handsome contribution [contribution]
7. never paid his bills on time [bills]
8. at once called his uncle a brick [uncle, brick]
9. often was weary after his workout [weary]
10. soon returned the book he had borrowed [book]

Many English sentences can be divided into two parts, one consisting of a noun cluster and the other a verb cluster. The sentences in the exercise below illustrate this point.

Exercise No. 3.

In these sentences draw a line between the noun cluster and the verb cluster. Then underline the noun headword and then draw a circle around the verb headword.

1. The red pony in the pasture / [galloped] along the fence.
2. Many students / [attended] the Christmas party.
3. The senior who sells the most tickets / will be [honored] at the prom.

4. The pipes in the classroom / [pounded] noisily.
5. The choir in the loft / [sang] the last hymn softly.

In the sentences above, the headword of the noun cluster is the subject of the verb and called the modified or complete subject. The verb cluster is called the predicate.

Exercise No. 4.

Add a verb cluster to each of the noun clusters making complete sentences.

1. The tiny leak in the hose _____.
2. The canoe that he wanted _____.
3. The pie _____.
4. The steaming apple pie _____.
5. The passenger in the front seat who was watching the speedometer _____.

Exercise No. 5.

Add a noun cluster to introduce each of the following verb clusters, making complete sentences.

1. _____ later regretted his decision.
2. _____ came after his dog when school was over.
3. _____ will soon return to college.
4. _____ always seemed to have a complaint to make.
5. _____ merrily swung the heavy pack on his back to begin the long hike.

Sentence Patterns

We do not speak English by merely stringing words together in some random fashion. Instead, we carefully arrange our words, for the most part unconsciously, into patterns. In English we use a limited number of basic patterns and many sub-patterns. It will now be our purpose to examine the basic sentence patterns of English. Any sentence you speak will probably be based on one of these patterns.

Included in the patterns are five basic function classes. We will consider these as each pattern is discussed.

1. subject of the verb
2. subjective complement
3. verb
4. direct object of the verb
5. indirect object

The first three patterns have be as their verb. It is necessary to give be special treatment because it behaves differently from other verbs. Remember, be has eight different forms: am, are, is, was, were, be, being, been.

Some of the common linking verbs that pattern as the verb be in Pattern No. 1 and No. 3 are: seem, appear, become, grow, remain, taste, look, feel, smell, sound, get.

If these linking verbs are followed by an adjective we have Pattern No. 1, if followed by a noun, Pattern No. 3, but if followed by an adverb we have Pattern No. 4. For example:

The cyclist appears weary. (Pattern No. 1)

John seemed the winner. (Pattern No. 3)

John remained quietly in his room. (Pattern No. 4)

<u>Pattern No. 1:</u>	N	BE	Adj.
	Food	is	good.

Notice the relationship between the noun and the verb. If we make the noun plural (those foods), we must also change the verb to are. We describe this relationship by saying the noun is "tied to" or "agrees" with the verb. The noun is called the subject of the verb; food is the subject of the verb is.

In Pattern No. 1, the third term must be an adjective. For example: That food is poisonous.

You can test for Pattern No. 1 in a very simple way. It is capable of this expansion:

That food is good - That good food is very good.

That food is poisonous - That poisonous food is very poisonous.

If a sentence will not undergo this expansion, it belongs to some pattern other than Pattern No. 1. For example, the next sentence cannot be expanded as above so it does not belong to Pattern No. 1.

My mother is outside.

My outside mother is very outside.

Exercise No. 1.

Apply the expansion test to see which of these sentences belong to Pattern No. 1. Write "1" after each sentence.

1. The box is large. [1]
2. The box is here.
3. My mother is kind. [1]
4. The boys were busy. [1]
5. My mother is out.
6. The boys were upstairs.
7. The dahlias have been lovely. [1]
8. The party must have been enjoyable. [1]
9. The party was afterward.
10. The car is inside.

Pattern No. 2: N BE ADV.
The girl is here.

Pattern No. 2 differs from Pattern No. 1 in these respects:

1. The verb be often, but not always, has a meaning like 'be located' or "occurs", whereas the be of Pattern No. 1 means "may be described as."

2. Pattern No. 2 is not capable of taking the Pattern No. 1 expansion.

3. The third position is occupied by an uninflected word such as: here, there, up, down, in out, inside, outside, upstairs, downstairs, on, off, now, then, soon, tomorrow, yesterday, over, through, above, below, after. For most words in the third position one can substitute there or then.

Example: The pingpong table is downstairs. (there)

The game was yesterday. (then)

The balls are outdoors. (there)

Often a prepositional phrase with a there or then meaning will occupy the third position.

Example: The wolf is at the door. (there)

The game will be at three o'clock. (then)

Their coats are inside the closet. (there)

I am in the attic. (there)

The concert will be in an hour. (then)

Exercise No. 1.

After each sentence place a number 1 or 2 to identify the patterns to which it conforms.

1. The picnickers were happy. [1]

2. The batter is tall. [1]

3. The batter is inside. [2]

4. They are on the lawn. [2]
5. Our appointment is now. [2]
6. The meeting will be in an hour. [2]
7. The principal is in. [2]
8. The dean is benevolent. [1]
9. The bunks are below. [2]
10. Your house is in the woods. [2]

Pattern No. 3: N¹ BE N¹
 My brother is a doctor

This is the last of the three patterns with the verb be. In the example brother and doctor refer to the same person. The meaning of be in Pattern No. 3 is "be classified as." Study these sentences and the relationship between the first noun and the noun in the third position. (Superscript 1 means that both nouns have the same referent.)

Exercise No. 1.

1. The girl is the winner.
2. The heart is a pump.
3. My brother is a doctor.
4. She had never been an honor student.
5. Harry is my favorite uncle.

The first and third positions may also be occupied by personal pronouns:

1. This is she.
2. It's me.
3. It was they.
4. That is mine.

In these examples both pronouns refer to one and the same person or object. This relationship is the same as that existing between nouns.

Exercise No. 2.

Indicate the pattern of each sentence by 1, 2, or 3.

1. Sandy must have been the culprit. [3]
2. The dinner was over. [2]
3. The dinner was tasty. [1]
4. The dinner was a feast. [3]
5. The Indians were the winners. [3]
6. My cousin is a fool. [3]
7. My cousin is proud. [1]
8. The policeman may be wise. [1]
9. The policeman may be there. [2]

Pattern No. 4: N INV
 Girls giggle.

At this point it is advisable to develop the concept of the subject of the verb. We said in the discussion of Pattern No. 1 that the subject is the noun which is "tied to" the verb. In the sentence above the change from Girls giggle to The girl giggles shows that girls is the subject.

Below are two simple exercises to fix the subject-verb relationship in your mind. Notice now that we are not dealing with the verb be any longer.

Exercise No. 1

Change the plural subjects to singular ones and make the necessary changes in the verbs. For example: cigarettes burn - cigarette burns; airplanes fly - airplane flies.

1. Cats purr.
2. Students study.
3. Houses deteriorate.
4. Vases break.
5. Visitors depart.

Exercise No. 2.

Now reverse the procedure, changing the subject from singular to plural. For example: The dog barks - The dogs bark.

1. The cat prowls.
2. The musician plays.
3. The professor teaches.
4. The bus waits.
5. The comedian laughs.

When a noun cluster is in the position of the subject, it is the headword which is tied to the verb and is therefore the subject. For example: duties is the subject of the verb, depend.

The duties of the center / depend on the kind of offense used.

The height of the bushes / varies.

Exercise No. 3.

Below each sentence write the headword and the verb to which it is joined.

1. The purposes of the training / make me eager to begin.
2. The leader of the trainees / selects a deputy.
3. One among the flock of swans / maintains guard.

4. The difference between the two men / appears when they are at a game.
5. The troublemakers on the squad / were hard to locate.

Now back to Pattern No. 4: N INV
 Girls giggle.

The verb in Pattern No. 4 is called an intransitive verb. An intransitive verb is self-sufficient; it can stand alone with its subject. An intransitive verb cannot be followed by a noun or pronoun.

The sportsman fished.

The sportsman was fishing.

The intransitive verb can be modified by words or word groups known as adverbs but it cannot be completed by a noun or pronoun.

The sportsman fished early. (Adverb)

In the sentence, They finished late, finished is an intransitive verb because it is modified by an adverb, late. But in the sentence, They finished the game or They finished it, finished is not intransitive because it is completed by a noun, game or pronoun it.

Analyze the following pair of sentences in the same way:

He hammered fast. [INV]

He hammered the nail. [TRV]

Exercise No. 4.

Write INV after each sentence which contains an intransitive verb and is a Pattern No. 4 sentence.

1. The audience clapped. [INV]
2. The audience clapped loudly. [INV]
3. The audience clapped their hands. --
4. They were drinking quietly at the table. [INV]

5. They were drinking their morning coffee. --
6. He always paid promptly. [INV]
7. He paid his bills on the first of the month. --
8. Jack left early. [INV]
9. Jack left his clothes in the closet. --

Pattern No. 5: N¹ TRV N²
 The girl bought a dress.

In Pattern No. 5 the verb is completed by a noun or pronoun and is called a transitive verb. Notice that the noun is shown by the superscript 2 which indicates that it does not refer to the same person or thing as the subject, N¹. You may recognize N² as the "direct object."

To determine if the verb is transitive apply this test. If you can substitute him, her, it, or them for the noun or pronoun we have a transitive verb.

Exercise No. 1.

Each of the sentences below is a Pattern No. 5 sentence (N¹ TRV N²). Apply the test, substituting pronouns for the underlined words. Remember, in Pattern No. 4 the intransitive verb could not be completed by a noun or pronoun.

1. The salesman sold the car. [it]
2. Both soldiers saluted the colonel. [him]
3. Mrs. Grundy grew roses every year. [them]
4. At the desk we met the nurse. [her, him]
5. The chauffeur repaired the tire. [it]
6. Mrs. Hooper injured her ankle. [it]
7. The collision broke the wheel. [it]
8. I met your sister. [her]
9. The veterinarian carried the dog. [it, her, him]
10. We trimmed the bushes. [them]

Exercise No. 2.

In this exercise you are to distinguish between transitive verbs, intransitive verbs, and the verb BE. After each sentence place TRV, INV, or BE to label the verb. In the second blank write the number of the sentence pattern.

1. The center passed the ball to the quarterback.
[INV - 5]
2. I'll pass. [INV - 4]
3. The sheriff was the leader of the posse. [BE - 3]
4. who is leading now? [INV - 4]
5. The sheriff was leading the posse. [TRV - 5]
6. The dean made an important announcement. [TRV - 5]
7. The announcement may be helpful to you. [BE - 1]
8. The company sent a form letter to all its customers.
[TRV - 5]
9. The driver turned sharply. [INV - 4]
10. The driver turned the car around. [TRV - 5]

A transitive verb has two forms which we call active and passive. The active form is the one that is followed by the direct object, which we have seen in pattern No. 5. From the active form we can make the passive form.

Example: The waitress poured the coffee.

The coffee was poured by the waitress.

There are three things to notice:

1. The object of the active form becomes the subject of the passive form. (coffee)
2. The passive is made up of a form of the verb be plus a past participle as in was poured.
3. The subject of the active verb may be made the object of the preposition by.

Exercise No. 3.

Put the following active sentences into passive form.

1. The tourists burned wood in the fireplace.
2. The shepherd counted his sheep.
3. We began the game at four o'clock.
4. The Smiths built a new house on the river.
5. The nature club spotted a woodpecker.

Exercise No. 4.

These sentences contain transitive verbs in the passive form. For each verb underline the be auxiliary once and the past participle twice. Then change the sentences to the active form. In cases where there is no by phrase, you will have to supply a subject.

1. The rat was killed by the terrier.
2. The pancakes were turned by the cook.
3. Much corn is raised in Iowa.
4. An early folk tune was heard.
5. The dishes were washed.

There is in English a small group of transitive verbs that do not form the passive. These are illustrated below. Try turning each sentence into the passive and see if the results sound like English in your ears.

Exercise No. 5.

1. The key fits the lock.
2. Joe resembles his father.
3. I have a friend.
4. The settlement suited Mr. Jacob.
5. This means war.

Pattern No. 6: N^1 TRV N^2 N^3
 The mother bought the girl a dress.

In Pattern No. 6 there are five matters to be observed.

1. The superscripts, 1, 2, and 3 indicate that each noun has a different referent; mother, girl, and dress are three separate entities.

2. We see two grammatical objects after the verb bought. If we omit the first one (N^2) the pattern becomes No. 5 (N^1 TRV N^2), and dress is seen to be the direct object. These two objects are called, in order, the indirect object and the direct object.

3. The indirect object may often be replaced by a prepositional phrase beginning with to or for or occasionally with a different preposition.

Example: He sold the student a ticket.

He sold a ticket to the student.

4. The verbs that can be used in Pattern No. 6 are a restricted group. Some of the common ones are:

give	buy	play	feed	pass
make	write	build	offer	sell
find	send	teach	throw	pay
tell	ask	assign	hand	

Exercise No. 1.

The following sentences follow Pattern No. 6. Replace the indirect object by a prepositional phrase. Put the latter where it sounds most natural.

1. The librarian found me the pamphlet.
 [The librarian found the pamphlet for me.]
2. He assigned Jack the toughest job.
 [He assigned the toughest job to Jack.]
3. The spaniel brought his master the stick.
 [The spaniel brought the stick for his master.]

4. Susie fed the baby robins some juicy worms.
[Susie fed some juicy worms to the baby robins.]
5. Her mother sent her a new laundry box.
[Her mother sent a new laundry box to her.]
6. The sargeant found the recruit a rifle.
[The sargeant found a rifle for the recruit.]
7. The dentist presented her father the bill.
[The dentist presented the bill to her father.]

Pattern No. 7: N¹ TRV N² N²
The players chose Harry captain.

Pattern No. 7 like the preceding one has two objects following the verb. But it differs from Pattern No. 6 in three respects.

1. In the order of objects, the direct object comes first. If we eliminate the second object, we are left with Pattern No. 5.

(The players chose Harry.)

The second object (captain) is called the objective complement because it completes the direct object.

2. In Pattern No. 7 both objects refer to the same thing; i.e. both Harry and captain refer to the same person - N² N².

3. Only a very small group of verbs can be used for Pattern No. 7. Among them are:

name	select	think	label
choose	vote	believe	
elect	make	suppose	
appoint	consider	find	
designate	imagine	prove	

Exercise No. 1.

Identify the following items as Pattern No. 6 or Pattern No. 7 sentences.

1. She played him a record. [6]
2. He appointed George the committee chairman. [7]
3. You threw us a curve. [6]
4. The student body selected Arabella the beauty queen. [7]
5. The faculty chose Sieverson the head counselor. [7]
6. We found her a sandwich. [6]
7. She fed him the pabulum. [6]
8. The dealer sold me an air mattress. [6]
9. The city elected Mauchy mayor. [7]
10. He named his new boat, Belle. [7]

Pattern No. 7 has variations in which the third position is occupied by forms other than a noun, in all cases related to the direct object.

Examples: Adjective - He considered her beautiful.

Pronoun - I thought the caller you.

Adverb - I thought him upstairs.

Past Participle - I imagined him seated.

Exercise No. 2.

Underline the objective complement in these sentences. In the blanks label these objective complements, using the terms given for the examples above.

1. I supposed Harry outside. [adv.]
2. Sally painted the kitchen yellow. [adj.]
3. We believe him elected. [past part.]
4. The critic thought the painting bad. [adj.]
5. The test proved him fit. [adj.]

APPENDIX 3

CONCEPTS OF LANGUAGE STRUCTURE OF THE EXPERIMENTAL
TREATMENT, INSTRUCTIONS TO THE TEACHERS,
AND SEQUENCE OF EXPERIMENTAL LESSONS

APPENDIX 3

CONCEPTS OF LANGUAGE STRUCTURE OF THE EXPERIMENTAL TREATMENT, INSTRUCTIONS TO THE TEACHERS, AND SEQUENCE OF EXPERIMENTAL LESSONS

Concepts of Language Structure of the Experimental Treatment

Morphology Section

A morpheme is a short segment of language that meets three criteria: it is a word or part of a word that has meaning; it cannot be divided into smaller meaningful parts without violating its meaning; it recurs in differing verbal environments with a relatively stable meaning.

Morphemes are of two kinds, free and bound. A free morpheme is one that can be uttered alone with meaning. A bound morpheme, unlike the free, cannot be uttered alone with meaning. It is always annexed to one or more morphemes to form a word.

A paradigm is a set of related forms having the same stem but different affixes.

The noun paradigm consists of the stem, possessive singular, plural, and possessive plural.

Ways of distinguishing singular from plural involve the substitution of pronouns, signaling by modifiers, and concordance with the verb form.

A variety of semantic relationships can exist between the possessive noun and the one that follows.

The verb paradigm consists of the stem, third person singular, present participle, past tense, and the past participle. The third person singular is used with singular nouns, and words for which these pronouns will substitute. The past tense takes on numerous forms but the most usual ones end in ed. The present and past participle combine with be and have to make verb phrases.

Modal auxiliaries make up a small group of structure words that associate with verbs. They precede verbs and give them special shades of meaning.

There are three verbs (do, be, have) which often serve as auxiliaries. Do is reserved for questions, negatives, and emphatic affirmations.

The comparative paradigm consists of the stem, comparative, and superlative forms. One-syllable adjectives and some two-syllable adjectives follow this paradigm. Some adverbs follow the usual pattern and some are used with more and most.

The capacity to take inflectional suffixes (er and est) signals a difference between adjectives and nouns in the position of modifier preceding a noun.

Three processes by which words have been formed are: clipping, acronymy, and blending. Clipping means cutting off the beginning or the end of a word, or both, leaving a part to stand for the whole. Acronymy is forming a word from the initials or beginning segments of a succession of words. Blending is the fusion of two words.

A determiner is a word that patterns with a noun. The absence of a determiner sometimes produces ambiguity. Six determiners may serve as noun substitutes.

Prepositions are words like of, in and to which are usually followed by a noun, personal pronoun, or noun substitute called the object of the preposition. Some prepositions are of two-syllables and some have a verb as a stem and end in -ing.

Syntax Section

A noun cluster consists of a headword and all the words and word groups that belong with it and cluster around it. Most sentence positions which are occupied by nouns can also be occupied by noun clusters.

A verb cluster consists of a verb and all the words and word groups which belong with the verb and cluster around it. The verb itself is called the headword, and the other words and word groups are the auxiliaries, modifiers, and complements of the verb.

Many English sentences can be divided into two parts, one consisting of a noun cluster and the other a verb cluster.

Sentence pattern #1 is Noun Be Adjective. There is concordance between subject and verb. Pattern #1 is capable of the following expansion: The _____ food (any noun) is very _____.

Sentence pattern #2 is Noun Be Adverb. The verb often has the meaning "be located" or "occurs". The third position is occupied by an uninflected word for which one can substitute there or then. Often a prepositional phrase with similar meanings will occupy this third position.

Sentence pattern #3 is Noun¹ Be Noun¹. The meaning of be is "be classified as". Personal pronouns may occupy the third position.

Sentence pattern #4 is Noun Intransitive Verb. The headword of the noun cluster is tied to the verb. If a verb is preceded by an auxiliary, the subject is tied to the first auxiliary. The verb in this pattern is self-sufficient. That is, it can stand alone with its subject. An intransitive verb is not usually completed by a noun or pronoun.

Sentence pattern #5 is Noun¹ Transitive Verb Noun². In this pattern the verb is completed by a noun for which one can substitute him, her, it, or them. The second noun does not have the same referent as the first noun and is called the direct object. Pattern #5 has two forms, the active and the passive.

Sentence pattern #6 is Noun¹ Transitive Verb Noun² Noun³. Each noun has a different referent. There are two grammatical objects, the indirect object, and the direct object. The verbs that can be used with pattern #6 are a restricted group: give, make, buy.

Sentence pattern #7 is Noun¹ Transitive Verb Noun² Noun². This pattern has two objects but differs from pattern #6 in three ways. The direct object comes first. Both objects have the same referent. Only a small group of verbs can be used for this pattern. Pattern #7 has variations in which the third position is occupied by forms other than a noun, in all cases related to the direct object.

Instructions to the Teachers

- A. Teach only that material prepared for the particular day. Follow the given schedule for this purpose. Do not assign additional work beyond the exercises provided.
- B. If a lesson is completed before the end of class, please record the amount of time remaining in your plan book. Also, if a lesson is not completed during the class period, make a note of this. (N.B. In general, the lessons leave considerable time to complete the teaching of the lesson's concepts. For this reason work slowly.)
- C. Encourage participation by calling on all pupils, not only those superior ones or those you know. Use the class lists for this purpose.
- D. Encourage pupils to think. Pupils are therefore to react in writing prior to reciting. This is especially important in the inductive groups.
- E. Under no circumstances should pupils be informed that an 'experiment' is being performed.
- F. Follow the prepared lessons and the workbook material carefully.

Teachers of the Deductive Classes

- A. Transmit meaningfully the substantive content of each lesson. Explain, relate and interpret, clarify, and illustrate the concepts to be learned.
- B. Provide a broad and complete introduction of what the lesson will encompass and summarize the salient points at the conclusion of each lesson.
- C. After the concepts have been presented through the verbal exposition, instruct pupils to apply them in the exercises provided and to verbalize them.
- D. Review the prerequisite concepts of the preceding lesson.

Teachers of the Inductive Classes

- A. Guide the pupils in discovering the concepts of each lesson. Present the problem and keep attention focussed on the examples and instances.
- B. Have pupils review prerequisite concepts of preceding lesson.
- C. Answer questions of fact but turn other questions back to the class for concepts are to be arrived at by the pupils. Although accepting all responses as attempts to contribute, do not leave the impression that an incorrect response was correct.
- D. After pupils react to examples and write their discoveries, have them verbalize the concepts in discussions and recitations. Pupils should summarize the salient concepts at lesson's conclusion.

Sequence of Experimental Lessons

1. The morpheme defined
2. The morpheme - free, bound, bound base
3. The noun paradigm
4. Noun plurals, noun possessive
5. The verb paradigm: pres., past, pres. part.
6. The verb paradigm; past. part., aux.
7. The comparable paradigm
8. Word formation
9. Determiners
10. Prepositions
11. Noun clusters
12. Verb clusters
13. Sentence pattern #1
14. Sentence pattern #2
15. Sentence pattern #3
16. Sentence pattern #4
17. Sentence pattern #5
18. Sentence pattern #5 passive form
19. Sentence pattern #6
20. Sentence pattern #7

APPENDIX 4

CRITERION MEASURE, ANSWER SHEETS
AND QUESTIONNAIRE

APPENDIX 4

CRITERION MEASURE, ANSWER SHEETS AND QUESTIONNAIRE

Criterion Measure

Recognition Section

Part I

1. An example of a word containing two morphemes is
 - A. mahogany
 - B. capsize
 - C. rainy
 - D. man
2. A word containing two bound morphemes is
 - A. doctors
 - B. intervene
 - C. antedate
 - D. preview
3. HANG is the meaning of the underlined portion of which word?
 - A. impending
 - B. suicide
 - C. elect
 - D. mortuary
4. A paradigm is illustrated by which group of words?
 - A. talked, fixed, learned
 - B. brother, sister, carpenter
 - C. friendly, sweeter, nearest
 - D. cloud's clouds, clouds'
5. Using membership in a paradigm as a test, what should AGONIZE be called?
 - A. noun
 - B. verb
 - C. adverb
 - D. noun or verb

6. The poorest way to determine singularity or plurality is to examine the
- A. pronouns that may be substituted
 - B. form of the word
 - C. modifiers of the noun
 - D. letters at the end of the noun
7. OBJECT OF THE ACT is the relationship that exists between the possessive noun and the one that follows in
- A. John's flight
 - B. Picasso's painting
 - C. Tom's football
 - D. Jim's punishment
8. The addition of the morpheme s' forms the possessive plural of
- A. woman
 - B. cattle
 - C. pliers
 - D. table
9. Acronymy is the process of word formation whereby
- A. two words are fused into one
 - B. a word is formed from the initials or beginning parts of a series of words
 - C. a part of a word stands for the whole word
 - D. a word is formed from a word that looks like it
10. Which of the following words illustrates a process of word formation known as clipping?
- A. bus
 - B. smog
 - C. spurt
 - D. gasoline
11. Which of the following may be used as a noun substitute?
- A. their
 - B. her
 - C. his
 - D. our

12. Which headline is least confusing?
- A. TIME FLIES
 - B. CONFLICT IN ASIA
 - C. SHIP SAILS TODAY
 - D. JOHNSON REPORTS OPEN MEETING
13. The confusion of the meaning of UNION DEMANDS INCREASE can be corrected by adding
- A. punctuation marks
 - B. determiners
 - C. modifiers
 - D. small letters
14. Which sentence contains a preposition?
- A. The paint bucket fell off.
 - B. They haven't seen him since.
 - C. She placed the dishes upon the shelf.
 - D. The soldier is following orders.
15. What is the headword of the following cluster: ALL THE YOUNG CHILDREN OF THE ELEMENTARY SCHOOL IN BEDFORD
- A. young
 - B. children
 - C. school
 - D. Bedford
16. What is the headword of the following cluster: THE GENIAL MILK INSPECTOR ON MY RIGHT WHO WAS SMOKING A PIPE
- A. genial
 - B. inspector
 - C. was smoking
 - D. pipe
17. What is the headword of the following cluster: SOON RETURNED THE BOOK HE HAD BORROWED
- A. soon
 - B. returned
 - C. book
 - D. borrowed

18. What statement is NOT true of sentence pattern #1?
(N be ADJECTIVE)

- A. The verb is self-sufficient and can stand alone.
- B. The noun is tied to the verb.
- C. It is capable of the expansion, "That food is good - That good food is very good."
- D. The verb often has a meaning something like "be described as".

Read directions before continuing. Questions #19 - #26 are based on the following sentence patterns:

- A. Pattern #1 N be ADJECTIVE
- B. Pattern #2 N be ADVERB
- C. Pattern #3 N be NOUN
- D. Pattern #4 N INTRANSITIVE VERB

Use the letters A, B, C, or D to indicate what pattern is represented by each sentence.

- 19. Your concert was wonderful.
- 20. Harriet was here a moment ago.
- 21. The archers were not successful hunters.
- 22. The frogs were croaking in the marsh.
- 23. My uncle is the worst bridge player in town.
- 24. The pickles are near the sandwiches.
- 25. He has always been a serious boy.
- 26. They were roommates for three years.

A. Pattern #5 N¹ TRANSITIVE VERB N²
B. Pattern #6 N¹ TRANSITIVE VERB N² N³
C. Pattern #7 N¹ TRANSITIVE VERB N² N²
(N² here includes variations)
D. A sentence in the passive voice

27. The rancher told his guests a tall tale.
28. Jerry thought the proposal a mistake.
29. The Romans won the first battle.
30. The board elected Mr. Stoopnagel the president.
31. Dancing is liked by most teenagers.
32. The director found him a new costume.
33. The coach designated Joe the new manager of the team.
34. A new house was built on the lake by the Smiths.
35. We considered his offer a fine gesture.

This concludes Part I of the examination. If you have time remaining check over your work. Be certain that you have attempted every question and that you have attempted every question and that you have properly marked the answer sheet. Turn in both the question sheets and the answer sheet.

Criterion Measure
Recognition Section
(Answer Sheet)

Name (print clearly) _____

Teacher _____

Circle one:

Section: A B C D E F G H I

Part I

Directions: Each question contains four possible answers. One of these is most true or most correct. Select the answer that you think is correct and completely blacken the corresponding letter. Answer every question. If you are not sure of the answer, take a good guess.

- | | | | |
|-------------|-------------|-------------|-------------|
| 1. A B C D | 11. A B C D | 21. A B C D | 31. A B C D |
| 2. A B C D | 12. A B C D | 22. A B C D | 32. A B C D |
| 3. A B C D | 13. A B C D | 23. A B C D | 33. A B C D |
| 4. A B C D | 14. A B C D | 24. A B C D | 34. A B C D |
| 5. A B C D | 15. A B C D | 25. A B C D | 35. A B C D |
| 6. A B C D | 16. A B C D | 26. A B C D | |
| 7. A B C D | 17. A B C D | 27. A B C D | |
| 8. A B C D | 18. A B C D | 28. A B C D | |
| 9. A B C D | 19. A B C D | 29. A B C D | |
| 10. A B C D | 20. A B C D | 30. A B C D | |

Criterion Measure

Transfer Section

Part II

Directions: This part of the examination uses nonsense language to test your knowledge of structure. Study each question carefully before selecting your answer. Although the words have no meaning, their structure will lead you to the correct choice.

Questions #1 - #10 are based on the sentence patterns below. Use the corresponding letters to designate the pattern of each sentence:

- A. Pattern N be Adjective
- B. Pattern N be Adverb
- C. Pattern N be Noun
- D. Pattern N Intransitive verb

1. His yap were yaply.
2. He always dobbed dippitly.
3. Three woggles were the woolest woopers.
4. The vips were in that vooper for vorge vitants.
5. The higgs of the repil were repimmerful.
6. The tilk's toggles were the toggs of the tistern tentry.
7. The zad of the zing zaggage had been tersive that mugus mart.
8. Many rabbages rabbed rabbily during the ribber rester.
9. Although capping capers, Cap was not a coop cipper.
10. Winkums which link in the ink are on the winkums.

Questions #11 - #20 are based on the sentence patterns below. Use the corresponding letters to designate the pattern of each sentence:

- A. Pattern N¹ Transitive Verb N²
- B. Pattern N¹ Transitive Verb N² N³
- C. Pattern N¹ Transitive Verb N² N² (and variations)
- D. A sentence pattern in the passive voice.

11. John, silk the rilK.
12. The wog wiggd the wigg two wolly giggs.
13. The prantic prassers proffered Frike those prills.
14. The glutest gluters were glurring their gluly glums between glump and glemp.
15. A smuggger smigged three smooogs and three smooogs were smiggen by a smuggger. (REFER ONLY TO THE UNDERLINED PART.)
16. The platter pleated John many pleams.
17. The boing goinged Bing the goinger of the blong.
18. The Faddies had findled many fuddles during three fedders.
19. His blantly blimp blumpted their blurs.
20. The mooders meened his moons a miller mall.

Directions: Read each nonsense sentence carefully and study the four choices. One of these is most true based on the sentence given.

21. The droozes between way and forla were groopest on the gribber bide.
 - A. all droozes bide
 - B. way and foral were groopest
 - C. groop droozes were bides
 - D. groop droozes were on the gribber bide
22. my pam's lerka was keeding a kiddo on the medan near the pander.
 - A. my pam's lerka was keeded near the pander
 - B. the pander is close to the medan
 - C. it was on the pander that my lerka was keeding a kiddo
 - D. the kiddo was keeded by my pander

23. The wickle in Joann's vort vealed a resious rester during the penter of the denter.
- A. during the penter a wickle vealed a rester
 - B. John's vort vealed a rester
 - C. the wickle vealed a resious
 - D. John's vot has a resious wickle
24. The libber litted libbily.
- A. a libber litted
 - B. it is possible to litt in a libbily way
 - C. the litting is over
 - D. all of the above
25. All mimsy were the borogoves
And the mome raths outgrabe. (Poetic lines)
- A. the borogoves and raths outgrabe
 - B. the borogoves and the mome were mimsy
 - C. all mimsy were the raths
 - D. the borogoves were mimsy and the raths outgrabe
26. The yappers have dellen Kom monner of the mips.
- A. the yappers delled the mips
 - B. Kom was dellen by the mips
 - C. Kom is now a monner
 - D. Kom delled the yappers
27. Mot's manims were handily hasting those jumpors in the rabbel above the panchim.
- A. jumpors belong to Mot
 - B. the panchim is located ahead of the jumpors
 - C. the jumpors were hasted handily by manims
 - D. manims dislike rabbels
28. Several semmers of the seam were in the stinnest sim to snee the snupper snooters.
- A. semmers were sims
 - B. semmers snee snappers
 - C. seam snee snooters
 - D. semmers snee snooters

29. Rilk the tilks of the bilks, Filk.

- A. bilks have little to do with tilks
- B. tilks can rilk
- C. bilks can rilk
- D. Filk can rilk

30. Hatto's wank was the limest want of the macers.

- A. Hatto owned limmers
- B. all wanks are the same
- C. wanks are macers
- D. Hatto was the limest

The examination is over. If time remains, check your answer sheet carefully. Be certain you have answered every question. If you changed an answer, erase your first answer thoroughly.

Criterion Measure

Transfer Section

(Answer Sheet)

Name _____

Teacher _____

Circle one:

Section: A B C D E F G H I

Part II

Directions: Each question contains four possible answers. One of these is most true or most correct. Select the answer that you think is correct and completely blacken the letter corresponding to the answer you have chosen. Answer every question. If you are not sure of the answer, take a good guess.

- | | | |
|-------------|-------------|-------------|
| 1. A B C D | 11. A B C D | 21. A B C D |
| 2. A B C D | 12. A B C D | 22. A B C D |
| 3. A B C D | 13. A B C D | 23. A B C D |
| 4. A B C D | 14. A B C D | 24. A B C D |
| 5. A B C D | 15. A B C D | 25. A B C D |
| 6. A B C D | 16. A B C D | 26. A B C D |
| 7. A B C D | 17. A B C D | 27. A B C D |
| 8. A B C D | 18. A B C D | 28. A B C D |
| 9. A B C D | 19. A B C D | 29. A B C D |
| 10. A B C D | 20. A B C D | 30. A B C D |

Questionnaire

Name _____

Teacher _____

Circle one: Section A B C D E F G H I

Directions: Read each statement carefully and check the line under the word(s) which best expresses your feeling.

STATEMENT	STRONGLY AGREE	AGREE	UNCERTAIN	DISAGREE	STRONGLY DISAGREE
1. Pupils think for themselves when studying structural grammar.	_____	_____	_____	_____	_____
2. Studying grammar is boring.	_____	_____	_____	_____	_____
3. You have to be smart to learn the grammar of a language.	_____	_____	_____	_____	_____
4. Pupils appreciate their language more after studying its structure.	_____	_____	_____	_____	_____
5. The study of grammar gives a person confidence in his ability to learn.	_____	_____	_____	_____	_____
6. Language structure gets confusing after studying grammar for awhile.	_____	_____	_____	_____	_____
7. Pupils think more about their language after studying grammar.	_____	_____	_____	_____	_____
8. It is hard to see the "tie" between structural grammar and the sentences we read and write.	_____	_____	_____	_____	_____

STATEMENT	STRONGLY AGREE	AGREE	UNCERTAIN	DISAGREE	STRONGLY DISAGREE
9. Structural grammar is a difficult subject to study.	_____	_____	_____	_____	_____
10. The study of struc- tural grammar is interest- ing.	_____	_____	_____	_____	_____

APPENDIX 2

TABLES SHOWING ANALYSIS OF VARIANCE OF THE DIFFERENCES
BETWEEN MEANS OF THE TREATMENT AND THE
CONTROL GROUPS

APPENDIX 5

Table XXI.-

Analysis of Variance of the Difference Between the Means
of the Treatment and Control Groups on the Total Score
of the Immediate Criterion Measure.

Source of Variation	Sum of Squares	df	Variance Estimate	F
Main Effects				
A - Treatment	11714.92	2	5857.46	161.68**
B - Ability	8455.54	2	4227.77	73.39**
C - Sex	415.37	1	415.37	7.21*
Interactions				
A x B	2174.85	4	543.71	9.43*
A x C	204.88	2	102.44	1.77
B x C	78.32	2	39.16	.67
A x B x C	152.36	4	38.09	.66
Within Cells	13248.46	230	57.60	

** F .01.

* F .05.

Table XXII.-

Analysis of Variance of the Difference Between the Means
of the Treatment and Control Groups on the Recognition
Section of the Immediate Criterion Measure.

Source of Variation	Sum of Squares	df	Variance Estimate	F
Main Effects				
A - Treatment	4241.93	2	2120.96	100.17**
B - Ability	2208.97	2	1104.48	52.16**
C - Sex	32.40	1	32.40	1.53
Interactions				
A x B	546.92	4	136.73	6.45*
A x C	91.58	2	45.79	2.16
b x C	13.17	2	6.58	.31
A x B x C	69.17	4	17.29	.81
Within Cells	4869.93	230	21.17	

**p .01.

*p .05.

Table XIII.-

Analysis of Variance of the Difference Between the Means
of the Treatment and Control Groups on the Transfer
Section of the Immediate Criterion Measure.

Source of Variation	Sum of Squares	df	Variance Estimate	F
Main Effects				
A - Treatment	1875.86	2	937.93	57.72**
B - Ability	2047.98	2	1023.99	63.01**
C - Sex	215.62	1	215.62	13.26*
Interactions				
A x B	562.70	4	140.67	8.65*
A x C	24.75	2	12.37	.76
B x C	29.96	2	14.98	.92
A x B x C				
Within Cells	3737.41	230	16.24	

** P .01.

* P .05.

APPENDIX 6

TABLES SHOWING MEANS AND STANDARD DEVIATIONS OF
EXPERIMENTAL CELLS ON THE CRITERION MEASURE
AND QUESTIONNAIRE

APPENDIX 6

Table XXIV.-

Means and Standard Deviations of Experimental Cells on the Recognition Section of the Immediate Criterion Measure.

Cell Designation*	Number	Mean	Standard Deviation
1. Ind-Bel-M	12	12.33	3.60
2. Ded-Bel-M	14	12.92	3.57
3. Ind-Ave-M	12	16.33	4.63
4. Ded-Ave-M	12	16.08	4.17
5. Ind-Abo-M	14	24.67	4.65
6. Ded-Abo-M	13	20.69	7.19
7. Ind-Bel-F	14	14.92	5.40
8. Ded-Bel-F	13	14.00	6.08
9. Ind-Ave-F	16	20.56	5.02
10. Ded-Ave-F	17	15.00	3.23
11. Ind-Abo-F	14	20.65	4.90
12. Ded-Abo-F	14	21.42	5.43

- * Ind - Inductive
- Ded - Deductive
- Bel - Below Average
- Ave - Average
- Abo - Above Average
- M - Male
- F - Female

Table XXV.-

Means and Standard Deviations of Experimental Cells on the Transfer Section of the Immediate Criterion Measure.

Cell Designation*	Number	Mean	Standard Deviation
1. Ind-Bel-M	12	9.16	3.97
2. Ded-Bel-M	14	7.92	3.08
3. Ind-Ave-M	12	13.75	4.38
4. Ded-Ave-M	12	12.75	3.03
5. Ind-Abo-M	14	19.57	4.18
6. Ded-Abo-M	13	16.30	5.78
7. Ind-Bel-F	14	12.07	2.98
8. Ded-Bel-F	13	10.84	2.24
9. Ind-Ave-F	16	15.12	3.96
10. Ded-Ave-F	17	12.76	3.54
11. Ind-Abo-F	14	23.57	3.92
12. Ded-Abo-F	14	18.07	6.50

- * Ind-Inductive
- Ded-Deductive
- Bel-Below Average
- Ave-Average
- Abo-Above Average
- M -Male
- F -Female

Table XXVI.-

Means and Standard Deviations of Experimental Cells on the Total Score of the Immediate Criterion Measure.

Cell Designations*	Number	Mean	Standard Deviation
1. Ind-Bel-M	12	21.50	5.70
2. Ded-Bel-M	14	20.87	5.86
3. Ind-Ave-M	12	32.08	8.35
4. Ded-Ave-M	12	30.83	6.28
5. Ind-Avo-M	14	43.64	8.35
6. Ded-Avo-M	13	37.00	12.47
7. Ind-Bel-F	14	27.86	7.69
8. Ded-Bel-F	13	24.84	7.39
9. Ind-Ave-F	16	35.68	8.46
10. Ded-Ave-F	17	27.76	5.93
11. Ind-Avo-F	14	50.07	7.95
12. Ded-Avo-F	14	39.50	10.76

- * Ind - Inductive
- Ded - Deductive
- Bel - Below Average
- Ave - Average
- Abo - Above Average
- M - Male
- F - Female

Table XXVII.-

Means and Standard Deviations of Experimental Cells on the Recognition Section of the Delayed Criterion Measure.

Cell Designation*	Number	Mean	Standard Deviation
1. Ind-Bel-M	12	11.00	2.94
2. Ded-Bel-M	14	11.35	3.43
3. Ind-Ave-M	12	16.50	4.78
4. Ded-Ave-M	12	17.66	3.74
5. Ind-Abo-M	14	24.07	5.65
6. Ded-Abo-M	13	19.92	7.09
7. Ind-Bel-F	14	17.21	4.17
8. Ded-Bel-F	13	13.38	4.44
9. Ind-Ave-F	16	19.62	5.50
10. Ded-Ave-F	17	14.64	4.37
11. Ind-Abo-F	14	26.78	5.29
12. Ded-Abo-F	14	21.50	5.55

* Ind - Inductive
 Ded - Deductive
 Bel - Below Average
 Ave - Average
 Abo - Above Average
 M - Male
 F - Female

Table XXVIII.-

Means and Standard Deviations of Experimental Cells on the Transfer Section of the Delayed Criterion Measure.

Cell Designations*	Number	Mean	Standard Deviation
1. Ind-Bel-M	12	9.33	3.22
2. Ded-Bel-M	14	7.42	2.92
3. Ind-Ave-M	12	14.41	4.71
4. Ded-Ave-M	12	13.25	3.00
5. Ind-Abo-M	14	19.07	4.89
6. Ded-Abo-M	13	16.15	5.90
7. Ind-Bel-F	14	11.92	4.57
8. Ded-Bel-F	13	9.76	2.60
9. Ind-Ave-F	16	16.75	4.96
10. Ded-Ave-F	17	11.23	3.09
11. Ind-Abo-F	14	21.50	4.67
12. Ded-Abo-F	14	17.57	5.03

- * Ind - Inductive
- Ded - Deductive
- Bel - Below Average
- Ave - Average
- Abo - Above Average
- M - Male
- F - Female

Table ANIX.--

Means and Standard Deviations of Experimental Cells on the
Total Scores of the Delayed Criterion Measure.

Cell Designation*	Number	Mean	Standard Deviation
1. Ind-Bel-M	12	26.33	5.02
2. Ded-Bel-M	14	18.78	5.45
3. Ind-Ave-M	12	30.91	3.15
4. Ded-Ave-M	12	30.01	5.23
5. Ind-Abo-M	14	43.14	9.86
6. Ded-Abo-M	13	36.07	12.38
7. Ind-Bel-F	14	29.14	8.06
8. Ded-Bel-F	13	23.15	6.28
9. Ind-Ave-F	16	36.50	9.88
10. Ded-Ave-F	17	25.88	6.26
11. Ind-Abo-F	14	48.14	8.50
12. Ded-Abo-F	14	39.07	9.69

* Ind - Inductive
Ded - Deductive
Bel - Below Average
Ave - Average
Abo - Above Average
M - Male
F - Female

Table XX.-

Means and Standard Deviations of Experimental Cells on the Questionnaire.

Cell Designation*	Number	Mean	Standard Deviation
1. Ind-Bel-M	12	15.41	4.19
2. Ded-Bel-M	14	16.42	2.77
3. Ind-Ave-M	12	15.91	3.06
4. Ded-Ave-M	12	15.25	3.39
5. Ind-Abo-M	14	16.26	2.40
6. Ded-Abo-M	13	14.84	3.41
7. Ind-Bel-F	14	16.71	1.90
8. Ded-Bel-F	13	16.15	1.95
9. Ind-Ave-F	16	15.87	2.95
10. Ded-Ave-F	17	15.29	2.05
11. Ind-Abo-F	14	16.50	2.87
12. Ded-Abo-F	14	15.57	1.63

- * Ind - Inductive
- Ded - Deductive
- Bel - Below Average
- Ave - Average
- Abo - Above Average
- M - Male
- F - Female

APPENDIX 7

ABSTRACT OF

An Experimental Comparison of Inductive and Deductive
Methods of Teaching Concepts of Language Structure

APPENDIX 7

ABSTRACT CP

An Experimental Comparison of Inductive and Deductive Methods of Teaching Concepts of Language Structure¹

The state of the empirical research concerning the effectiveness of inductive (discovery) and deductive (didactic expository) methods precludes firm conclusions, and the meager research evidence has not contributed substantially to the formulation of a theory of instruction. The beginning of classroom experimentation illustrates the need to study the nature and conditions of these procedures in a qualitatively different and more complex milieu than exists in the laboratory setting in order to derive data more serviceable for educational recommendations. It is out of this need for research evidence that contributes to instructional theory and provision of a paradigm for further classroom experimentation that the present investigation has evolved.

The specific questions which the research proposes to answer are: (1) which method, the inductive or deductive, will produce significantly higher scores on a recognition and transfer criterion measure administered immediately after termination of instruction and two weeks later, and (2) will

¹ Malcolm F. Rizzuto, doctoral thesis presented to the Faculty of Education of the University of Ottawa, Ontario, August 1968, xxxi-273 p.

there be interaction involving sex, ability, and treatment factors on the same criterion.

The subjects were 248 pupils in grade eight of the Fox Lane Middle School in Bedford, New York. Six teachers, randomly selected and assigned, administered the experimental treatment which consisted of twenty lessons dealing with language structure concepts. Each lesson was forty-five minutes maximum duration and the total period lasted five weeks. Subjects were stratified by sex and ability as determined by verbal scores on the School and College Ability Test and randomly assigned to the inductive, deductive, or control group. The control group did not receive the experimental treatment.

The inductive method was defined as the presentation of a structured sequence of specific instances or exemplars from which the learner was to discover and verbalize principles, rules, or concepts. The deductive method was defined as the didactic verbal exposition of the principle, rule, or concept which the learner was to verbalize and apply to instances or exemplars.

Prior to the experiment, the teachers entered a training program which included teaching and pretesting all material with non-experimental groups. During the actual experiment, each teacher was video-taped on two occasions to determine how closely the methods were adhered to and

differentiated. Immediately after termination of instruction, all subjects were administered a recognition and transfer of learning criterion measure. An ancillary questionnaire assessing attitude toward the content of the lessons was also given to the experimental subjects. The final form of the immediate criterion measure yielded a reliability coefficient of .875 for the recognition section and .864 for the transfer of learning section.

It was hypothesized that there would be no significant differences in the mean scores of the subjects taught inductively and those taught deductively ($p < .05$) and that there would be no interaction involving treatment, ability, and sex factors on either the immediate or delayed criterion measures. The independent variables were treatment, verbal ability, and sex; the dependent variables were the immediate and delayed criterion measures. A three-way analysis of variance design was used to test the difference between the means. There were eighty-two students in the inductive group, eighty-three in the deductive group, and eighty-three in the control group.

The significant treatment main effect of the analysis of variance and subsequent calculation of Dunnett's test indicated superiority of each treatment group over the control group and provided conclusive evidence that the experimental lessons taught concepts not already available to the subjects.

The inductive method was superior to the deductive method for each of the recognition, transfer, and total score variables of the immediate test ($p < .01$), and the absence of any interactions allowed for a straightforward interpretation of the main effect. The delayed criterion corroborated the findings produced by the significant main effects of the immediate test since the inductive method was superior for each variable at the .01 level. However, a significant interaction ($p < .05$) involving treatment and sex for the recognition section and total score variable prevented a straightforward interpretation of the main effect.

It was concluded that within the limits of the present investigation subjects of the inductive method were superior to those of the deductive in recognizing and transferring concepts of language structure immediately after termination of instruction, and this superiority was evidenced two weeks later. Though no interactions existed on the immediate test, the inductive method was found to be more effective with female subjects on the delayed test regardless of ability level.

An Experimental Comparison of Inductive and Deductive
Methods of Teaching Concepts of Language Structure

M. Virginia Keith
University of Ottawa
Malcolm F. Rizzuto
Bedford Public Schools
Bedford, New York

Commensurate with the change from a child and society centered curriculum to a discipline centered curriculum has been a fundamental alteration of the teaching-learning process. The deductive approach of didactic exposition has been challenged by a problem solving approach with emphasis on inductive procedures. In spite of this, the research evidence is meager and there exists a dearth of controlled classroom experimentation dealing with the inductive-deductive hypothesis.

The present state of research suggests that deductive procedures result in greater initial learning and retention (Grote (3), Guthrie (4), Haslerud (5) and Wittrock (9)), while discovery experience supplemented by guidance in the form of prompts or verbal cues invariably facilitates greater transfer of learning (Craig (1), Gagne and Brown (2), Kittell (6), Ray (7), and Rowlette (8)). However, principles have seemingly been uncritically extrapolated and claims have not been empirically substantiated. What remains is a series of hypotheses instead of a body of research, and this has led to a highly tentative theory of instruction.

If instruction theory is to offer principles which prescribe

stimuli that optimize learning, than experimentation must make available alternatives each of which attempts to improve learning. Up to now, inductive procedures have been pitted against generally unacceptable and outmoded instructional practices. In the present investigation, both the discovery and didactic expository methods are optimized in the teaching and learning of concepts of language structure, and their effectiveness is compared. Specifically, the research purports to answer the questions: (1) which method, the inductive or the deductive, will produce significantly higher mean scores on a recognition and transfer criterion measure administered immediately after termination of instruction and two weeks later, and (2) will there be interaction involving ability, sex, and method factors.

Design

The present experiment employed an analysis of variance for a $2 \times 3 \times 2$ factorial experiment. For the study 165 eighth grade pupils were stratified by sex and ability and randomly assigned to the inductive or deductive treatment group, the latter serving as the control. The comparison, in other words, was between the discovery treatment of the inductive group and the didactic expository method that filled the same time interval. To verify learning as a direct result of the treatment and to illustrate the difficulty of achieving on the criterion measure without exposure to the lessons, a third group was formed. This group was administered only

the immediate criterion measure.

After exposure to the inductive and deductive teaching treatment, which consisted of twenty lessons of forty-five minutes duration and covered a five week period, all Ss were administered a recognition and transfer criterion measure. Two weeks later the experimental groups were administered the same measure .

Three class units made up the inductive group, and similarly, three units comprised the deductive. Each class contained Ss of both sexes at each of three ability levels. Six teachers were randomly selected and assigned, one to each of these class units. To verify adherence to the treatment, each experimental teacher was video-taped on two occasions, once during the first two weeks and once during the last two weeks of the experiment.

Hypotheses

Four hypotheses were tested:

1. There will be no significant differences in the scores on the recognition and transfer criterion measure between the subjects taught by the inductive method and those taught by the deductive method administered immediately after termination of instruction.
2. There will be no interaction involving method, ability, or sex as determined by the recognition and transfer criterion measure administered immediately after the termination of instruction.
3. There will be no significant differences in the scores on the recognition and transfer criterion measure between the subjects taught by the inductive method and those taught by the deductive method administered two weeks after the termination of instruction.

4. There will be no interaction involving method, ability, or sex as determined by the recognition and transfer criterion measure administered two weeks after termination of instruction.

Subjects

To examine interaction effects and make possible a more thorough exploration of the findings, Ss were stratified according to sex and verbal ability levels as determined by local norms derived from the verbal subtest of the School and College Ability Test (S.C.A.T.). The subtest, involving as it does Ss' ability to comprehend sentence sense and attach meaning to isolated words, was acceptable as an independent measure since it was directly related to the treatments which taught morphological and syntactical concepts.

That the Ss of the present investigation exceed national averages in verbal ability is seen in Table 1. Of special note is the fact that the local median approximated the 75th %ile, nationally.

An average S was one whose converted score placed him between the 35th %ile and 65th %ile on local norms. This designation required a converted raw score in the interval 269 - 280. The national percentile bands corresponding to 269 and 280 are 56 - 73 and 82 - 93 respectively. Scores above and below the 65th %ile and 35th %ile designated the S as above or below average in verbal ability.

TABLE 1.-NATIONAL AND LOCAL NORMS OF VERBAL SECTION
OF SCHOOL AND COLLEGE ABILITY TESTS

	National Norms	Local Norms
Median	263	274.3
Upper Quartile	274	283.2
Lower Quartile	254	264.7
Mean	263	273.5
Standard Deviation	14	14.1

Treatment

The inductive method was defined as the presentation of a structured sequence of specific instances or exemplars from which the learner was to discover and verbalize the concept. Inherent here was the presentation of a stimulus situation consisting of carefully selected observable facts that were specific instances of a concept class.

At the outset, the teacher had only to pose the linguistic topic of the lesson and focus the learner's attention on the problem. As the lesson progressed, the teacher asked open-ended unanswered questions which prompted and guided pupils in making discoveries. When necessary, the teacher supplied information, but communication among the Ss was emphasized rather than teacher-student dialog. In essence, the teacher's function was that of a catalyst, insuring that learners engaged in the process of inquiry and supporting and guiding them in understanding and communicating their perceptions without assuming the stance of an authority figure. It was assumed that to a greater or lesser degree Ss participated in such covert behavior of discovery learning as hypothesizing, performing internal trial and error, observing, thinking multiply, and moving from lower to higher order abstractions.

The deductive method was defined as the didactic verbal exposition of the concept which the learner was to verbalize and apply to instances or exemplars. The stimulus situation was a

precise and accurate verbal exposition by the teacher of the substantive concepts in their final form. Inherent in the presentation of the potentially meaningful concepts was the teacher's delineation of similarities and differences between related concepts, and explanations, interpretations, clarifications, and illustrations of the concepts. In transmitting the concepts, the teacher was supportive and helped the pupils to verbalize the concepts.

The learner was to comprehend the verbal exposition and grasp the abstractions and then to identify, relate, and apply these to the exercises. His verbalizations enabled him to translate the concepts into a personal frame of reference.

The treatment lessons represented a phase of the language arts curriculum actually taught, and the total sequence was long enough to produce cumulative learnings. Ss of both experimental groups received identical content for separate workbooks written for each method and detailed lesson plans written for the experiment were the only sources of subject matter. These also served to control practice effect and further differentiated treatments.

Criterion Measure

The criterion measure constructed for this investigation consisted of a thirty-five item multiple choice test of recognition (Part I) and a thirty item multiple choice test of transfer of learning (Part II). The recognition section yielded a reliability

coefficient of .875 and the transfer section a reliability coefficient of .864. In both instances these were based on an odd-even split half test for the 165 Ss who comprised the experimental groups.

Ten of the recognition items were concerned with morphology, twenty-two with syntax, and three were of a miscellaneous nature. Eighteen items were of the traditional multiple choice variety. That is, each stem was followed by four different possible responses. Seventeen items deviated slightly from this construction. To test recognition of syntax concepts, the stem of these items were followed by the same groups of responses, four basic sentence patterns.

The strategy employed in the transfer section was the use of nonsense sentences for which the Ss had to transfer concepts of language structure. The first group of items consisted of nonsense sentences for which the S had to designate the particular pattern. The second involved interpretation of nonsense sentences. The examinee was told that one of the responses was true based on the sentence.

The interrelationship that existed between the recognition and transfer sections of the criterion measure was evidenced by the .782 correlation on the immediate administration and the .806 of the delayed test. The correlation between the immediate and delayed tests was .922 based on the total score variable.

Results

Before proceeding with the analyses of variance, Bartlett's test of homogeneity was calculated. The obtained value of 2.86 was not significant at the .05 level. As a result, it was concluded that the samples were not heterogeneous in variance. In addition, Dunnett's test for comparisons of treatments with a control established that the mean scores of the experimental groups were significantly high than the control. It was then possible to turn to the important questions of the investigation.

Six $2 \times 3 \times 2$ analyses of variance were computed to test the four hypotheses. The obtained F values are presented in Table 2. It can be observed that in each case the treatment main effect, which corresponded to a comparison of the inductive and deductive treatment groups averaged over the three ability levels and the sex levels, was significant at the .01 level. (The .05 level had been specified as the accepted level of significance.) Therefore the hypotheses of no significant differences between methods for the immediate and delayed criterion measures were held untenable. Table 3 reveals that this superiority favored the Ss of the inductive treatment in every case.

The significant ability main effects expected and merely reflected the predetermined stratification of Ss according to ability levels. The main effect of C (sex factor) represented a comparison between males and females averaged over the treatment and ability

TABLE 2.-F VALUES OBTAINED FROM ANALYSES OF VARIANCE

Source of Variation	Immediate Criterion Measure			Delayed Criterion Measure		
	Recognition Section	Transfer Section	Total Score	Recognition Section	Transfer Section	Total Score
Main Effects						
A - Treatment	9.29**	13.14**	13.46**	12.26**	17.83**	17.80**
B - Ability	48.57**	66.36**	69.04**	51.66**	55.55**	64.26**
C - Sex	1.55	10.40**	5.67*	7.00*	4.77*	7.14**
Interactions						
A X B	2.24	2.15	2.47	1.47	.41	.86
A X C	3.17	.79	2.31	5.77*	1.81	4.41*
B X C	.80	1.19	1.19	2.17	1.00	1.83
A X B X C	.59	.23	.31	.83	.82	.89

**p < .01

*p < .05

TABLE 3.-MEANS OF CRITERION MEASURE BY TREATMENT

Criterion	Inductive N=82	Deductive N=83
Immediate Test		
Recognition	19.68	16.91
Transfer	15.73	13.09
Total	35.41	30.01
Delayed		
Recognition	19.44	16.26
Transfer	15.67	12.44
Total	35.15	28.74

levels. Females were superior to males on all but the recognition variable of the immediate criterion. Means for the total score variable favored female Ss 34.01 to 31.93 on the immediate test and 33.51 to 30.10 on the delayed criterion.

The absence of significant F values for the interaction effects on the immediate criterion measure permitted an acceptance of Hypothesis 2. It was concluded that the superiority of the inductive treatment was independent of ability or sex factors on the basis of the immediate criterion. Though this superiority remained independent of the ability factor on the delayed criterion, a significant method by ability (A X C) interaction at the .05 level compelled a rejection of Hypothesis 4. However, this was done so with reservation since the interaction did not appear on the transfer section. From Table 4 it can be observed that the difference is considerably greater for female Ss than the difference between the treatments for the male Ss. The absence of an A X B X C interaction indicated that the treatment by sex interaction was of the same form for the ability factor. It was concluded that after an interval of two weeks the inductive superiority was significantly a function of the female by treatment interaction.

Discussion

The results of this investigation demonstrated that under the conditions set forth the inductive method was superior to the deductive. A consistent pattern of superiority was indicated, pervading

TABLE 4.-MEANS AND MEAN DIFFERENCES FOR TOTAL SCORES ON DELAYED
CRITERION MEASURE BY TREATMENT AND SEX

	Inductive Treatment	Deductive Treatment	Difference
Male	32.04	28.22	3.82
Female	37.83	29.20	8.63

the recognition and transfer section of both the immediate and delayed criterion measures.

One supposition for the inductive superiority rests in the fact that the five week treatment period provided intrinsic rewards for Ss of this group that were not available to the deductive Ss. The daily stimulation of discovery experiences may have accounted for the consistent and active involvement of the learners.

The lengthy treatment period posed a problem of information storage for all Ss. It is conceivable that the inductive Ss who reduced concepts into their own personal verbal constructs would be more efficient at retrieving these. At the same time, this unique verbal behavior could also have served to simplify the concepts thus prompting more efficient recall. In contrast, the deductive Ss were presented concepts in final form although opportunity was given in class to rephrase the concepts. This could not match the inductive experience of regularly recording discoveries of the concepts.

The inductive superiority in the matter of transfer may well have been due to the Ss' more adequate retrieval of their learning and the ability to manipulate these learnings when faced with the challenge of novel problems. Also, transfer tests are generally inductive in nature in the sense that the stimuli are

are unknown. For the inductive S who has had to bring order to the exemplars of the lessons, the confrontation with the nonsense material was in keeping with the ambiguity of the stimuli he met daily when scanning the exemplars. On the other hand, the deductive S may have become anxious at having to deal with the ambiguous stimuli especially since their lessons consisted of clear and precise expositions.

The results of the delayed criterion probably indicated the degree to which Ss had incorporated the concepts into their cognitive structure and how well the learnings were organized within a personal frame of reference. To a certain extent motivation played a part since the second administration test² the Ss' willingness to react to the test a second time when memory loss produced a degree of frustration.

The A X C interaction suggested that females of all ability levels took more advantage of the strengths of the inductive procedures for they were less reticent about verbalizing in class and exchanging ideas. It is conceivable that their greater overt involvement with the material enabled them to recognize concepts with which they had dealt. One possible explanation for the lack of interaction on the transfer section may be that the covert behavior of discovery learning pervaded the whole group. Where novel stimuli existed on the transfer test these covert processes were

apparently more important influences for learning and thus males and females could not be differentiated when their superiority over the deductive counterparts was evaluated.

Finally, classroom experimentation with further manipulation of variables is recommended in order to substantiate the proper place and function of inductive and deductive methods. To the extent that evidence is provided with an overall and pervasive instructional theory be established.

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