

A SUGGESTED RESOURCE UNIT ON LEARNING FOR AN
INTRODUCTORY PSYCHOLOGY COURSE

by 45

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INTRODUCTION

Psychology has long been established as an integral part of many high school curricula but has only recently experienced the growth in popularity that makes its inclusion more nearly the rule rather than the exception.

In keeping with this trend the Shawnee Mission High School District inaugurated a psychology course in the fall of 1966 after routine follow-up interviews with alumni who had gone on to the universities revealed its need.

The psychology course is taught as a separate subject and needs its own organization set forth concretely in curriculum guides and resource units. The apparent dearth of such organized material provides a very real dilemma for the conscientious high school teacher.

Statement of the Problem

The purpose of this resource unit was to provide Shawnee Mission High School District psychology teachers with a set of objectives and outline of content for a unit in learning; a comprehensive group of experiments, demonstrations and other activities; as well as such useful sources of information as books, periodicals, tape recordings and films.

Significance of the Problem

It is essential that the introductory course, which is perhaps the most important one taught in psychology, make the student grasp the meaning of the scientific approach to human nature, thus giving him a correct first-impression of the field of psychology. This course should be planned as a systematic presentation of scientific content rather than stressing immediate practical concerns of the student or appeals to his preconceived ideas about the nature of psychology. It is hoped that such a course would enlighten the student as to his place in the world and help him to meet life's challenges more effectively, but it was never intended to be a course in mental hygiene, personal therapy, or social problems.

For the terminal student, this first course is also his last and will therefore more or less permanently influence his attitudes toward, and give him a lasting impression of, psychology. For the college-bound student, the elementary course will greatly influence his decision to explore this area further or not. The initial course attracts a substantial portion of those students who attend college and decide to major in the field. A personal problems or life-adjustment course is likely to lack appeal for the scientifically-minded student whom the psychologist would like to recruit. This student can make damaging comparisons between his socially oriented psychology course and the systematic rigor of

mathematics and the natural sciences.

It is probable also that personal growth and emotional adjustment are not effectively fostered in a classroom situation, therefore a direct attack upon attitudes and personality problems is likely to be unsuccessful within the scope of a one- or two-semester psychology course.

When the emphasis is properly placed upon the intellectual rather than personal needs of the students, the necessity for organization of material and enhancement of learning activities becomes more urgent. The scientifically oriented resource unit helps to alleviate this urgent need.

Assumptions and Limitations

For the purpose of this report it will be assumed that no controversy exists concerning the question of whether or not psychology is a fit subject for inclusion in a high school curriculum, although some controversy still exists.

The usefulness of this resource unit will be limited to those high school districts where, like the Shawnee Mission District for which it was intended, the administrators have chosen a scientific approach to the subject rather than a social orientation.

Being an individual project, this resource unit necessarily includes only the writer's point of view and thus does

not benefit, as does the usual resource unit, from a variety of contributions.

A further limitation is due to the fact that the writer has not had an opportunity to put the entire resource unit on trial in the classroom.

REVIEW OF THE LITERATURE

Psychology has been in the secondary school curriculum by that title since at least 1895 and possibly before that. Harris¹ maintained that as early as 1910 psychology had been added to the secondary curriculum as an elective in the Kansas schools. By 1933 Pechstein and Broxson² had completed a suggested course content and set forth both major and minor topics to be included in the material for this course. Roback³ pointed out that the subject was commonly taught in the United States prior to our century.

There exists a long-standing controversy concerning the appropriateness of psychology as a high school subject that,

¹R. S. Harris, "Psychology in the High School," School and Community, 25:62-63, 1939.

²L. A. Pechstein and J. A. Broxson, "The Determination of a Course in Psychology for the High School," School Review 41:356-61, May, 1933.

³A. A. Roback, "Psychology in American Secondary Schools in the 90's," American Psychologist, 7:44-45, 1952.

in Elder's⁴ opinion, is still an unresolved issue although Lucas⁵ contended that the issue has become little more than an academic question among psychologists who are no longer debating about it.

Among those who have made a stand in favor of high school psychology are Geisel,⁶ Riddle,⁷ Burgum,⁸ Shannon,⁹ Sheehan,¹⁰ Liddy,¹¹ and Smith.¹² Arguments against the subject at the secondary level have been offered by Stone and Watson,¹³

⁴J. H. Elder, "High School Psychology: An Up-to-date List of Collateral Readings for this Popular Course," Clearing House, 41:308, January, 1967.

⁵Ann F. Lucas, "Guide to Upgrade the High School Psychology Course," Clearing House, 37:523, May, 1963.

⁶J. B. Geisel, "Mental Hygiene in the High School," Phi Delta Kappan, 20:186-87, February, 1938.

⁷E. M. Riddle, "Psychology by Request," High School Journal, 22:275-77, November, 1939.

⁸L. S. Burgum, "The Value of High School Psychology," School and Society, 52:45-48, July, 1940.

⁹J. R. Shannon, "High School's the Place for a Psychology Course," Clearing House, 17:296-97, January, 1943.

¹⁰Mary R. Sheehan, "Psychology for High Schools," Secondary Education, 11:13, February-March, 1944.

¹¹R. B. Liddy, "Psychology for Secondary Schools," School, 33:476-81, February, 1945.

¹²Victor C. Smith, "Psychology for High School Students," Secondary Education, 13:468-71, November, 1946.

¹³C. P. Stone and G. Watson, "Report of the Committee to Study Problems Connected with the Teaching of Psychology in High Schools and Junior Colleges," Psychological Bulletin, 33:709-14, November, 1936.

Skaggs,¹⁴ Mikesell,¹⁵ Ransom,¹⁶ and Kogan.¹⁷ A 1959 questionnaire by Engle¹⁸ to randomly selected members of the American Psychological Association, Division 2 brought 100 responses, 10% of which expressed the opinion that psychology should not be taught in high school.

Pechstein and Broxson¹⁹ reported results of a questionnaire survey showing that a majority of high school principals of Utah either offered or favored offering a course in psychology. Similar results were obtained in two state surveys by Bjork²⁰ and Burgum.²¹ Harris²² testified to the increasing popularity of the course in his high school. A 1937 American Psychological Association Committee to Study Problems Connected

¹⁴E. B. Skaggs, "Psychological Studies in the Grades and High School," School and Society, 46:598-99, November, 1937.

¹⁵W. H. Mikesell, "Psychology in Kansas High Schools," Journal of Applied Psychology, 27:75-82, February, 1943.

¹⁶J. E. Ransom, "Psychology and the School," Phi Delta Kappan, 27:18-20, December, 1945.

¹⁷Nathan Kogan, "Psychology Course in High School," American Psychologist, 12:226-27, 1957.

¹⁸T. L. Engle, "Preparation for Teaching in High School," American Psychologist, 15:353-54, 1957.

¹⁹Pechstein and Broxson, op. cit., p. 358.

²⁰R. Bjork, "Psychology in the High Schools of Montana," Montana Education, 13:10-11, 1937.

²¹Burgum, op. cit., p. 58.

²²Harris, op. cit., p. 63.

with the Teaching of Psychology reported a steady increase in the popularity of psychology in the high school curriculum from 1929-1934. Looking at the other side of the coin however, Skaggs²³ remarked that one seldom finds a psychology course in high school. More recently Engle,²⁴ Smith,²⁵ and Helfant²⁶ have attested to psychology's growth and popularity in the secondary schools.

In 1950 Engle²⁷ reported that only nine states had specific liscensing requirements for high school teachers of psychology, but by 1960²⁸ this number had grown to one-third of the states in which psychology is taught.

A survey of psychology teachers by Engle²⁹ revealed that they have a mean number of 5.04 years of college training.

²³Skaggs, op. cit., p. 598.

²⁴T. L. Engle, "A National Survey of the Teaching of Psychology in High School," School Review, 59:468, 1951.

²⁵M. B. Smith, "Psychology in a Liberal Education," Journal of Higher Education, 22:181-87, 1951.

²⁶Kenneth Helfant, "The Teaching of Psychology in High School: A Review of the Lieterature," School Review, 60:469, 1952.

²⁷T. L. Engle, "The Training and Experience of High School Teachers of Psychology," Educational Administration and Supervision, 38:91, 1952.

²⁸Engle, "Preparation for Teaching in High School," op. cit., p. 354.

²⁹Engle, "The Training and Experience of High School Teachers of Psychology," op. cit., p. 94.

However, Mikesell,³⁰ Skaggs,³¹ Coffield,³² Engle,³³ and Lucas³⁴ have objected to the lack of sufficient training specifically in the area of psychology among teachers of this subject in the high schools.

Engle's 1952 survey³⁵ indicated a tendency for psychology to be taught more commonly in large high schools than in small schools. At least part of the reason for this may be surmised from Skaggs's³⁶ statement that the lack of sufficiently trained teachers is especially a problem in small high schools.

Pechstein and Broxson³⁷ and Engle³⁸ have found that high school psychology is most often offered as an elective for one semester and is usually open only to seniors or to juniors and seniors.

³⁰Mikesell, op. cit., p. 77.

³¹Skaggs, op. cit., p. 599.

³²Kenneth E. Coffield, "Suggested Standards for Teachers of High School Psychology," Bulletin of the National Association of Secondary School Principals, 43:200, 1959.

³³Engle, "Preparation for Teaching in High School," op. cit., p. 355.

³⁴Lucas, op. cit., p. 524.

³⁵Engle, "A National Survey of the Teaching of Psychology in High School," op. cit., p. 470.

³⁶Skaggs, loc. cit.

³⁷Pechstein and Broxson, op. cit., p. 357.

³⁸Engle, op. cit., p. 468.

Of 100 replies to Engle's³⁹ 1959 questionnaire, 48% of the selected APA members said that psychology should be in the science department, 29% thought it should be in the social studies department and 23% felt it could be in either.

There is a tendency for brighter students to enroll in high school psychology courses according to at least one survey. Engle⁴⁰ found that 66.8% of psychology students were from the upper half of their high school classes. Significant sex differences were found with 55.3% of the boys and 73.6% of the girls in the upper half of their classes.

Skaggs,⁴¹ Engle⁴² and Mikesell⁴³ agreed that an important problem to those interested in the teaching of high school psychology was the lack of suitable textbooks. Coffield and Engle⁴⁴ pointed out that an important trend is for teachers to now have a greater selection of textbooks than was formerly the case.

³⁹Engle, "Preparation for Teaching in High School," op. cit., p. 354.

⁴⁰T. L. Engle, "College Plans and Scholastic Standing of Students Taking Psychology in High School," Bulletin of the National Association of Secondary School Principals, 42:93, 1958.

⁴¹Skaggs, loc. cit.

⁴²T. L. Engle, "An Analysis of High School Textbooks in Psychology," School Review, 58:343-44, 1950.

⁴³Mikesell, loc. cit.

⁴⁴Kenneth E. Coffield and T. L. Engle, "High School Psychology: A History and Some Observations," American Psychologist, 15:351, 1960.

There was considerable division of opinion concerning the proper goals or objectives for a psychology course both at the high school and college levels. In one camp were such writers as Skaggs,⁴⁵ Bjork,⁴⁶ Engle,⁴⁷ Harris,⁴⁸ Pitkin,⁴⁹ Mikesell,⁵⁰ Geisel,⁵¹ Pressey,⁵² Faw,⁵³ Berrien,⁵⁴ Castore and Berrien,⁵⁵ Asch,⁵⁶ and Grumman and Gordon⁵⁷ who were generally

⁴⁵Skaggs, op. cit., pp. 598-99.

⁴⁶Bjork, loc. cit.

⁴⁷T. L. Engle, "Psychology -- For Michigan City Seniors," Clearing House, 14:49-51, 1939.

⁴⁸Harris, loc. cit.

⁴⁹Royce S. Pitkin, "Psychology for High School Students?" Progressive Education, 12:251-53, April, 1935.

⁵⁰Mikesell, op. cit., p. 78.

⁵¹John B. Geisel, "Alumni Opinions Concerning a High School Course in Mental Hygiene," Mental Hygiene, 26:419-33, 1940.

⁵²S. L. Pressey, "The Place and Functions of Psychology in Undergraduate Programs," American Psychologist, 4:148-50, 1949.

⁵³V. A. Faw, "A Psychotherapeutic Method of Teaching Psychology," American Psychologist, 4:104, 1949.

⁵⁴F. K. Berrian, "General Education and Psychology," School and Society, 73:353-56, 1951.

⁵⁵G. F. Castore and F. K. Berrien, "A Student Evaluation of a Case Method Course," American Psychologist, 5:149, 1950.

⁵⁶M. J. Asch, "Nondirective Teaching in Psychology," Psychological Monographs, 65:4, 1951.

⁵⁷D. L. Grumman and T. Gordon, "The Counseling Center at the University of Chicago," American Psychologist, 3:166-71, 1948.

agreed that the emphasis should be on self-understanding and understanding of others, with social problems and the problems of personal adjustment being stressed. They believe students should be taught to apply psychological principles to their own lives.

Smith,⁵⁸ Keller and Schoenfeld,⁵⁹ the Wolfle study group,⁶⁰ Young,⁶¹ and Skinner⁶² were writers in an opposing camp whose opinions were in support of a scientifically-oriented psychology course with emphasis upon the presentation of science as a discipline, letting the student make of it what he would for his personal life. Lucas⁶³ reported that Coffield and Elder were of the opinion that the scientific nature of a psychology course should be stressed whether it was taught with emphasis on good emotional adjustment, as a science course with emphasis on the biological, or as a social studies course.

⁵⁸V. C. Smith, op. cit., p. 469.

⁵⁹F. S. Keller and W. N. Schoenfeld, "The Psychology Curriculum of Columbia College," American Psychologist, 4:165-72, 1949.

⁶⁰Dael Wolfle, et al, Improving Undergraduate Instruction in Psychology (New York: The MacMillan Company, 1952), pp. 72-73.

⁶¹K. Young, "Psychology as a General Social Science Course," American Psychologist, 10:25-26, 1955.

⁶²B. F. Skinner, Science and Human Behavior (New York: The MacMillan Company, 1953), p. 52.

⁶³Lucas, loc. cit.

With psychologists and other writers in disagreement about the proper goals for an elementary course, it follows that, as Engle⁶⁴ and Coffield⁶⁵ have avowed, there is no commonly accepted content material for the course. Harper⁶⁶ suggested that the beginning student should be taught the basic facts and of the multiple implications and applications of these facts. In 1950 Engle⁶⁷ wrote his opinion that the present-day emphasis is on problems of personality and mental hygiene. A member of the American Psychological Association, Division 2, responding to a questionnaire from Engle⁶⁸ indicated his view that psychology in high school should be taught essentially the same as it is taught in college. On the other hand, Engle⁶⁹ believes teachers should not consider it necessary to cover the same topics that are usually covered in a college course.

⁶⁴Engle, "An Analysis of High School Textbooks in Psychology," op. cit., p. 344.

⁶⁵Kenneth E. Coffield, op. cit., p. 202.

⁶⁶Robert S. Harper, "The First Course in Psychology," American Psychologist, 7:722-27, 1952.

⁶⁷Engle, op. cit., p. 346.

⁶⁸Coffield and Engle, op. cit., p. 350.

⁶⁹Engle, "Psychology -- For Michigan City Seniors," op. cit., p. 50.

Andrews,⁷⁰ Lucas,⁷¹ Engle,⁷² and Coffield and Engle⁷³

propose the use of laboratory experiments and demonstration devices, stating that these are valuable teaching methods.

In his survey, Mikesell⁷⁴ found that no careful techniques were followed in the teaching of high school psychology.

Lucas⁷⁵ warned against the hazards involved in field trips and discouraged letting students talk about personal problems in class. An article by Birney and McKeachie⁷⁶ quoted Hoban and Ash as supporting the use of films as teaching tools.

A number of experiments have been conducted comparing student-centered and instructor-centered teaching methods with quite different results. Using examination scores as criteria, Faw⁷⁷ obtained better results with student-centered methods

⁷⁰T. G. Andrews, "Demonstrations for the Introductory Course," American Psychologist, 1:313, 1946.

⁷¹Lucas, loc. cit.

⁷²T. L. Engle, "Psychology as a High School Science," The Science Teacher, 22:235, 1955.

⁷³Coffield and Engle, op. cit., p. 351.

⁷⁴Mikesell, op. cit., p. 80.

⁷⁵Lucas, op. cit., p. 528.

⁷⁶Robert Birney and Wilbert McKeachie, "The Teaching of Psychology: A Survey of Research Since 1942," Psychological Bulletin, 52:57-58, 1955.

⁷⁷V. A. Faw, op. cit., p. 107.

while Asch⁷⁸ found instructor-centered methods superior. Using the same criteria, Johnson and Smith,⁷⁹ Bills,⁸⁰ Husbands,⁸¹ and Eglash⁸² found no differences between the two methods. McKeachie,⁸³ reviewing Landsman's doctors' dissertation, also reported that he found no significant difference, however Sheldon and Landsman⁸⁴ found student-centered methods better. Student-centered teaching methods produced high scores on tests of reasoning ability and creativity, a growth in social skills, an increase in empathy, and greater insight and understanding on the Johnson and Smith,⁸⁵ Gibb and Gibb,⁸⁶ Kelley

⁷⁸N. J. Asch, loc. cit.

⁷⁹D. M. Johnson and H. C. Smith, "Democratic Leadership in the College Classroom," Psychological Monographs, 67, No.11, 1953.

⁸⁰R. E. Bills, "An Investigation of Student-Centered Teaching," Journal of Educational Research, 46:313-15, 1952.

⁸¹R. W. Husband, "A Statistical Comparison of the Efficacy of Large Lecture versus Smaller Recitation Sections Upon Achievement in General Psychology," Journal of Psychology, 31:297-300, 1951.

⁸²A. Eglash, "A Group Discussion Method of Teaching Psychology," Journal of Educational Psychology, 45:257-59, 1954.

⁸³W. J. McKeachie, "Student-centered Versus Instructor-Centered Instruction," Journal of Educational Psychology, 45: 144, 1954.

⁸⁴W. P. Sheldon and T. Landsman, "An Investigation of Non-directive Group Therapy with Students in Academic Difficulty," Journal of Consulting Psychology, 14:210-15, 1950.

⁸⁵Johnson and Smith, loc. cit.

⁸⁶Lorraine M. Gibb and J. R. Gibb, "The Effects of the

and Pepiton,⁸⁷ Bovard,⁸⁸ and McKeachie⁸⁹ experiments respectively.

SUGGESTED RESOURCE UNIT ON LEARNING

Overview of a Typical Introductory Psychology Course

The typical content of an elementary psychology course was determined from a survey of the table of contents of ten introductory psychology textbooks, not all of which were clearly intended for high school use. All of the complimentary examination copies of introductory textbooks submitted to the Shawnee Mission High School District for consideration for use in their new course were included in the sample.

The textbooks used were by Branca, Engle, Hilgard and Atkinson, Kendler, Morgan and King, Munn, Ruch, Sanford, Sartain and Chapman, and Sells.

Topics were listed in order of importance as judged by the number of chapters devoted to the subject in the ten

Use of 'Participative Action' Groups in a Course in General Psychology," American Psychologist, 7:247, 1952.

⁸⁷H. Kelley and A. Pepitone, "An Evaluation of a College Course in Human Relations," Journal of Educational Psychology, 43:193-209, 1952.

⁸⁸E. W. Bovard, Jr., "The Psychology of Classroom Interaction," Journal of Educational Research, 45:215-224, 1951.

⁸⁹W. J. McKeachie, "Anxiety in the College Classroom," Journal of Educational Research, 45:153-60, 1951.

textbooks. The headings "Biology," "Science of psychology," and "Social psychology" were arbitrarily chosen by the writer and include a variety of chapter headings in the textbooks.

- I. Learning (Thirty chapters)
 - Basic processes including conditioning
 - Remembering and forgetting
 - Thinking, language, problem solving
- II. Biology (Twenty-nine chapters)
 - Senses and the nervous system
 - Biological bases of behavior
 - Heredity versus environment
 - Maturation and development
- III. Measurement (Fifteen chapters)
 - Intelligence
 - Testing
- IV. Social psychology (Fourteen chapters)
 - Social behavior and social problems
 - Groups
 - Attitudes, beliefs, prejudice
 - Cultural influences on the individual
- V. Personality (Thirteen chapters)
- VI. Science of psychology (Eighteen chapters)
 - Introductory material
 - Description of psychology: Its origins, uses, fields and methods.
 - (Two books had four chapters each)
- VII. Perception (Ten chapters)
- VIII. Motivation (Nine chapters)
- IX. Adjustment (Nine chapters)
 - Frustration, conflict, self defense
- X. Emotion (Eight chapters)
- XI. Mental health (Eight chapters)
 - Behavior disorders and Psychotherapy
- XII. Vocational adjustment (Three chapters)
- XIII. Love and marriage (One chapter)

When invited to make comments about their introductory psychology course at the end of each semester, many students of the four Shawnee Mission high schools indicated that the chapters on learning were least preferred and most difficult, yet learning is given core-content status by most psychologists and textbook writers. The space devoted to learning in the textbooks included in this survey certainly exceeded that given to any other single subject, especially when the inclusive nature of the second-running topic "Biology" is considered.

This problem provides a challenge for the teacher to make the study of learning, to which the student must be exposed, more interesting and meaningful. Fortunately in this respect learning material, more than any other topic covered in a general course, lends itself to easily performed experiments and demonstrations.

It is for these reasons that learning was chosen as the topic for this resource unit.

Objectives⁹⁰

I. General Goals

A. Scientific Values and Skills

Attitudes

1. Curiosity about human behavior.
2. Appreciation of the scientific method and readiness to apply it to problems of human behavior; with awareness of its limitations.
3. A critical attitude toward generalizations about human behavior.
4. Intelligent skepticism about the finality of our present state of knowledge. Ability to get along without absolute answers to every problem.
5. Intelligent skepticism about the adequacy of methods used in arriving at conclusions, especially about human behavior.
6. Recognition of the influence of needs and cultural values upon the acceptance of generalizations and upon the definition of research areas. Desire to separate values from observations.

Abilities

7. Understanding the elements of the experimental method in psychology.
 - a) Recognizing the importance of control of variables in research.
 - b) Knowledge of some of the important variables to control in research on human behavior; e.g. motivation, past experience.
 - c) Understanding some of the terms used in describing experiments: viz. assumptions, hypotheses, variables, sample, control group.

⁹⁰W. R. McKeachie, et al, "List of Objectives of the General Psychology Course," Document #4205, American Documentation Institute, Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington, D.C.

8. Ability to discriminate between reasonable and unreasonable generalizations in terms of the evidence upon which they are based.
9. Awareness of some of the major tools and methods of psychology.
10. Ability to relate the principles that are taught to individual attitudinal structures, hopefully resulting in more liberal or tolerant attitudes. However, teaching should not directly aim at specific changes in social attitudes or personality.

B. Knowledge of Psychology

1. Awareness of major psychological approaches to human behavior.
2. Ability to see the operation and meaning of major psychological concepts and principles in everyday life.
3. Ability to describe behavior in objective terms (relatively independent of the student's own biases) and get emotional understanding of it.
4. Understanding principles and concepts of psychology which are basic for further study of psychology or for use in other areas of life.

II. Specific Goals for Unit on Learning and Thinking

A. Scientific

1. Familiarity with experiments in learning as examples of experimental method.
2. Awareness of conditioning as a method of study in psychology.

B. Knowledge

1. Ability to revise own study habits in line with principles of learning.
2. Understanding of the following principles:
 - a) Acquisition

- (1) Conditioning: A neutral stimulus may be paired repeatedly with a stimulus adequate to elicit a response such that the previously neutral stimulus may now elicit this response.
- (2) Instrumental Learning: A motivated organism, when confronted by a problem, will adopt variable behavior until the appropriate response is selected out by reward.
- (3) Avoidance Learning: A neutral stimulus may be paired with a noxious stimulus such that the previously neutral stimulus will come to elicit an avoidance response.
- (4) Efficient human associative learning: There are certain conditions for efficient human associative learning.
- (5) Insight

b) Retention

- (1) Amount of learning retained as a function of
 - (a) conditions of learning
 - (b) conditions of the intervening time interval.
- (2) Organization of learned material may change over time.

c) Use of Previous Learning

- (1) Increased or decreased efficiency in present learning.
- (2) Reasoning.

Outline of Content

Principles of Learning

I. Factors in Learning

- A. Association
 - 1. Sensory associations
 - 2. Stimulus-response associations
 - 3. Contiguity
 - 4. Interference
- B. Motivation
- C. Variability
- D. Habituation
- E. Sensitization
- F. Imprinting
- G. Inhibition

II. Classical Conditioning

- A. Conditioning
- B. Extinction
- C. Reinforcement
- D. Spontaneous Recovery
- E. Stimulus Generalization
- F. Higher-Order Conditioning

III. Instrumental Learning

- A. The Skinner Experiment
- B. Extinction
- C. Secondary Reinforcement
- D. Partial Reinforcement

IV. Avoidance Learning

- A. Stages in Learning
- B. Reinforcement and Extinction
- C. Punishment

V. Perceptual Learning

- A. Conditioned Discrimination
- B. Discriminative Learning
- C. Incidental Learning
- D. Spontaneous Discrimination
- E. Insightful Learning

VI. Maze Learning

- A. Chaining of Responses
- B. Discrimination
- C. Gradient of Reinforcement
- D. Anticipation and Perseveration

Learning and Forgetting

- I. Acquiring Skills
 - A. Learning Curves
 - B. Plateaus
 - C. Distribution of Practice
 - D. Knowledge of Results
 - E. Reading Versus Recitation
 - F. Meaningfulness of Material
 - G. Whole Versus Part Learning
- II. Memory Processes
 - A. Memory Images
 - B. Reproduction of Visual Figures
 - C. Verbal Associations
 - a) Serial anticipation of nonsense syllables
 - 1. Meaningfulness
 - 2. Statistical dependencies
- III. Transfer of Training
 - A. Principles of Transfer
 - 1. Similarity of stimuli
 - 2. Similarity of responses
 - B. Transfer of Training in Formal Education
- IV. Retention
 - A. Measuring Retention
 - 1. Recall
 - 2. Recognition
 - 3. Savings
 - B. Amount of Retention
 - C. Qualitative Changes in Retention
- V. Forgetting
 - A. Retention After Sleeping and Waking
 - B. Retroactive Inhibition
 - C. The Nature of Forgetting
 - D. Repression and Forgetting
- VI. Techniques of Study
 - A. Motivation to Study
 - B. Organizing a Study Routine
 - C. Study Methods
 - D. Taking Lecture Notes and Examinations
- VII. Programmed Learning
 - A. Programmed Textbooks
 - B. Teaching Machines

Language and Thinking

- I. Signs, Symbols, and Meaning
 - A. Signs, Signals, and Symbols
 - B. Natural Signs
 - C. Words as Symbols
 - D. The Meaning of Meaning
 1. Associative processes
 2. Mediating processes
- II. The Thinking Process
 - A. Trace Processes
 - B. Role of Images
 - C. Imageless Thought
 - D. Implicit Responses
 - E. Cue-Producing Responses
- III. Formation and Meaning of Concepts
 - A. Words and Concepts
 - B. Abstraction
 - C. Methods of Learning Concepts
 1. Discrimination Learning
 2. Context
 3. Definition
 4. Classification
 - D. Factors Affecting Concept Formation
 - E. Meaning of Concepts
 1. Free response
 2. Discrimination
 3. Word association
 4. Semantic differential
- IV. The Solution of Problems
 - A. Motivation
 - B. Habit and Set
 - C. Unconscious Factors
 - D. Solution by Insight
 - E. Adventurous Thinking
- V. Logical Reasoning
 - A. Verbal Reasoning
 - B. Logical and Illogical Thinking
 - C. Distortions in Reasoning
- VI. Language and Communication
 - A. Language Units (Phonemes)
 - B. Vocabulary
 - C. Verbal Diversification
 - D. The Meaning of Language
 - E. Meaning in Context

Activities

Experiments, demonstrations and exercises

Principles of Learning

SCHEDULES OF REINFORCEMENT

Purpose: To demonstrate practical applications of schedules of reinforcement.

Materials: Paper and pencil.

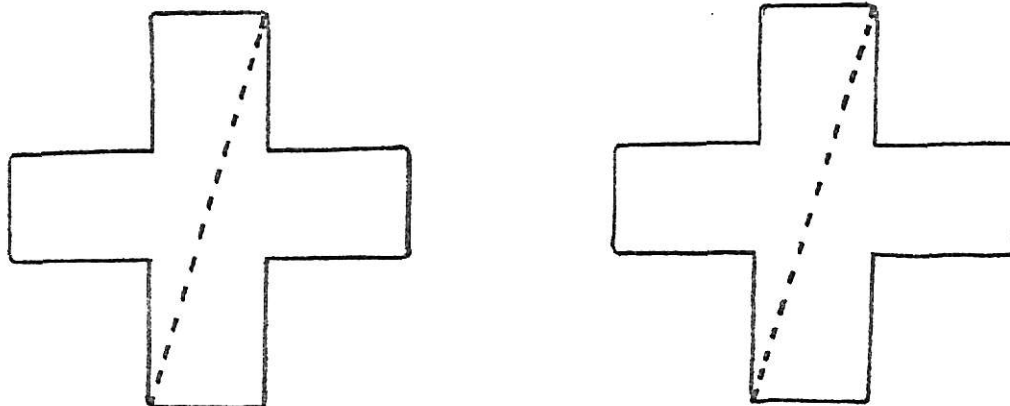
Procedure: Ask students to identify each of the following situations as being an example of a variable interval, fixed interval, variable ratio, fixed ratio, or continuous reinforcement.

1. A man is fishing from a boat (leaving his line in the water.)
(Variable interval)
2. A workman is paid weekly.
(Fixed interval)
3. A workman is paid for each item he produces.
(Continuous)
4. A salesman makes a sale at some houses, not at others.
(Variable ratio)
5. A baby is fed at 2:00 A.M., 10:00 A.M., and 6:00 P.M.
(Fixed interval)
6. A waitress is tipped by some customers.
(Variable ratio)
7. A man buys candy bars from a properly serviced and maintained machine.
(Continuous)

CROSS PUZZLE⁹¹

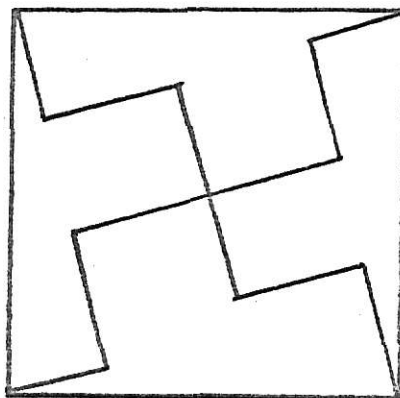
Purpose: To demonstrate human learning by trial and error or insight or a combination of both.

Materials: Two paper or cardboard crosses of equal size similar to the ones shown below.



Procedure: Cut each cross along the dotted line. Fit the four pieces together to form a square. Instruct students to note how they go about the solution.

Solution:



Discussion: Do you learn how to solve the puzzle by trial and error, by insight, or by a combination of both? Do you talk to yourself as you work? Do you suddenly see the relationship?

⁹¹T. L. Engle, Psychology: Its Principles and Applications (fourth edition; New York: Harcourt, Brace and World, Inc., 1964.

CLASSICAL CONDITIONING OF A KNEE-JERK⁹²

Purpose: To demonstrate the phenomenon of classical conditioning by testing the hypothesis that after an auditory stimulus has been associated with a tap causing a reflexive knee jerk, an individual learns to respond to the auditory stimulus alone.

Materials: Knee-jerk apparatus and a buzzer. Two students to act as experimenters and a naive outside subject.

Procedure: The subject should be seated comfortably so that his feet do not touch the floor. A cuff to measure the extent of the knee jerk is attached to the subject's ankle, and both subject and the knee-jerk apparatus are adjusted so that the hammer will hit the patellar tendon at the point where a good strong response will occur.

Through the experiment the subject should read, do homework, or otherwise occupy himself rather than attend to what the experimenters are doing.

There will be five preliminary trials during which only the buzzer is presented for about one second. There should be a ten-second pause between trials throughout the experiment, and the height of the knee jerk should be recorded after each trial.

These preliminary trials will be followed by a series of 250 or 300 trials as follows:

For 49 trials experimenter turns on the buzzer and after it has sounded for about one-half second, releases the hammer to hit the knee. Immediately after the hammer hits the knee, experimenter turns the buzzer off. Then he records the amount of the knee jerk. Pause ten seconds between trials.

On trial No. 50 only the buzzer is presented and the knee jerk is recorded. Repeat this procedure every 50 trials until 250 trials are completed.

On trial No. 250 if the subject has a good strong response to the buzzer alone, continue to present the buzzer alone until extinction of the knee jerk occurs. Otherwise, go on with trials 251-299 presenting buzzer and hammer together. After trial No. 300, go into the extinction procedure. Remember to record the knee jerk after every trial.

Results: Present the data in tabular form and then present it in graphic form.

Discussion: Discuss the results considering their significance. Relate these results to classical conditioning in general.

⁹²James H. L. Roach, Barbara R. Sherman, and Patricia P. Roach, Experiments in General Psychology (New York: Harper and Row, Publishers, 1965), pp. 93-96.

"FEAR" CONDITIONING⁹³

The results obtained in this experiment will be compared with those obtained from the classical conditioning of a knee-jerk experiment on page 26.

Purpose: To determine whether fears may be acquired in the same way as other learned responses and if they extinguish as rapidly. The specific hypothesis to be tested is this: A conditioned emotional response (galvanic skin response or GSR) is extinguished at the same rate as a conditioned knee jerk.

Materials: Equipment for administering a slight electric shock, a low-amplitude buzzer (or other sound source), GSR equipment. Two students to act as experimenters (Es) and a naive outside subject (S).

Procedure: The subject should be comfortably seated with both his hands resting on a table. Attach shock apparatus to one hand and GSR finger electrodes to the other. Subject should be told that as a subject in the experiment he will be given a strong but not harmful shock at intervals and that he should relax as much as possible.

1. Sound the buzzer and record the GSR, if any. Wait about a minute and repeat. Continue doing this until there is either no GSR reading or a low one. Then go on to step 2.

2. Repeat the following procedure for ten trials: Sound the buzzer, wait about one-half second and give the subject a slight shock. Record the GSR. Wait until the GSR returns to a low level and repeat. After ten trials, the subject should be conditioned to show a GSR at the sound of the buzzer. However, if he is not, continue for ten more trials.

3. E begins a series of extinction trials. Present the buzzer only and record the GSR reading. After GSR returns to the normal range, again present the buzzer only. Continue this procedure until extinction is obtained or lab time is over.

Results: Present the data in tabular form. Make a graph to represent the results.

Discussion: (1) How do these results compare with those obtained from the knee-jerk conditioning? Account for the difference obtained. (2) How do these classroom results compare with those of previous investigators?

⁹³Roach, Sherman and Roach, op. cit., pp. 105-108.

A SIMPLE CONDITIONING EXPERIMENT⁹⁴

Purpose: To demonstrate the development of a conditioned response in a human subject.

Materials: A young child. (This little experiment is patterned after one carried out by Dernowa-Yarmolenko on 1,000 Russian children.)

Procedure: Have the child watch you and raise his left hand as you raise yours. After he understands that he is to raise his hand every time you raise yours, and has done so a few times, tap on the table with a pencil about one second before you raise your hand. Continue to tap and raise your hand until you see him begin to raise his hand before yours comes up. Then tap without raising your hand. If the child now raises his hand, his hand-raising response is obviously conditioned to the tap of the pencil.

Results: Dernowa-Yarmolenko found that 90% of eight-year-olds, within ten trials, began to raise their hand at the tap of the pencil. This percentage dropped as older subjects were used.

⁹⁴Norman L. Munn, Student's Manual to Accompany Introduction to Psychology (Boston: Houghton Mifflin Co., 1962), p. 45.

MAZE LEARNING⁹⁵

Purpose: To observe the modification of behavior in an adult human as the correct path through a maze is learned under circumstances similar to those an animal faces when placed in a maze.

Materials: The maze in Figure 1, page 30 and a sheet of heavy paper to serve as a screen to cover the maze. A one-quarter inch hole should be cut in the center of the screen to serve as a peephole through which a small portion of the maze can be seen.

Procedure: Each student should find his way through the maze from ten to twenty times. After each trial, beginning at the starting circle and ending at E on the right, the student will record certain data on Table I, page 31.

Each intersection on the maze is marked with a heavy dot. In column two of the Table, each student should record the number of times he passed over dots during the entire process of moving across the maze from left to right. The dots will have to be counted as they are passed. This can be done by marking on a scratch paper each time a dot is passed.

Begin by placing the screen over the maze so that the S shows through the hole in the screen being careful not to examine the maze while uncovered.

Results: After completing the twenty trials and entering the data for each trial in the second column of Table I, use the following procedure to compute data for the third column.

Twenty dots must be passed in going from S to E without making any incorrect turns. Therefore to find the correct number of errors for each trial, subtract twenty from the total number of errors per trial.

Graph the data from the third column on Figure 2, page 32.

Have one or more students compute the mean number of errors for each trial for the entire class. Record these data in the fourth column of the table. Using a pencil of a different color, graph these data on the same graph in Figure 2 also.

⁹⁵T. L. Engle, Leonard J. West, and Ohmer Milton, Record of Activities and Experiments, with Programed Units (fourth edition; New York: Harcourt, Brace and World, Inc., 1964), pp. 41-43.

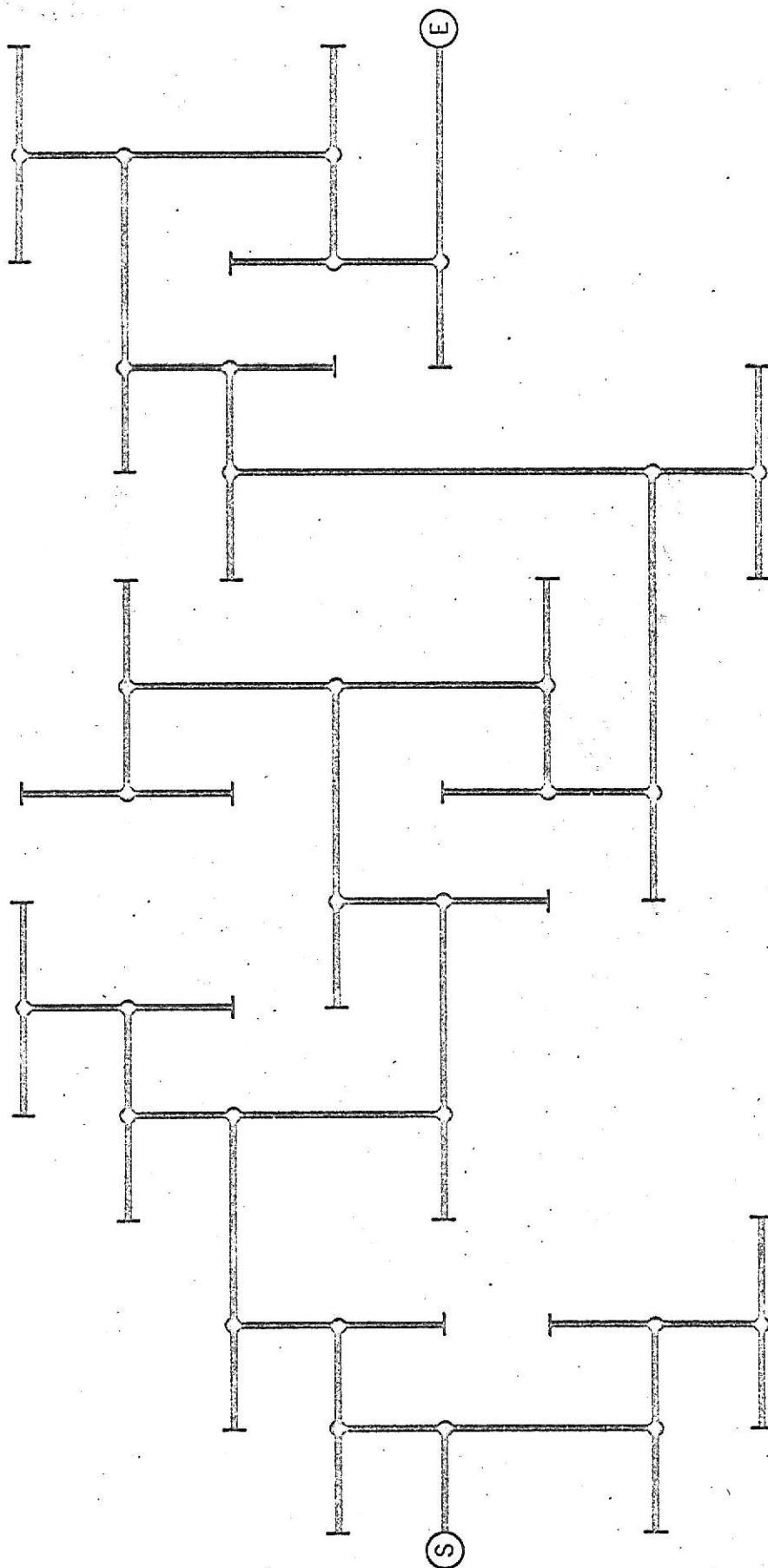


Figure 1. Maze.

TABLE I
DATA FOR MAZE LEARNING

TRIAL	NUMBER OF TIMES DOTS WERE PASSED	NUMBER OF ERRORS	CLASS MEAN NUMBER OF ERRORS
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

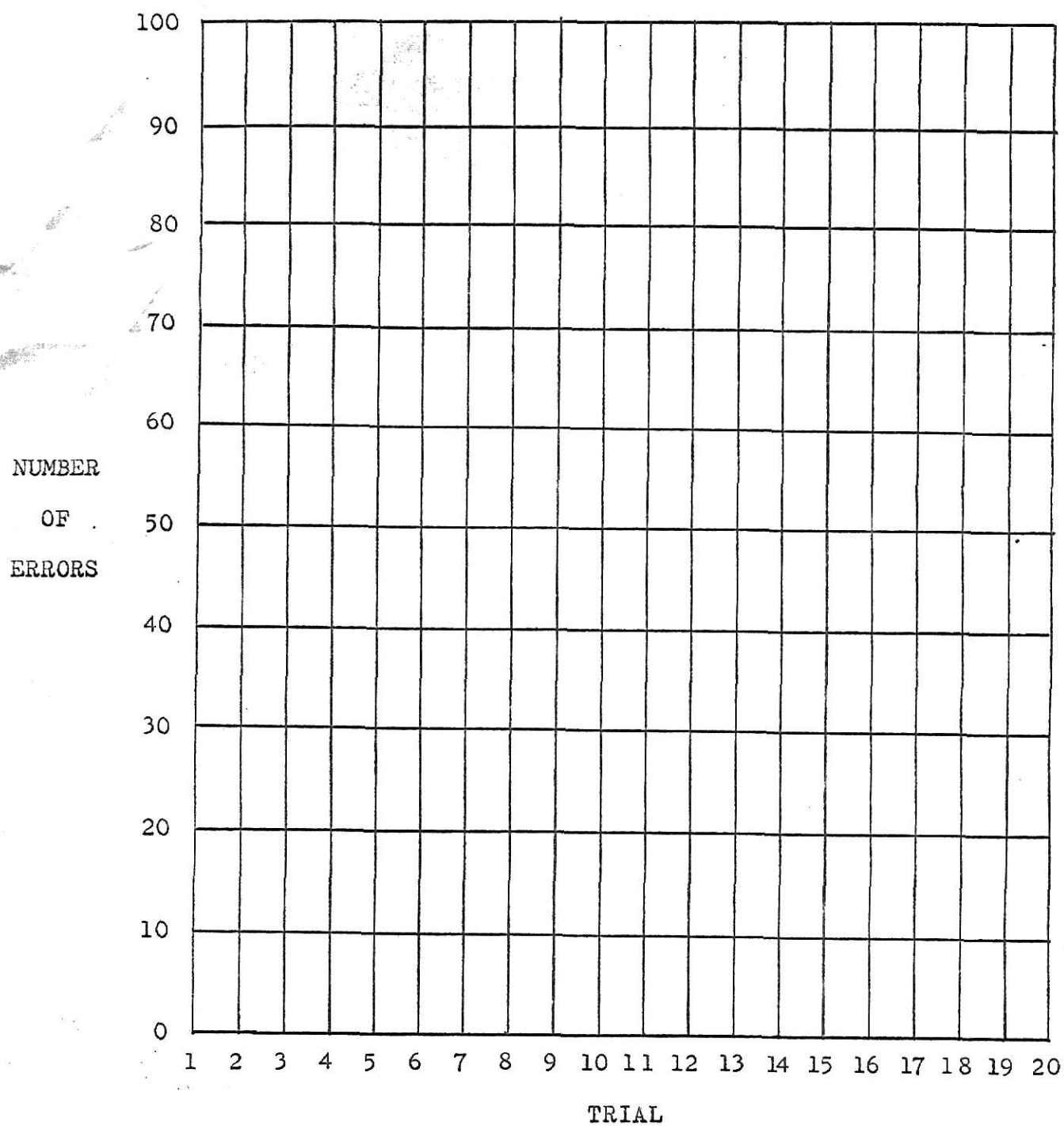


Figure 2. Graph of data for learning a maze.

PUNCHBOARD MAZE⁹⁶

Purpose: To demonstrate learning, show learning curves, and possibly the effects of distributed practice upon learning.

Materials: Two pieces of plywood, hinge and screws, drill.

Construction of punchboard maze

Drill as many rows and columns of holes in one piece of plywood as desired to make the maze more or less complicated. Above the top row of holes, drill a single hole which is used as the "Start" of the maze. Also under the bottom row of holes drill a hole which is the "Finish" of the maze. Holes should be large enough for a pencil to be inserted easily.

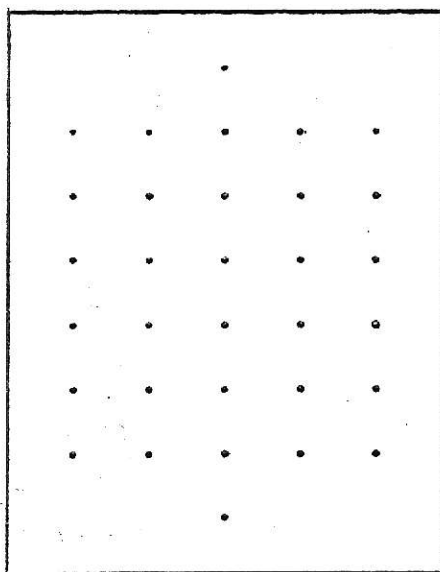
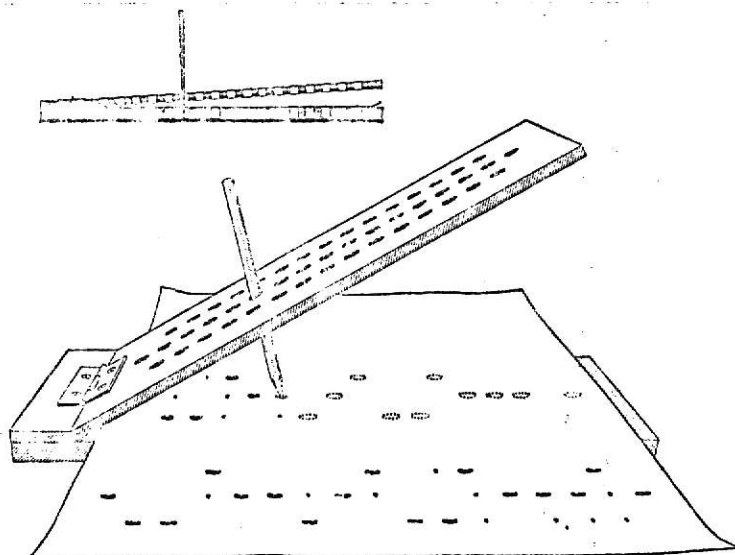
In the bottom piece of wood only one hole is drilled in each row. The arrangement of these holes is randomized according to the maze pattern desired. It is very important that the holes in the bottom piece of wood correspond exactly with the correct hole in the top piece of wood. The two pieces of wood are hinged at one end so that they open like a book. (See Figure 3 on page 34.)

Procedure: Without letting the subject see the maze, insert a piece of plain paper between the two pieces of plywood. The subject is timed from the moment he inserts his pencil in the starting hole. He is instructed to insert his pencil firmly so that he will either tear the paper if he chooses the correct hole or make a mark if he chooses an incorrect hole. He is to continue downward until he has found the correct hole in each row of holes.

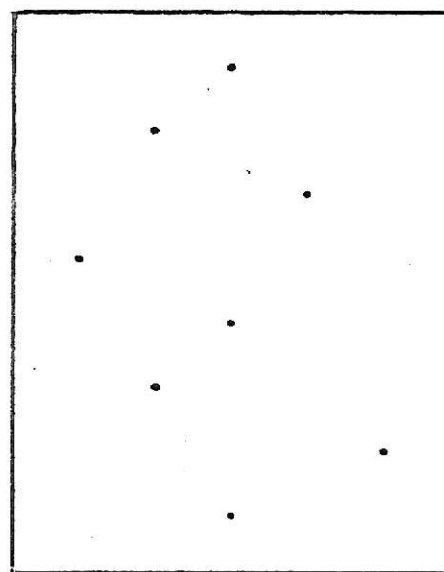
The subject's name, trial number, time and errors should be recorded on each sheet of paper. Errors can be determined easily by counting the number of pencil marks on the paper after it has been removed. Use a new sheet of paper for each trial and continue until the subject can find his way through the maze twice without making any errors.

Results: Learning curves can be constructed from two factors - time and number of errors per trial. Both factors can be plotted on the same graph using different colored pencils.

⁹⁶B. R. Bugelski, A First Course in Experimental Psychology (New York: Holt, Rinehart and Winston, 1951), pp. 313 - 318. Louis Snellgrove, Construction and Use of Inexpensive Psychological Apparatuses (Jackson, Tennessee: Union University, 1962), (Mimeographed) pp. 2-3.



Top piece of wood



Bottom piece of wood

Figure 3. The punchboard maze.

INSTRUMENTAL CONDITIONING⁹⁷

Purpose: To test the hypothesis that by appropriately reinforcing the subject's behavior, one can cause the subject to place marbles in one particular container when he apparently has a "free" choice of two containers.

Materials: A timer, tally sheet and pencil, 100 marbles, 3 large cans of identical size. One can will be marked "X," one marked "Y," and one unmarked which will initially contain the marbles. Two naive outside subjects, one experimental and one control.

Procedure: Place the unmarked can, containing the 100 marbles on a table. On another table place cans X and Y. (X and Y cans should be placed so that there is equal opportunity to place marbles in each. The subject should be standing and use only one hand.) After each trial the positions of the 2 cans should be switched. There will be 6 trials for each subject so that each can will be in a single position 3 times.

The instructions given the subjects should stress speed and should be given in the following manner.

"The purpose of this experiment is to determine how fast you can put the marbles in these 2 cans using only one hand. Place the marbles in the cans one at a time in a random choice, without counting or developing a pattern of any kind. Turn and face the cans when depositing the marbles, and please don't throw the marbles into the cans. Remember, this is a test of dexterity, and the time is very important."

Experimenter₁ will give the instructions and will start the subject. Experimenter₂ will operate the timer. In addition the following procedures will need to be carried out.

For the experimental subject. E₁ will keep a tally sheet in view of the subject and mark down a tally for each placement in the X can. Also E₁ will reinforce verbally each placement in the X can¹ with a rewarding "Oh huh!" E₂ will also reinforce the subject by saying a moderately² loud "Good" on every fifth correct response. At the end of each trial (100 marbles) the subject should be asked to leave the room. At this time the number of

⁹⁷Roach, op. cit., pp. 99-102.

marbles in cans X and Y should be determined and the time per trial noted.

For the control subject. No tally sheet will be necessary, and the experimenters will give no verbal reinforcement during the experiment. Only the number of marbles in each can and the time required for each trial need be recorded.

With both the experimental and control subjects it is important to stress speed of performance at the beginning of each trial. If both subjects happen to be in the waiting room at the same time, be sure to ask them not to discuss the experiment until it is all completed.

Results: Determine the number of marbles in each can for each trial. Present the results in tabular and graphic form.

Discussion: Discuss the significance of the following: stressing speed of performance; changing the position of the cans after each trial; choice of naive subject; reinforcing agents. Also discuss the role of reinforcement in general terms and specifically how it operated in this experiment.

CONDITIONING AN OPERANT RESPONSE⁹⁸

Purpose: To observe the progress of learning and extinction of the bar-press response in the white rat.

Materials: Skinner box and laboratory rat. (Rats are usually available and can be borrowed from the high school biology department).

Procedure: Three students may work together conducting this experiment in the form of a demonstration for the entire class. A plexiglas operant conditioning kit (Skinner box), such as the one available from the Scientific Prototype Manufacturing Corporation, makes it possible for the entire class to observe the experiment.

One student experimenter will observe the rat; one will provide the reinforcement whenever the animal presses the bar, and the third will record the time of every bar-press in seconds. Start timing by minute and second from the moment the rat is put in the Skinner box. The specific procedure follows:

1. Insert the rat and note the time. When the rat depresses the bar to the criterion point, reinforce it with food or water, depending on the apparatus used. Make sure the rat eats or drinks before giving it any more.

2. Allow the rat to depress the bar twenty times, "reinforcing" each response with a food pellet or drink. Record the time of each response.

3. After twenty reinforcements, stop feeding or offering water to the rat even though it presses the bar. Continue recording times of responses until the animal does not press the bar for two minutes. This will be considered an "extinction" to a two minute criterion.

4. Remove the rat from the box and wait five minutes. Replace the rat and record the time of the first response. Reinforce this, and the next four responses. If the rat presses the bar after the five minute interval, it can be said to have shown "spontaneous recovery." After the fifth reinforcement, remove the rat.

5. Throughout the training process, one student, acting as observer, will make notes on the behavior of the rat. He will especially watch for such items as the way in which the rat strikes the bar (with teeth, paws, head, etc., and any changes therein), how it responds to the food or water, and any routines or patterns of response engaged in by the rat.

⁹⁸Bugelski, op. cit., pp. 307-312.

Results: The record kept during this experiment will contain the times of response during reinforcement, extinction, and spontaneous recovery. Plot these times of response in a "cumulative" learning curve. Such a curve is easily drawn on graph paper where number of responses is indicated on the ordinate and time is on the abscissa. To plot the record, make one vertical square represent one response, two squares, two responses, etc. Then after the first response is recorded, draw a horizontal line parallel to the base line to the point indicating the time when the second response was made. Continue this procedure for each response. The final curve will be step-like, with longer or shorter distances between the steps, depending upon the rate of response. Label all sections of the curve (learning, extinction, recovery, relearning, etc.) In addition to the learning curve, present a rough-draft description of observations, and summarize the response data in a suitably constructed table.

SECONDARY REINFORCEMENT⁹⁹

Purpose: To demonstrate that when a rat is no longer reinforced by food for a given behavior, it persists in this behavior for a longer period in the presence of a secondary stimulus than when no secondary stimulus is presented.

Materials: Skinner box and two litter-mate rats.

Procedure: Deprive the rats of food for twenty-four hours. Train them to the same degree of performance in bar-pressing on a continuous reinforcement schedule. That is, reinforce the rat each time he presses the bar. Each time the rat pushes the bar and is reinforced by food, a light should come on. The light is expected to take on reinforcing power and therefore becomes a secondary reinforcement. After the rats have achieved a high degree of response stability, begin extinction trials; i.e. for rat #1 present no food and no light when he presses the bar; for rat #2 present the light only when he presses the bar. Number of trials to extinction should be recorded for both rats.

Results: Compare the number of extinction trials for rats #1 and #2. Present the results in tabular form and illustrate them graphically.

Discussion: Discuss the significance of the difference on extinction trials for the two rats. Are these results comparable to those obtained by previous investigators?

⁹⁹Roach, op. cit., pp. 111-14.

Human Learning, Remembering, and Forgetting

CATEGORY SET IN ANAGRAM SOLUTION¹⁰⁰

Purpose: To test the hypothesis that category set, (readiness to respond to words belonging to a common class or category, i.e. a group of words with high inter-item associative connections) coming into operation during the course of solving a list of anagrams, will decrease the solution time as compared with a control group solving a list of anagrams of equal length but made up of unrelated words. It is further hypothesized that there should be a decrease in solution time for successive anagrams when subjects solve anagrams made from associately related words since associations called up by previously solved anagrams will aid the subject in the solution of later problems on the list.

Materials: Table II, page 42 contains a total of 36 anagrams arranged in six lists of six anagrams each. The arrangements are such that the solutions in each list form a common category, e.g. List 1 solutions are words related to "military." These lists were constructed by Safren by giving word association tests to a separate group of subjects to determine empirically that words of each list are interassociated.

From these organized lists, different lists of six unrelated words can be obtained by taking one word from each of the six organized lists for each unrelated list. It is possible to form 36 different unrelated lists of six words with each word appearing six times as Safren did, but it will be sufficient for this experiment to use one unrelated list. The list for this experiment should be constructed by using all words in any given row (across categories) as the unrelated list. Prepare the items to be presented to the subjects by printing each anagram on separate small cards.

Procedure: Each experimenter (E) will obtain two subjects (Ss) of similar age and education. Assign the first S to one of the two conditions by the toss of a coin. The second S will be assigned to the other condition. After S is seated comfortably in a quiet place, read the following instructions:

"This is an experiment on anagram solution. As you may know, an anagram is a word with its letters rearranged. I will

¹⁰⁰ John Jung and Joan Bailey, Contemporary Psychology Experiments (New York: John Wiley and Sons, Inc., 1966), pp. 129-135.

show you a number of anagrams, one at a time. You are to determine without the aid of paper and pencil what the original word is. Work as rapidly as you can since you will be allowed the maximum of four minutes for each anagram. As soon as you have a solution, tell me what it is. If you cannot solve any anagram in the time allotted, we will stop and go to the next one after I give you the answer. You will solve six different anagrams. Have you any questions? Here is the first anagram."

After each anagram is completed, announce to S: "Here is the next anagram."

Use the list of six anagrams from any one row in Table II for the unrelated list and the list of six anagrams from any one column for the organized list. Ideally the six anagrams within a list should be presented in all possible serial orders for different Ss. This arrangement would balance out practice effects and any possible differences in difficulty level in going from word to word. However, for the purposes of this experiment, it will suffice for each E to use a different order of the words within the lists for his Ss. This ordering should be pre-arranged in class.

Record the time in seconds for the solution of each anagram. If S fails to solve any anagram within four minutes, stop him and record 240 seconds as his solution time. Give S the solution and then present the next anagram. In going through the list, the next anagram should be presented as soon as the solution time for the preceding one has been recorded. Do not discuss the experiment with S until all six anagrams have been presented.

Results: Combine the solution times which have been recorded by all experimenters for each anagram on the lists for the two conditions and place on Table III, page 43. Compute the median solution times for anagrams one through six for the two conditions separately. Analyze the anagrams in their order of presentation for the Ss even though different Ss will have had different problems in each of these positions. Prepare a graph showing any changes in solution times over successive problems for each of the two conditions.

Determine whether there is a statistically significant difference between median solution times on the list for the organized and unrelated conditions by applying the Mann-Whitney U test. (Directions for performing this test may be found on pages 46-47 in Student's Manual for General Experimental Psychology by Robert S. Daniel).

Discussion: (1) What changes in solution times appeared over the six successive anagrams for the organized list group? For the unrelated list group? (2) Were the unrelated and organized groups approximately equal in solution time for each anagram at the outset of the experiment? At the end? (3) Is it conceivable that the formation of a category set might actually impede rather than facilitate solution time? How?

TABLE II
SIX ORGANIZED LISTS OF ANAGRAMS
(From Safren, 1962)

List 1	List 2	List 3	List 4	List 5	List 6
CANDOMM (command)*	WHELIST (whistle)	RAICH (chair)	LIMK (milk)	DOROCT (doctor)	SAQURE (square)
REDOR (order)	TARNI (train)	FOST (soft)	RECAM (cream)	URNSE (nurse)	CIRLEC (circle)
RAMY (army)	NESOI (noise)	OFAS (sofa)	USGRA (sugar)	EHALHT (health)	DUNRO (round)
OYEB (obey)	UNDOS (sound)	CUNSHIO (cushion)	EFECOF (coffee)	KISC (sick)	BECU (cube)
SODLERI (soldier)	SHLIRL (shrill)	WOLPIL (pillow)	SWETE (sweet)	MEDCIENI (medicine)	CLOBK (block)
VANY (navy)	OLDU (loud)	COCHU (couch)	DINRK (drink)	ECRU (cure)	LALB (ball)

* Solutions in parentheses

TABLE III
DATA SUMMARY ON CATEGORY SET: SOLUTION TIMES

Unrelated List							Organized List						
Anagram							Anagram						
	1st	2nd	3rd	4th	5th	6th		1st	2nd	3rd	4th	5th	6th
S 1							S 1						
2							2						
3							3						
4							4						
5							5						
Sn							Sn						
Median Time per Ana- gram							Median Time per Ana- gram						

MENTAL SET - A DEMONSTRATION EXPERIMENT¹⁰¹

Purpose: To demonstrate how subjects will instruct themselves and behave in a particular manner in spite of no instructions to do so.

Materials: Mimeographed copies of thirty five-letter anagrams found in Table IV, page 46 for two groups of subjects - experimental and control.

Procedure: Subjects in the two groups should not know that there are two different sets of materials, one set for each group. Of the thirty anagrams to be solved, fifteen have only one solution, that is, only one English word can be made up of the five letters involved. Thus the letters "khale" can be rearranged to spell "chalk" but no other word. The remaining fifteen anagrams have two or more solutions.

The arrangement of the anagrams differs for the two groups. For the experimental group, the anagrams are arranged so that the first fifteen have only one solution, the remainder (16 through 30) have at least two common-word solutions. All of the thirty anagrams for this group can be solved by following a simple formula: the last three letters are the first three of the solution, and the first and second letters are reversed to form the fourth and fifth letters. Numerically, the order of the letters is 54123. The subject going through the list can solve the first fifteen only in the 54123 manner. This practice tends to carry over, and he continues to solve many of the remaining fifteen in the same fashion, even though other solutions are possible.

For the control group, only those anagrams which comprise the last fifteen of the experimental group can be solved by the formula. These "test" or "key" anagrams are intermixed at random with fifteen other anagrams which have only one solution, but this solution does not follow any formula. (The same words which make up the first fifteen of the experimental group are used, but the order of the letters is scrambled at random.)

The experimenter instructs both groups to solve the anagrams as rapidly as possible and in consecutive order without returning to any missed. One minute is allowed for each anagram, although subjects may go on if they finish before time is called for the next anagram.

The subjects note the time of finishing the task, and report this later. A sheet of paper with a narrow slot in one

¹⁰¹Bugelski, op. cit., pp. 262-265.

edge is used as a screen, permitting work on only one anagram at a time and serving as a record sheet. As soon as the subject finishes the anagrams, he is asked to attempt the solution of a fairly difficult puzzle. The puzzle, prepared by the experimenter, can be included on the record sheets or written on on a blackboard, although the former method is more suitable.

The subjects are not informed until the experiment is over that they were members of different groups or that they worked on different materials. At the end of the thirty-minute work period, the experimenter questions members of both groups in a manner calculated to bring out the answers called for under "results." The questions should be informal and nondirective, and should develop the degree of information about the nature of the anagrams and the experiment that the subjects obtained. Particular emphasis should be placed on such questions as: "Why did the members of the experimental group work as they did?"

Results: 1. How many of the subjects knew that some of the anagrams could be solved by a "system"? How many knew that all of the experimental ones could be so solved? When was such information acquired, i.e., after how many solutions?

2. How many subjects knew that several solutions were possible in the last fifteen experimental anagrams? This is a crucial question, as it reflects a type of "set," or "one-track-mind" factor. Which group finished first? Why?

3. How many subjects can accurately describe the system without reference to the words?

4. How many subjects had a preponderance of "formula" solutions without knowing there was a formula?

5. What is the critical ratio of the difference between the percentage of test anagrams solved by formula between the two groups? In calculating this percentage, add all the 54123 solutions for the test anagrams in each group separately. Divide this by 15 N where N is the number of subjects. Then use the formula below for the "standard error of the difference." Note that N1 and N2 in the formula are also obtained as above and amount to 15N. The p's represent the percentage of formula solutions, the q's represent 100p. The p's and q's are reported as decimals, e.g., 0.58.

Standard error of difference between
two percentages =

$$\frac{p_1 q_1}{n_1} + \frac{p_2 q_2}{n_2}$$

Discussion: (1) Why were you asked to work on a puzzle after solving the anagrams? (2) How does this experiment demonstrate the nature of "sets"? (3) Why is a control group used in this experiment? Did the control group use the formula often? If so, why?

TABLE IV

ANAGRAM LISTS

Experimental List		Control List	
1. elunc	16. bushr	1. enluc	16. ritna
2. klcha	17. nolem	2. khalc	17. egbul
3. ensce	18. kaste	3. ehyno	18. camre
4. tsgho	19. hsfle	4. erspa	19. tslea
5. lecam	20. naorg	5. bushr	20. hawel
6. yehon	21. maste	6. ohgst	21. tnsai
7. dlchi	22. egbul	7. dlchi	22. tesle
8. neque	23. tnsai	8. nolem	23. umhto
9. frsca	24. tslea	9. kaste	24. naoce
10. peshe	25. tesle	10. nquee	25. reang
11. nitra	26. nrtho	11. hsfle	26. cnees
12. macre	27. reang	12. afscr	27. nrtho
13. elwha	28. ersho	13. phsee	28. ersho
14. ytpar	29. erspa	14. naorg	29. tarpy
15. htmou	30. naoce	15. maste	30. macle

VERBAL LEARNING¹⁰²

Purpose: To illustrate three aspects of verbal learning:

1. the influence of meaningfulness of material on recall,
2. the association value of nonsense syllables, and
3. position effect in learning lists of verbal materials.

Materials: The three lists of words in Table V, page 50, pencil and paper. Since three subgroups are required, this demonstration is most effective with classes of at least twenty-five students.

Procedure: 1. Distribute, face down, to each student one list of verbal material to be memorized. Use the three lists of nonsense syllables, unrelated three-letter words, and related three-letter words, giving each list to approximately one-third of the students. These lists must be distributed in such a fashion that the students believe everyone has received the same list. This deception is best accomplished if, after mimeographing, the lists are cut into strips of identical size and shape. These lists may be distributed by dealing from the top, bottom, and middle of the deck. All students in the same row should receive the same list. As a rule, this demonstration is most effective when the front rows receive the nonsense syllables, middle rows receive the unrelated three-letter words, and the back rows receive the related three-letter words.

Before passing out the lists, the instructor states: "Each of you will now receive a list of verbal material to be memorized. Leave it face down on your desk until you are told to begin. You are not permitted to use pen or pencil during the memorizing period; the time limit will be one minute."

Depending upon the level and motivation of the subjects, the instructor may wish to lengthen or shorten the one-minute memorization period. The aim is to provide a period just long enough for the subjects using the related words to recall 95-100 per cent of the list. If the period is too long or too short, differences between the groups will not appear.

2. At the word "Go," permit students one minute to memorize their lists. After this period, the lists are turned face down on the desk. Each student recalls as many items as he can from his list, writing them on the paper provided previously. They do not have to be recalled in the original order.

¹⁰²Dodge L. Fernald, Jr., Experiments and Studies in General Psychology, (Boston: Houghton Mifflin Company, 1965), pp. 17-21.

After an appropriate recall interval, the students are asked to turn over the original lists again and check their results. Each student is asked to write the number of correct items at the top of his recall sheet.

3. With classes of 25 to 50 the results may be tabulated orally. The instructor asks each successive student to tell him the number of items recalled correctly, and these data are tallied on the blackboard. In this procedure, the instructor inconspicuously starts a new column of responses each time he comes to a part of the class that had a different list. This procedure arouses class interest as the numbers become higher and higher toward the back of the room. When the different lists are disclosed, the mean for each group is determined readily from the data tallied on the blackboard.

The aim is to find (1) the mean number of items correctly recalled for each list, (2) which items in terms of serial position, are most commonly recalled, and (3) which nonsense syllables are most commonly recalled. This task can be accomplished by simply making tallies on each of three master lists, one for each set of material.

4. After the tallying, or before class if the information can be kept out of view, the instructor writes the three lists on the blackboard. When tallies for all items are complete, the totals are written on the blackboard beside the appropriate items.

5. The students are directed to complete Table VI, page 50 indicating the names and mean values for all three groups: nonsense syllables, unrelated words, and related words.

Results: Discuss any or all of the three chief aims and outcomes of this demonstration. As a rule, the following results are obtained:

1. Meaningfulness of material. The order or magnitude of recall, from most to least, is related words, unrelated words, and nonsense syllables. Typical mean scores are approximately 13, 9, and 5 respectively. These findings indicate the importance of both meaningfulness, or association value, of individual items, and the presence of meaningful relationships among items for successful recall. Superior recall of the list of related words is attributable to both the meaningfulness of the separate items and the meaningful relationships among items.

2. Position effect. Recall is more accurate for items at the beginning of the list than for those at the end; and items at the end of the list are recalled more accurately than those in the middle.

3. Association value of nonsense syllables. Generally, there are wide differences in frequency of recall for the different nonsense syllables, even for those occupying adjacent

positions on the list. When two items of similar serial position are recalled with unequal frequency, it often appears that the more commonly recalled item has a greater association value.

Discussion: (1) What is the independent variable in this experiment, i.e., the variable studied for its influence on verbal learning? Discuss the influence of this factor in this experiment. (2) Briefly describe the "position effect" in verbal learning. (3) Offer an explanation for differences in frequency of recall for different nonsense syllables. (4) Suggest a practical application for one of the findings of this experiment.

Discussion Answers: (1) The independent variable is meaningfulness of material. In this experiment, it is shown to influence the amount of recall of previously learned verbal material. (2) In verbal learning, items in a homogeneous list may be recalled with unequal frequency owing to their different serial positions. When other factors remain constant, items at the beginning of the list are recalled most accurately followed by items at the end and middle, respectively. Different explanations have been offered for this finding, including an inhibition theory based upon conditioning phenomena, as well as the primacy-recency notion. The merits and criticisms of Hull's inhibition theory have been discussed by Deese (1958, pp. 172-75). (3) The association value of nonsense syllables has been studied widely. Since Glaze (1928) first suggested that nonsense syllables are not entirely nonsense, i.e., that they vary widely in association value, much research has been devoted to the quantification of meaningfulness and association values. The findings of such studies suggest that differences in recall for different syllables are due to differences in meaningfulness or association value.

TABLE V
LIST OF SYLLABLES AND WORDS WITH VARYING
DEGREES OF ASSOCIATION VALUE

Nonsense Syllables	Unrelated Three-letter Words	Related Three-letter Words
mul	rag	mom
roc	lob	pop
peb	hat	son
duv	pet	dog
bac	red	out
tej	bun	car
nir	top	gas
hab	pub	oil
wom	saw	see
tol	fit	sky
lup	rat	sea
gif	lip	inn
xoy	eel	eat
sed	nut	gay
keh	rod	eve

TABLE VI
SUMMARY DATA FOR CORRECT RECALL

Group	Recall Performance
1.	
2.	
3.	

PAIRED-ASSOCIATE LEARNING¹⁰³

Purpose: To demonstrate several of the principles of learning and forgetting.

Materials: The lists of nonsense syllables and meaningful words and their stimulus syllables or words in Tables VII and VIII on page 53. Pairs of students in the class should conduct this experiment outside of class time.

Procedure: The two students should agree which will be the subject (S) and which one the experimenter (E). Three different experimental sessions will be required: the second about four hours after the first, and the third about 24 hours after the first.

First Session. The first session consists of original learning of a list of nonsense syllables and a list of meaningful words. The procedure is exactly the same for both kinds of material.

Once, and only once, E reads each stimulus word (or syllable) and immediately following it the response word (or syllable). He does this slowly and clearly, allowing about five seconds to elapse between the reading of each pair in the list. At the end of this reading of both stimulus and response words, S should be allowed a brief rest of a minute or so.

Now E begins reading the list again but this time giving only the stimulus word. S should respond promptly with the word he thinks is the response word. If he does not know, he must guess. If his response is correct, E says "correct"; if it is incorrect, E says the correct response word. Each time S is correct, E makes a check mark in the corresponding space in the chart. The first complete reading of the list in this fashion is called trial 1. When it is completed, E begins with trial 2 after a minute or so of pause. He continues on with trials 3, 4, and so on until S completes a perfect trial, that is, gives correctly all ten responses in a series.

When S has had a perfect trial on the nonsense syllables, he takes a few minutes of rest and then proceeds to the meaningful words, with E following the same instructions as for the nonsense syllables.

Second Session. About four hours after the first session, S and E should assemble again to proceed with the experiment. The procedure is exactly the same as it was in the

¹⁰³ Clifford T. Morgan, Study Guide to Accompany Introduction to Psychology (third edition; New York: McGraw-Hill Book Company, 1966), pp. 62-64.

trials of the first session. E gives the correct response word only when S has given an incorrect response. The procedure is carried out first for nonsense syllables and then for meaningful words until, in each case, S has a perfect trial.

Third Session. The last session of the experiment should be carried out about 24 hours after the first session. The procedure is exactly the same as it was in the second session.

Results: Plot the results on a graph. Different symbols may be used for results with nonsense syllables and meaningful words. Vertical lines should be drawn on the graph to separate the results of the three sessions. The curves drawn in the graph will give a general picture of the results. From the graph and the charts used to record the data, additional measures can be computed that further summarize the results. What are the two measures that can be used to express learning and retention? Consult pages 116 and 136 of Introduction to Psychology, third edition, by Morgan and King if necessary. Write these two kinds of measures in the following table, then compute and fill in the appropriate numbers.

MEASURES	NONSENSE SYLLABLES	MEANINGFUL MATERIAL
Original learning	_____	_____
First retention test	_____	_____
Second retention test	_____	_____

Discussion: (1) Which kind of material is the easier to learn? Which is the better retained? (2) How much savings is there in the two retention tests? How do the two kinds of material compare on savings? (3) How can you use a measure of recall to express retention in the experiment? What numerically would be the retention in terms of recall for the two kinds of material in the two tests of retention? (4) What can you say about the curve of forgetting from the data of this experiment?

TABLE VII
 PAIRED-ASSOCIATE LEARNING: NONSENSE SYLLABLES

Stimulus Syllable	Response Syllable	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7
zeb	guk							
bev	cav							
reb	dut							
nez	fec							
nef	lat							
mej	rel							
cef	bez							
boq	kek							
dom	lev							
kel	vac							

TABLE VIII
 PAIRED-ASSOCIATE LEARNING: MEANINGFUL WORDS

Stimulus Word	Response Word	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7
white	house							
red	rose							
brown	dirt							
gray	day							
light	work							
black	cat							
blue	vase							
pink	gin							
green	grass							
dark	glass							

DISTRIBUTED PRACTICE COMPARED TO MASSED PRACTICE¹⁰⁴

Purpose: To test the hypothesis that distributed practice is superior to massed practice in learning a simple motor skill involved in mirror tracing.

Materials: A small mirror, pencil, watch or clock with a second hand, ten to twenty sheets containing a picture of a six-pointed star having a double boundary (Figure 4, page 56) for each student, and a screen of some kind. This screen can be made from two piles of books with another book across the top of the piles, or it can be constructed quite easily. The basic requirement for the screen is that the subject be unable to see the star or his hand directly, but that he can see them in the mirror.

The more trials that can be run, the greater the likelihood of marked differences between distributed and massed practice.

Procedure: 1. A star design is placed so that the starting point is close to the mirror, and the subject is seated so that he can see his hand and the star only in the mirror. The point of the pencil is placed between the boundary lines at the starting position, and the subject is directed to trace around the star in a counterclockwise direction (clockwise if he is left-handed). He should be instructed to draw a line between the parallel lines forming the sides of the star. If the pencil crosses the lines in either direction he should get back between the lines at once and continue drawing without lifting his pencil or looking directly at the star other than in the mirror. The subject should trace around the star as rapidly as possible. He begins tracing when the experimenter gives the signal, thus enabling the experimenter to measure and record the time for each tracing. The experimenter records an error each time the subject goes outside the parallel lines.

Each student will serve in turn as subject for this initial trial and keep a record of his time and errors.

2. Students will work in pairs, one serving as experimenter and the other as subject, and then alternate. Selection of these pairs is the second step in the experiment. Selection of pairs will serve to control some variables. Names of students, together with their mirror tracing times and errors, can be placed on the board or submitted to a committee. Pairs will be selected whose members are equal, or as nearly equal as

¹⁰⁴T. L. Engle, West, and Milton, op. cit., pp. 57-60.

possible, in time and errors.

3. Half of the pairs in the class will begin the massed practice and half with distributed practice. Record the type of practice the individual student is using in the blank space under "Individual" in Table IX, page 57. The student in each pair selected to serve first as experimenter will number the star sheets before starting and change them as quickly as possible between trials. He will record the time for each trial in seconds, and give the subject the signal to start on the next trial.

In massed practice, the experimenter will require the subject to begin on a new tracing immediately following the completion of the previous trial. In distributed practice, the experimenter will require the subject to wait a certain length of time before beginning the next tracing; for example, a waiting interval of sixty to ninety seconds. During the waiting interval, the subject is not to look in the mirror or make any practice movements.

4. The experimenter and subject will change roles and use the alternate condition of practice. If the first subject was given massed practice, he will give distributed practice when he serves as experimenter, and vice versa.

5. Count the number of errors for each of the ten or more trials, the number of trials being determined by the time available. Record the number of errors under the heading "Individual Errors" on Table IX. Record the time in seconds for each tracing of the star under the heading "Individual Time."

6. For all subjects using massed practice, find the mean time and mean number of errors for each of the ten or more trials. Compute the same means for all subjects using distributed practice.

Record these means in the appropriate columns of Table IX. Make graphs showing all data.

Discussion: (1) What was the independent variable in this experiment? (2) What was the dependent variable? (3) What variables were controlled? (4) Did the curve for massed practice show improvement during the series of trials? (5) Did one curve indicate more improvement than the other? If so, which type of practice resulted in greater efficiency of learning? Explain. (6) Do the data gathered in this experiment tend to support the hypothesis? Explain.

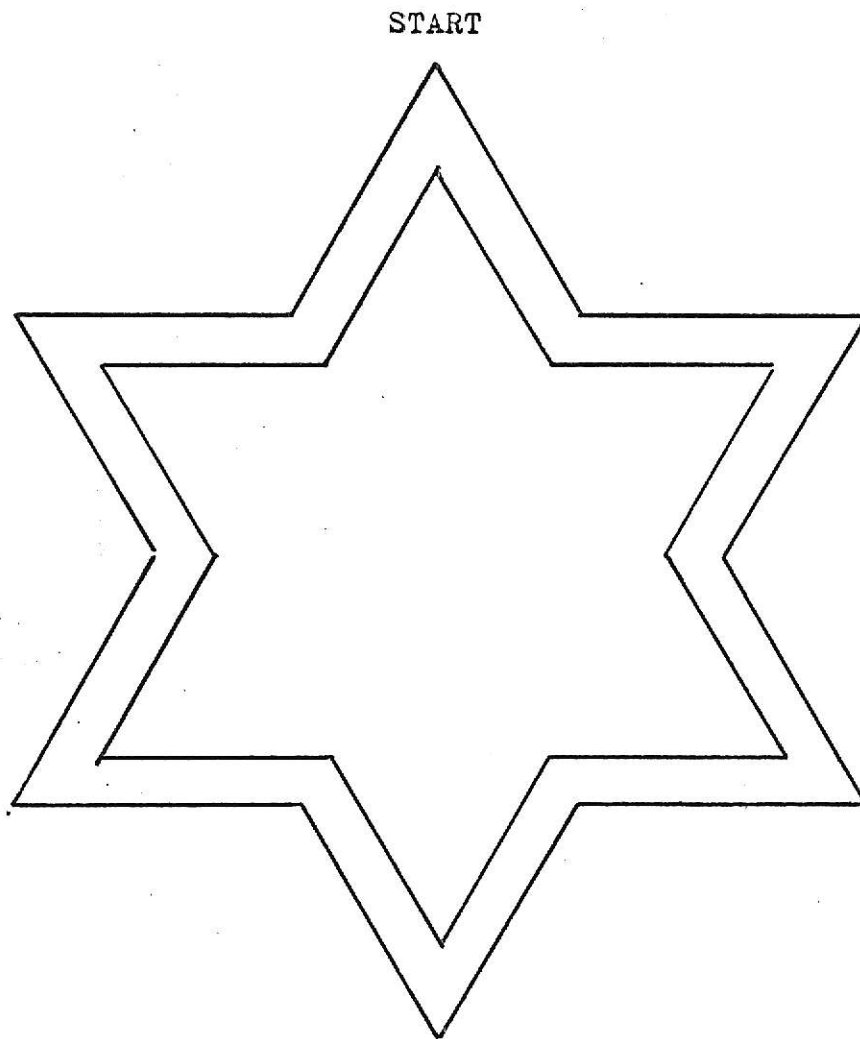


Figure 4. Star design for mirror tracing.

TABLE IX
INDIVIDUAL AND CLASS DATA FOR MIRROR TRACING

MIRROR TRACING TRIAL	INDIVIDUAL		CLASS MEANS			
	(KIND OF PRACTICE)		MASSED PRACTICE		DISTRIBUTED PRACTICE	
	TIME	ERRORS	TIME	ERRORS	TIME	ERRORS
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

LEARNING VERSUS PERFORMANCE DIFFERENCES AND DISTRIBUTION OF PRACTICE

Purpose: To demonstrate the great usefulness of the learning-performance distinction and to question any ideas that more learning is necessarily produced by spacing than by massing. The specific hypothesis to be tested is that massing and spacing of practice have no differential effect on learning because they have differential effects upon inhibition and, as a consequence, spacing produces only temporary (not habit-related) superiority in performance.

Introduction: Most textbooks state that spaced practice is superior to massed practice. The statement fails to make clear to what the superiority applies, learning or performance. The spacing of practice does not necessarily produce better learning. It will, however, usually produce better performance.

Hull (1943), as well as others, made important distinctions between learning and performance. He wrote: $R = f(H \times D) - I$, where R represents performance or output; H represents habit or learning effects; D is drive; and I is reactive inhibition or the negative effect of responding. Clearly, learning and performance are not identical, for performance is dependent upon three variables (H, D, I), only one of which is the learning factor.

Materials: A hand-tally counter with a thumb-operated control (e.g., a Veeder-Root counter is fine) for each subject (S) and a stop watch for each pair of Ss.

Procedure: The Ss will be given a preliminary trial in order to assign them to one of two matched groups. Training will then be given under either Massed (M) or Spaced (S) conditions. The members of a pair will do equal amounts of work during Training, and then rest long enough to recover from transient effects produced by M or S conditions. Thus, if there is no difference between groups during the Test period, there is no difference in the amount learned during Training.

The S's job is to activate the counter as fast as he can with the thumb of his preferred hand while standing with arm at his side. The S must not practice with the counter

except when specifically instructed to do so. Practice will be divided into three separate periods: Pretest, Training, and Test. Pretest and Test will be administered in the classroom by the instructor. Training will be administered by the students in their experimental rooms.

1. Pretest. After familiarizing the class with the counter, one 25-second Pretest trial will be given to all Ss. The scores will be posted on the blackboard, to be used to match and assign Ss to Groups M and S.

2. Training. Matched Ss go to their experimental rooms where the S assigned to Group S begins by administering the M trials to his partner.

a. After checking S's posture, read instructions M: "When I say 'Go,' press the counter button with your thumb, and go as fast as you can. Under no circumstances should you vary your technique of pressing. When I say 'Stop,' stop and read me your score. Then return your hand to your side without resetting the counter. Have you any questions?...Ready? Go!"

b. Give ten trials of 25 seconds of work and 5 seconds of rest; record in Table X, page 61 the number as read by S.

c. Do not stop or reset the stop watch until the conclusion of Trial 10 (i.e., at 25 and 55 seconds say "Stop," and at 0 and 30 seconds say "Go.")

Both Ss must do equal amounts of work. This is accomplished by using the Critical Score. Subtract 60 (Critical Score) in Table X. This is the number of responses which the Spaced S must equal or exceed.

Experimenter (E) and S exchange roles at this point.

a. After checking S's posture, read instructions S: "When I say 'Go,' press the counter button with your thumb and go as fast as you can. Under no circumstances should you vary your technique of pressing. When I say 'Stop,' stop and read me your score. Do not reset the counter. Then sit down and rest. When you feel sufficiently rested and want to begin another trial, stand up. I will give you the 'Ready....Go!' signals for the next trial. Any questions?...Ready? Go!"

b. Give S as many trials as necessary to equal or surpass the Critical Score, e.g., if the Critical Score is 800 and S has accumulated a score of 799, he must be given one more complete 25 second period of work. Record the data in Table X.

3. Test. A minimum average of twenty minutes of rest time between the completion of Training and the onset of Testing should be insured. For the Test, all Ss will be given, simultaneously, two 25-second trials 120 seconds apart. Enter these data on the rear of Table X.

Results: 1. Record the means of the class data in Table XI, page 62. Make a figure to include the means from all three practice periods. Describe the results you have plotted.
2. What short-term and what relatively long-term effects can be attributed to the two types of training used?

Discussion: (1) Why were the Test trials not given immediately after Training? (2) Why were the Ss matched? (3) Discuss the evidence that bears on the learning and performance distinction. (4) Are there circumstances where you would recommend massed practice? Spaced practice? In answering this question, you might consider the learning of other types of tasks.

TABLE X
INDIVIDUAL DATA FOR MASSED AND SPACED PRACTICE
OF A SIMPLE MOTOR PERFORMANCE

Massed S	Spaced S																		
Pretest Score: _____ Trial Cycle 25-5 1 _____ * 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ 7 _____ 8 _____ 9 _____ 10 _____ Critical Score: _____	Pretest Score: _____ Trial Cycle 25-X 1 _____ * 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ 7 _____ 8 _____ 9 _____ 10 _____ START _____ STOP _____ Total Time: _____																		
<table border="0" style="width: 100%;"> <tr> <td style="width: 15%; text-align: left;">Time</td> <td style="width: 35%; text-align: center; border-bottom: 1px solid black;">Total</td> <td style="width: 50%; text-align: center; border-bottom: 1px solid black;">Mean</td> </tr> <tr> <td>Work</td> <td style="text-align: center;">250 sec.</td> <td style="text-align: center;">25 sec.</td> </tr> <tr> <td>Rest</td> <td style="text-align: center;">45 sec.</td> <td style="text-align: center;">5 sec.</td> </tr> </table>	Time	Total	Mean	Work	250 sec.	25 sec.	Rest	45 sec.	5 sec.	<table border="0" style="width: 100%;"> <tr> <td style="width: 15%;"></td> <td style="width: 35%; text-align: center; border-bottom: 1px solid black;">Total</td> <td style="width: 50%; text-align: center; border-bottom: 1px solid black;">Mean</td> </tr> <tr> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> <tr> <td></td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> </tr> </table>		Total	Mean		_____	_____		_____	_____
Time	Total	Mean																	
Work	250 sec.	25 sec.																	
Rest	45 sec.	5 sec.																	
	Total	Mean																	
	_____	_____																	
	_____	_____																	

* Subtract the scores of successive trials and enter the remainders in this column.

TABLE XI
CLASS DATA FOR MASSED AND SPACED PRACTICE
OF A SIMPLE MOTOR PERFORMANCE

<u>Massed Group</u>		<u>Spaced Group</u>	
	<u>Mean No.</u>		<u>Mean No.</u>
Pretest	_____	Pretest	_____
Training		Training	
1	_____	1	_____
2	_____	2	_____
3	_____	3	_____
4	_____	4	_____
5	_____	5	_____
6	_____	6	_____
7	_____	7	_____
8	_____	8	_____
9	_____	9	_____
10	_____	10	_____
Total	_____	Total	_____
Test		Test	
1	_____	1	_____
2	_____	2	_____

Mean Training Time in Sec.

Work Period

Massed

Spaced

Rest Period

25.0

25.0

5.0

EFFECTS OF KNOWLEDGE OF RESULTS ON LEARNING¹⁰⁶

Purpose: To measure the influence of knowledge of results on drawing four-inch lines.

Materials: Blindfold, ruler, soft lead pencil, response sheets, graph paper. Two outside (naive) subjects are necessary.

Procedure: For the first subject (S_1) sequence ABBA will be followed; that is, the experimenter will follow the directions for Condition A (no knowledge of results), then Condition B (knowledge of results), repeat Condition B, and repeat Condition A.

For the second subject (S_2) sequence BAAB will be followed; the experimenter will carry out the instructions for Condition A first, Condition A second, repeat Condition A, and repeat Condition B.

The ABBA or BAAB sequence is followed in order to demonstrate the effects, if any, of experience on the responses.

Before beginning the experiment, response sheets will need to be prepared. Indicate on each sheet the sequence and condition being followed.

Subject sits at a table blindfolded, a soft lead pencil in his writing hand. Experimenter places the response sheet before subject in a standard fashion which will be kept constant for all trials. Experimenter refers to the response sheet and tells subject that he will be asked to draw four-inch vertical lines from the starting point while blindfolded. For the ABBA sequence, experimenter reads the following directions.

Condition A. "I will place your pencil on the starting point. When I release your hand and say, 'All right,' push your pencil forward away from yourself to make a line that you judge to be four inches long and perpendicular to the base line. Ten more trials will follow, making eleven trials in all."

Experimenter gives no information to subject concerning accuracy of his drawing. At the start of each trial, experimenter guides S's pencil to the starting point and says, "All right" as he releases S's hand. During each trial E holds the response sheet in place. Before each new trial he moves the paper enough so the starting point is in front of S. Complete eleven trials.

Condition B. When S is blindfolded and ready, repeat the instructions for Condition A and add the following. "When you finish each line, I will give the following information: If your line is exactly four inches long, I will say, 'Correct.'"

¹⁰⁶Roach, Sherman, and Roach, op. cit., pp. 2-5.

If your line is within $1/2$ inch of being correct, I will say, 'A little short' or 'A little long.' If your line is more than $1/2$ inch in error, I will say, 'Too short' or 'Too long.'"

Results: Collect data on both Ss. Measure the errors for the ten experimental trials and record on the data sheet shown in Table XII, page 65. Omit the practice trial. The score for each trial is the shortest distance, in eighths of an inch, from the point where the S's line ends to the four-inch line. Ignore plus or minus (too long or too short) aspects of the error. Obtain the average error for the A trials and the B trials for both subjects. Place results in Table XIII, page 65 and also illustrate results by the use of a graph. (Figure 5, page 66.)

Discussion: (1) Discuss the independent and dependent variables (knowledge of results and drawing four-inch lines) operating in this experiment. (2) Consider the variables which were controlled or which the experimenter attempted to control, including such factors as motivation and learning. (3) Discuss the meaning of the results, especially any general conclusions that might be applied to teaching.

TABLE XII
 ERRORS IN ONE-EIGHTH INCH IN DRAWING
 A FOUR INCH LINE

	A	B	B	A	B	A	A	B
Trial 1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
Mean								
Median								

TABLE XIII
 MEAN ERROR OF EACH SUBJECT WHEN INFORMED
 AND UNINFORMED OF RESULTS

	Subject I				Subject II			
Condition:	A*	B*	B	A	B	A	A	B
Mean Error:								

* A = uninformed, B = informed

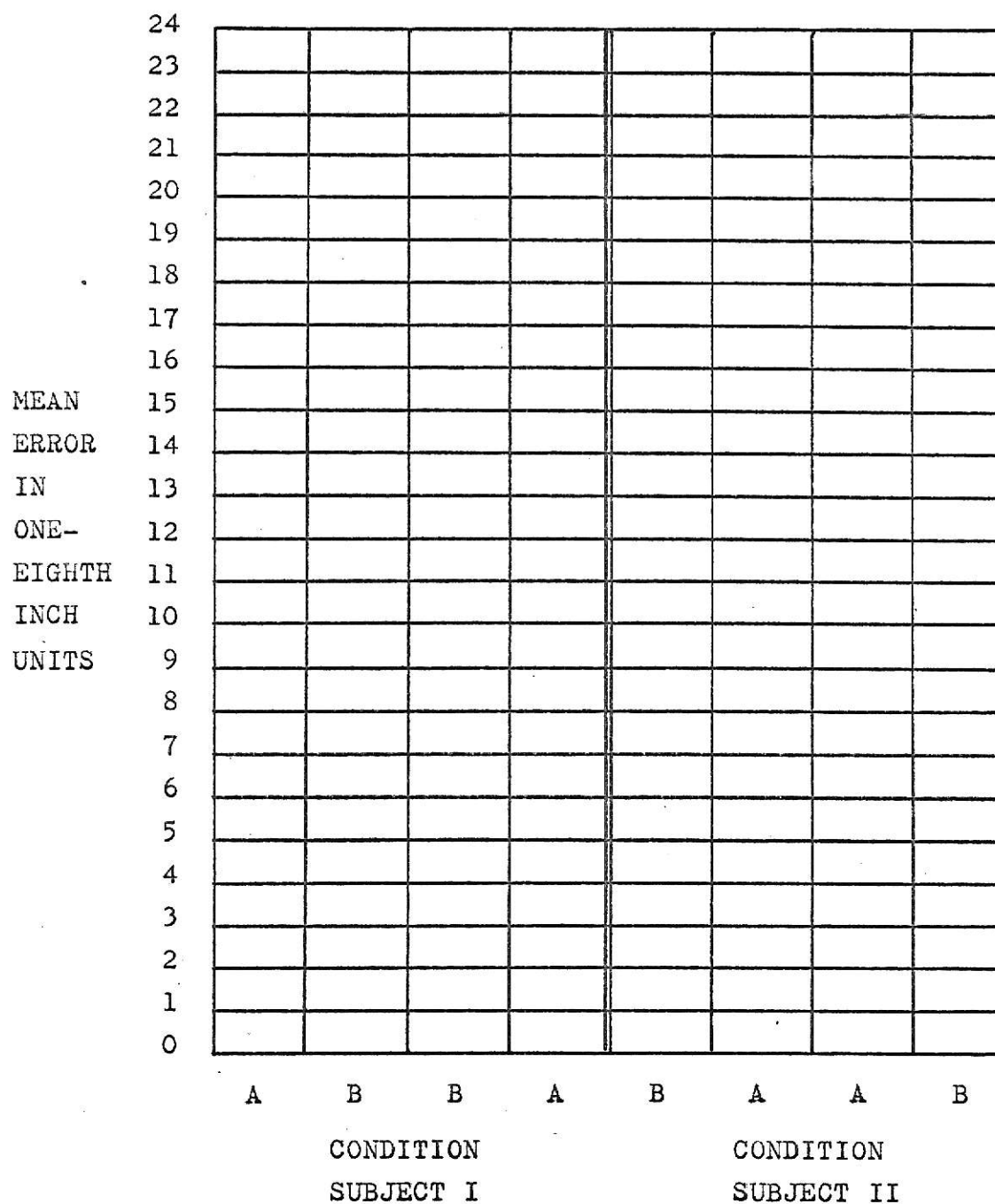


Figure 5. Mean error of each subject when uninformed and informed of results.

AN EXERCISE ON READING VERSUS RECITATION¹⁰⁷

Purpose: To evaluate amount of retention following two methods of learning.

Materials: Paper and pencil; the two poems given below.

Procedure: Spend three minutes memorizing Verse I with no attempt at recitation. Then cover the poem and try to recall it in writing. Next, spend three minutes memorizing Verse II. Read for one minute, then devote two minutes to recitation (with eyes closed try to repeat it silently). If something cannot be recalled, read it again. Repeat this procedure of reading, then trying to recall with closed eyes, checking if necessary. Work as quickly as possible. Cover the poem and recall it in writing. The number of words recalled correctly in the proper order is the score.

Results: Which method yielded the higher score?

Discussion: What is wrong with this exercise from the standpoint of making an adequate comparison between the reading and recitation methods? How should an experiment on this problem be designed so as to make the comparison adequate?

Verse I What would I do if I were wise?
 I would not debate about the skies.
 Nor would I try a book to write;
 Or find the wrong in the tangled right.
 I would not debate with learned men;
 Of How and What and Why and When;
 - I'd train my tongue to the linnet's song,
 I'd learn the words that couldn't go wrong.
 - And then I'd say . . . and
 Win the prize. If I were wise.

Verse II If I were rich what would I do?
 I'd leave the horse just ready to shoe;
 I'd leave the pail beside the cow;
 I'd leave the furrow beneath the plow;
 I'd leave the ducks, tho' they should quack,
 "Our eggs will be stolen before you're back";
 I'd buy a diamond brooch, a ring,
 A chain of gold that I would fling
 Around her neck . . . Ah, what
 an itch if I were rich.

¹⁰⁷Munn, op. cit., p. 48.

THE ROLE OF MEANING¹⁰⁸

Purpose: To demonstrate the benefit of tying each new fact in as well as possible with preexisting knowledge and habits of thought, in other words, demonstrating the role of meaning in learning.

Materials: The letter-square shown below.

Procedure: Ask students how many minutes of study they think it would require before they could reproduce accurately the following letter-square? How long would they remember it?

S	A	V	A	O
R	E	E	E	G
U	R	S	Y	A
O	O	D	N	S
F	C	N	E	R

Before students spend too much time trying to memorize, ask them to try starting in the lower left hand corner and reading upwards. Most of them will recognize the first six words in Lincoln's Gettysburg Address. If so, the square can be reproduced without further study.

Discussion: The best way to remember something "new" is to discover a method of organization which allies it with something previously known. This is often done by finding "analogies." The parables of Jesus illustrate this tying-in of new concepts with everyday experience. Basic principles, mastered at the outset, may also provide a framework for the easy assimilation and retention of great masses of material which, without such organization, would be very difficult to learn.

¹⁰⁸Munn, op. cit., p. 53.

PENCIL AND PAPER DEMONSTRATION OF TRANSFER OF TRAINING¹⁰⁹

Purpose: To demonstrate the principle of positive transfer.

Materials: Pencil and paper.

Procedure: The number "1 0 3 0" is written on the board. Students are invited to "make" a walking man by adding three straight lines.

After a few minutes of trial and error, the students are given special training in the solution of this type of problem as follows:

"V O" is placed on the board. Students are told that this is a Russian word (fictional) for a part of a tree. Translate to English by adding three straight lines. The solution given is: "K N O T."

"L O S S" is placed on the board with these instructions: A man taking on a business venture went broke and suffered financial loss. By adding three straight lines, show exactly how much he lost. The solution given is "4 0 \$ \$."

Next use "1 0 1" and invite students to show how this number can be changed to 2,000 pounds by adding three straight lines. Solution given: "T O N."

After this "training" the students are again given the original problem and asked to solve it. Solution: "H O B O."

¹⁰⁹Snellgrove, loc. cit.

TRANSFER OF TRAINING USING INVERTED ALPHABET PRINTING¹¹⁰

Purpose: To determine to what extent practice with the preferred hand will facilitate performance with the nonpreferred hand, or to determine the extent of bilateral transfer in a simple perceptual-motor task.

Materials: Two pencils, paper, watch with a sweep second hand.

Procedure: The subject's task is to print, in capital letters, the alphabet backwards (Z to A) and upside down, as rapidly and accurately as possible. After each trial, the experimenter records the time in seconds, i.e. the time required to go through the alphabet once, notes the errors by turning the paper around and reading it in a normal position, and provides a thirty-second rest interval which begins immediately after each trial. Time and errors may be recorded on Table XIV, page 72. During the rest interval the subject is allowed to watch (upside down) as the errors are scored. Following the scoring, all printing is folded underneath so that it is out of sight for the next trial. Any letter which is incomplete or not printed both backwards and upside down is scored as an error. Twelve trials are presented. The subject uses his non-preferred hand for the first and last trials, which constitute the pre-test and post-test, respectively. Trials 2 through 11, performed with the preferred hand, are the practice trials.

Results: Determine the amount of bilateral transfer in time scores using the formula presented below. In this formula, trial 12 is the post-test and trial 1 is the pre-test. Thus, transfer is zero when the scores are equal on these two trials; transfer is 100 per cent when the last practice trial (11) and the post-test (12) are equal. In using this formula, make sure that all minus signs are treated correctly.

$$\text{Per cent transfer} = \frac{\text{trial 12} - \text{trial 1}}{\text{trial 11} - \text{trial 1}}$$

Construct a learning curve based on time scores for the practice trials with the preferred hand (Figure 6, page 72). (The median bilateral transfer generally appears as approximately 75 per cent. Moderate individual differences occur, and individual scores vary from 45 to 94 per cent.)

¹¹⁰Fernald, op. cit., pp. 49-53.

Discussion: (1) Interpret results for per cent transfer. Discuss any evidence for positive and/or negative transfer. (2) According to this experiment, is the locus of the transfer in the central nervous system or in the effectors? Would transfer be larger or smaller in a less cognitive task? (3) Consider the relationship between time and error scores in this experiment. Are there instances of a sharp decrease in time or vice versa? If so, offer an explanation. (4) Offer a criticism of this experiment and a suggestion for improvement of the experimental design. (5) Some writers have suggested that essentially all human behavior is transfer. Explain this viewpoint.

TABLE XIV
HAND SEQUENCE AND DATA SHEET FOR ALPHABET TASK

Trial	Hand	Time	Errors	Trial	Hand	Time	Errors
1	NP			7	P		
2	P			8	P		
3	P			9	P		
4	P			10	P		
5	P			11	P		
6	P			12	NP		

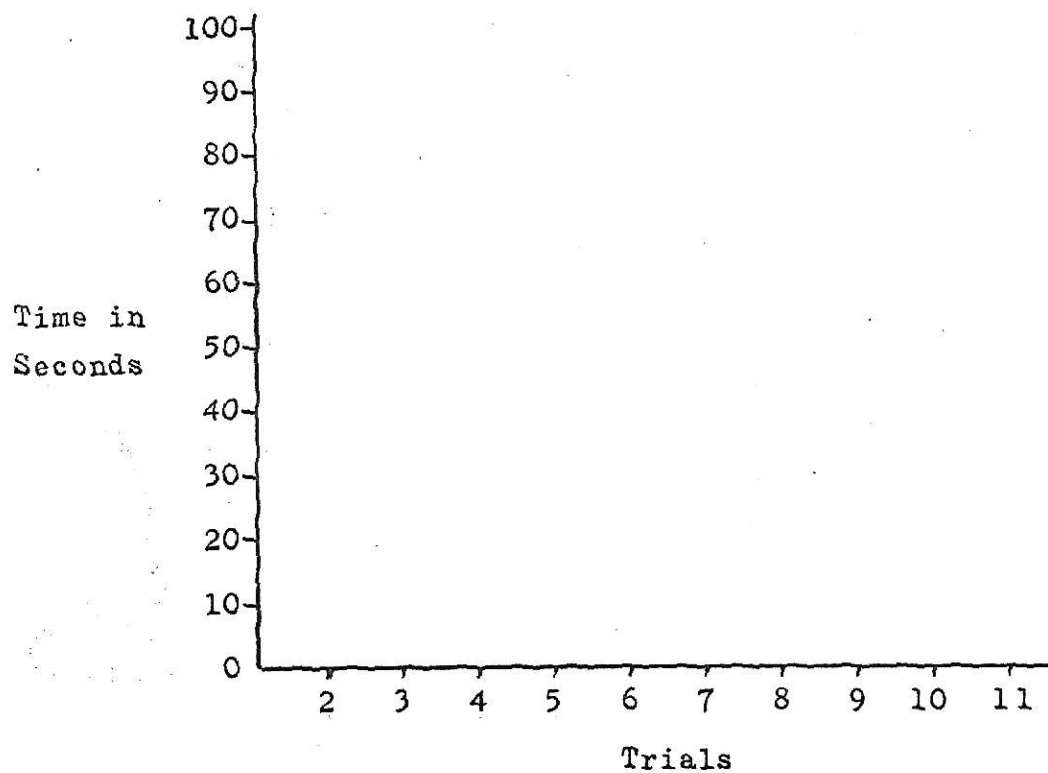


Figure 6. Learning curve for time scores with the preferred hand.

TRANSFER OF TRAINING OF A PERCEPTUAL MOTOR SKILL¹¹¹

Purpose: To investigate the effect of the learning of one task upon the learning of another second task.

This experiment is a variation of the transfer of training experiment from Fernald on page 70. The purpose and method are essentially the same but the materials used differ.

Materials: Mirror-drawing apparatus, short pencil, series of double-star outlines (illustrated in Figure 4, page 56), and a stop-watch.

Procedure: There will be two parts to this experiment. One student will act as experimenter (E) and the other as subject (S) for the first part, then they will exchange roles for the second part.

1. E will place a double-star outline under the mirror and give S a pencil. He will ask S to look in the mirror and trace a line around the star with his nondominant hand, keeping his line between the two star outlines. S must not raise the pencil until he has completed the task.

Next, S will outline twenty stars with his dominant hand as above, always going in the same direction. The final trial will be accomplished by S with his nondominant hand. On each trial E will record the time taken by S to outline the star. Each time S crosses a line, it will be counted as an error. The time and errors for each trial must be recorded. Errors can be counted after all trials are completed.

2. After changing roles the new E will have S outline a star as above with the preferred hand for one trial. Then for the next twenty trials S will use the nonpreferred hand. As above, time and errors for each trial must be recorded.

Results: For part I compare time and errors for the first trial with the nondominant hand to time and errors for the second trial with the nondominant hand. For part II compare the time and errors for the first trial with the preferred hand with time and errors for the second trial with the same hand. After giving data in tabular form, present it in graphic form.

¹¹¹Roach, Sherman, and Roach, op. cit., pp. 123-125.

PAIRED ASSOCIATES: RETROACTIVE AND PROACTIVE INHIBITION¹¹²

Purpose: To study the use of paired associates in attempting to get at the factors underlying retroactive inhibition; to observe both proactive and retroactive inhibition and the controls involved in the study of these phenomena.

Materials: Two sets of thirteen slides prepared on glass slides containing the symbols shown on page 76, Figure 7 paired with nonsense syllables. Size of the glass slides will depend on the size of the projector. Students need paper and pencil.

Procedure: In a retroactive inhibition experiment the subjects learn some material (A) then learn some "interpolated" material (B), and finally are tested for the retention of A by means of recall, recognition, or relearning techniques. If the learning of B has somehow reduced the efficiency of retention of A, we speak of "retroactive inhibition."

Because the decrement might be due to the passage of time, a control group, matched for learning ability, does not learn B, but waits for the retention test while the experimental group learns the interpolated material. During this waiting period it is important that the control group neither practice A nor learn anything else.

The thirteen slides of Set A are projected on a suitable screen for the entire class, one at a time, two seconds per slide. After this first presentation, the experimenter will expose only the figure side of each slide for three seconds. The subjects try to write down on slips of paper, with thirteen blanks, the syllable that accompanied the figure. The slides are shuffled between learning presentations and "test trials." Four more learning and test trials are given.

The experimenter then divides the subjects into two groups, an experimental and a control group, on the basis of their learning scores, taking care to balance the groups. The experimental group now learns (five trials) thirteen more figure-syllable combinations (Set B) in which the figures are similar to, but not identical with, those of Set A. The control group subjects leave the experimental room and occupy themselves with New Yorker or other cartoons, each member trying to pick the funniest cartoon. When the experimental group is finished with B, both groups are tested by recall and relearning (two trials for material A).

¹¹² B. R. Bugelski, op. cit., pp. 343-46.

Results: This demonstration is in effect a repetition of one-fifth of an experiment conducted by Gibson.¹¹³ The results from her subjects are listed in Table XV, page 77. Space has been provided for inserting the group data of this experiment in the same table for ready comparison. (1) How much retroactive inhibition did the experimental group show? (2) Were there any proactive effects? (3) How could you test for these? (4) Do you have any data which bear upon the factors responsible for proactive or retroactive inhibition?

Discussion: (1) How do your experimental data compare with those of Gibson? Can you account for any discrepancies? (2) Why did she use such figures as she did for the stimulus side of the paired comparisons? (3) Why did she use five trials in the original learning and two in the relearning? Why thirteen pairs? (4) Why was material B so much like A on the stimulus side? Did it confuse the members of the experimental group? (5) Why use figures at all? Why not nonsense-syllable pairs? (6) What sources of error do you detect in this experiment? How could they be controlled?

¹¹³E. J. Gibson, "Retroactive Inhibition as a Function of Degree of Generalization Between Tasks," Journal of Experimental Psychology, 28:93-115, 1941.

Figure 7. The Gibson paired associates.

Two sets of thirteen slides are prepared on glass slides (size depending on projector to be used). Slides are prepared in India ink on one surface. This surface is then covered with a plain glass cover slide and the two sheets bound with tape. Each slide contains one of the diagrams above, drawn on the left half of the slide and followed by a dash-line, and then by a nonsense syllable. When the slide is exposed, it is possible to show the diagram alone or the diagram plus syllable. The figures have been copied from Gibson's groups I and II, which are supposed to be relatively similar and to produce a high degree of retroactive inhibition when used as described in the procedure on page 74.

TABLE XV

COMPARISON OF LOCAL DATA WITH DATA OBTAINED BY
E. J. GIBSON FROM 22 SMITH COLLEGE STUDENTS*
IN AN EXPERIMENT ON RETROACTIVE INHIBITION*

Results	Experimental Group		Control Group	
	Gibson N =	Local N =	Gibson N =	Local N =
Mean no. correct responses on test five of original learning.	7.86		7.91	
Mean no. correct responses on test five of interpolated learning	9.86			
Mean no. correct recall of original learning	3.00		7.57	
Mean number of trials to relearn original	3.73		2.35	
Retroactive inhibition on Recall I	59.9%			

*"Retroactive inhibition" is calculated by comparing the percentage of retention in the experimental group with the percentage of retention in the control group. If the control group retains 90 per cent and the experimental group retains 30 per cent, then the experimental group retains only thirty-three per cent of the amount retained by the control group. It has lost 66 per cent. This loss is the "retroactive inhibition."

RETROACTIVE INHIBITION¹¹⁴

Purpose: To study recall when the intervening task is similar but not identical with the original task. This experiment is based on the typical model for retroactive inhibition experiments.

Materials: The necessary equipment includes a pencil, paper, a watch with a sweep second hand, and the lists of nonsense syllables found in Table XVI, page 81. To enable both laboratory partners to act as experimental and control subject, lists A_1 and A_2 have been constructed as equivalent in meaningfulness or association value. Students work in pairs as experimenter and subject. The data of both students are pooled in order to obtain a sufficient number of subjects for this experiment. Each partner acts as both an experimental and a control subject.

Procedure: For this experiment, the partners designate themselves as first and second partners. To avoid excessive exposure to the lists, no scoring is attempted during the data collection. After all trials are completed, the recall lists are scored by counting the number of syllables written correctly.

The assignments and sequence of conditions for both experimental and control subjects, and the time interval for each condition, are summarized in Table XVII, page 81. The successive exchange of roles is required to provide sufficient rest between experimental and control conditions for each subject.

1. The experimenter (the second partner) presents list A_1 to the first partner, who acts first as a control subject, and says: "You will have two minutes in which to memorize this list of syllables. After this time, you will be asked to recall, in writing, as many syllables as possible. No specific order of recall is required." The experimenter answers any questions and then says, "Ready, begin." After exactly two minutes, the subject stops memorizing and is allotted one minute in which to write as many of the syllables as he can remember on a piece of paper, in any order. If the subject completes his recall in less than one minute the remainder of the period is considered a rest interval. The experimenter should not practice his list nor permit the subject the opportunity for additional practice of any list during any rest periods. Casual but steady conversation may be used for this purpose.

¹¹⁴Fernald, op. cit., pp. 59-65.

2. A three-minute rest period is provided after the recall interval. Following this period, S is asked again to write as many syllables as he can recall from list A₁ within one minute.

3. The second partner now becomes an experimental subject, and the first partner serves as experimenter. List A₁ is presented in the fashion described in step 1 above. Following the recall interval, the experimenter presents list B. The subject memorizes list B, following the same learning and recall procedures used for list A₁ - i.e., a two-minute learning period followed by a one-minute recall period. Immediately after the recall period for list B, the subject is instructed to recall as many syllables as possible from list A₁. This recall interval is one minute.

4. After another exchange of roles the first partner becomes the subject again, this time an experimental subject. E. administers lists A₂-B-A₂, in that order, following the learning and procedures described above in steps 1 and 3.

5. The partners exchange roles once again and the second partner this time becomes a control subject. The experimenter provides the following sequence of conditions: A₂-rest-A₂. The procedures are again exactly as described in steps 1 and 2 above.

Results: Record in the appropriate columns of Table XVIII, page 82, (1) the scores for immediate recall of lists A₁ and A₂, i.e., recall prior to the rest interval or the learning of list B, (2) the scores for delayed recall of list A₁ and A₂, i.e. recall following the rest interval or the learning of list B.

In Table XIX, page 82, indicate the total correct syllables for both subjects together in both conditions, as shown in Table XVIII. Determine the per cent correct syllables using as a base the number of correct syllables on the immediate recall list, not the number of syllables on the original list. Thus,

per cent correct recall = $\frac{\text{number of correct syllables on delayed recall}}{\text{number of correct syllables on immediate recall}}$

The per cent correct recall (delayed/immediate) generally is approximately 65 per cent for the experimental group and 95 per cent for the control group. However, the figures for the experimental group may be considerably lower and, on occasion, the control group may even exceed 100 per cent.

Discussion: (1) What was the effect of learning the interpolated material (list B) on the recall of the original material? (2) If list B had consisted of words rather than nonsense syllables, what would be the probable effect on the recall of

list A₁ or A₂? (3) Lists A₁ and A₂ were constructed by using ten pairs of² matched items and placing one item from each pair in each list. However, the two lists still may not be comparable as total lists. Why? (4) What was the purpose of calculating per cent correct recall on the basis of delayed/immediate rather than delayed/original list?

Discussion Answers: (1) The usual result is an interference effect, i.e., retroactive inhibition. There is poorer retention of the original material. (2) The recall probably would be greater if list B consisted of words rather than nonsense syllables because the intervening material (words) would be more dissimilar, hence less disrupting to recall of the original list. (3) Matching these lists item by item does not ensure that the two, as whole lists, are of equal difficulty. Meaningful relationships between and among items may be developed more readily for one list than another, thus making that list easier to memorize as a whole. (However, class testing has indicated that these two lists are of approximately equal difficulty.) (4) In this experiment, the subject is not required to learn the original list perfectly. Therefore, some measure of the subject's original learning is needed in order to determine the amount of forgetting caused by the intervening event. This measure of original learning is provided by the immediate recall list, not the original list.

TABLE XVI
NONSENSE SYLLABLES

List A ₁	List A ₂	List B
JID	SUW	QEC
XAZ	XIH	NIZ
QUG	FYM	FEP
MEP	SEH	JUL
LUJ	VOF	FIW
RUY	DOJ	MUH
NEJ	BIW	XAD
WOC	NER	KOV
VUK	JOF	TEB
DIB	KES	SOQ

TABLE XVII
ASSIGNMENTS AND SEQUENCE OF CONDITIONS FOR
EXPERIMENTAL AND CONTROL SUBJECTS

1st partner (C)	2nd partner (E)	1st partner (E)	2nd partner (C)
A ₁ (2 + 1)	A ₁ (2 + 1)	A ₂ (2 + 1)	A ₂ (2 + 1)
Rest (3)	B (2 + 1)	B (2 + 1)	Rest (3)
A ₁ (1)	A ₁ (1)	A ₂ (1)	A ₂ (1)

TABLE XVIII

DATA SHEET FOR CORRECT RECALL BY
EXPERIMENTAL AND CONTROL SUBJECTS

Subject	List	Condition	No. Syllables Recalled Correctly		
			Immediate Recall	Delayed Recall	Recall
1st partner	A ₁	Control			
2nd partner	A ₂	Control			
		Total			
1st partner	A ₂	Experimental			
2nd partner	A ₁	Experimental			
		Total			

TABLE XIX

TOTAL AND PER CENT CORRECT RECALL FOR
EXPERIMENTAL AND CONTROL SUBJECTS

Condition	Total Correct Syllables		Per Cent Correct Syllables
	Immediate Recall	Delayed Recall	(Delayed/Immediate)
Control			
Experimental			

THE MEMORY SPAN FOR IMMEDIATE RECALL¹¹⁵

Purpose: To measure individual differences in the memory span for immediate recall; to determine the effect of stimulus material; to demonstrate the method of systematic randomization.

Materials: Tape recorder and prepared tape containing digit series and letter-digit series varying in length from five to twelve units per group. Teacher's manual required.

Procedure: This is a group experiment in which the instructor serves as experimenter (E) and each of the students is a subject (S). From the tape recorder the Ss will hear a series of digit or letter-digit groups. One group might be for example, 7-2-6-1-3 and a letter-digit group might be P-A-L-1-3. Each of these examples contains five units. In the experimental series, on tape, the letter-digit series groups have been transposed from the digit series groups in terms of the telephone dial code. In the example above, 7 can be transposed to the letter P; 2 to A; and 6 to L. Thus if you dialed Pal-13 you would get the same number as if you dialed 7-2613. The major problem here is to determine if these two kinds of code representation are as equivalent to the person dialing as they are to the telephone being dialed.

Units in a group will be heard at the rate of one per second, and the different series lengths are presented in random order. After each group of digits or letter-digits is heard, S must attempt to recall and write the group in exactly the same order as they were read. Enter responses in Table XX. After the entire series has been presented the tape will be replayed and the Ss will score their answer sheets. For each correct group the S enters a number in the D or LD column of the table to indicate the group length. Cross out an incorrect group. No group is correct unless all of the units are given in correct order and there are no extra units present.

Students should be instructed to draw a line through any space immediately if they are unable to recall any of the units in the group.

Results: From Table XX, count the number of correct reproductions for each of the eight digit group lengths and enter in the second column of Table XXI. Do the same for the letter-digit groups and enter in Column 5 of Table XXI. Convert each entry to percentage and enter in the next column.

¹¹⁵Robert S. Daniel, Student's Manual for General Experimental Psychology (Columbia, Missouri: Lucas Brothers Publishers, 1965), pp. 23-28.

In order to find that group length which best represents each student's ability to listen and recall, the method of linear interpolation will be used. Each should construct a graph of his own results for digits by plotting group length along the abscissa and per cent (0 to 100) up the ordinate. Enter the eight correct figures into the graph and connect them with straight lines to form the "per cent correct curve." Now the same should be done for the per cent incorrect figures, which are the converse of the figures just plotted. Results will be more precise if the graph is made as large as the paper permits. Find the point where the two curves cross. If secure data is used this point will be at or near the 50% point. The instructor should be consulted about proper procedure if curves are not smooth. Drop a vertical line from the crossing point to the abscissa and read the individual memory span score on that scale. Repeat the above procedure for the letter-digit series data using a new graph.

Collect means for the class on each of the group lengths for both digits and letter-digits. Enter these data in Table XXI, page 87. Draw a set of graphs for the class means similar to those for individual data.

Apply the Sign Test to the class data in order to determine if memory span for the letter-digit series is greater than it is for the digit series. Use Table XXII page 88 for this analysis. The Sign Test is appropriate as a test of differences when scores can be paired, as in our present data. That is, there is a score for digits and letter-digits which "belong together" because they came from the same person. By the use of the Sign Test, and its table of interpretation on page 89 (Table XXIII), we can determine if enough of the Ss show faster RTs for the letter-digits to convince us that we would get results in the same direction in 95 out of 100 repeated experiments. This criterion is known as the 5% level of confidence and is commonly used in research work. The procedure is as follows:

1. Use the last column of Table XXII to record the signs. If an S's letter-digit memory is better than for digits, put a plus (+) sign in the column for that S. If his digit memory is better, enter a minus (-) sign. Use a 0 if the two scores are equal. Now count the number of + signs and enter this count at the bottom of the column.

2. Refer to XXIII, page 89. Count the total number of plus and minus signs in Table XXII (i.e. do not count the zeros). Find this number in the first column of Table XXIII, headed "N" then look in the same row over in column 2, headed "5% level." Now if your count of plus signs at the bottom of the last column of Table XXII is as large or larger than this figure then the letter-digit memory is indeed convincingly better than the digit memory for your group of Ss.

Students could profit from a further explanation of the logic of this procedure. If memory for the two kinds of material were truly equal, we would still expect to find that any particular S might show better memory for the letter-digits. Another S might show better memory for the digits. But in a group of people, it is probably that about half would recall one list better and the other half would recall the other list better. Even when precautions are taken to make conditions uniform from trial to trial, there are still factors which cause variability over which the experimenters have no control. So in order to be sure a difference is not due to chance (a term used to refer to all of the uncontrolled factors collectively) we look for a good many more cases than one-half of them showing up in the predicted direction. Table XXIII has been worked out by statisticians to show what proportion is required for the degree of confidence (convincingness or probability) we were looking for.

Discussion: (1) As you served the role of S in this experiment, what abilities did you feel were being used in performing the task? What sorts of real life situations require these abilities? (2) Why do we use a criterion of 50% right for the memory span score instead of some other value? (3) What unwanted factors were we attempting to control in using a tape recording instead of the instructor merely reading the lists? Why did we have four trials at each group length? Why were the different group lengths and the two kinds of series in random order? Why was a digit series group matched with a letter-digit series group? Within a group the successive digits (or letters) were random with the constraint that no unit would be repeated in the next position, nor would they appear in logical sequence (like 1-2-3). Why was this done? In short, what is systematic randomization and why is it used? (4) All of the letter-digit series were arranged to produce common first names or nicknames. If we had used nonsense combinations of letters what results would you expect? (5) Did you find the difference between memory span for digits and that for letter-digits convincing? Why? (6) What are the three "kinds" of memory? Which one is involved in the task measured in this experiment?

TABLE XX
 PROTOCOL AND SCORING OF MEMORY SPAN DATA

Ser. No.	Response	D	LD	Ser. No.	Response	D	LD
1				28			
2				29			
3				30			
4				31			
5				32			
6				33			
7				34			
8				35			
9				36			
10				37			
11				38			
12				39			
13				40			
14				41			
15				42			
16				43			
17				44			
18				45			
19				46			
20				47			
21				48			
22				49			
23				50			
24				51			
25				52			
26				53			
27				54			

TABLE XX (continued)

Ser. No.	Response	D	LD	Ser. No.	Response	D	LD
55				64			
56				65			
57				66			
58				67			
59				68			
60				69			
61				70			
62				71			
63				72			

TABLE XXI
ORDERING OF DATA

Series Length	Digit series			Letter-Digit series		
	Your Number Correct	Your Percent Correct	Class Mean % Correct	Your Number Correct	Your Percent Correct	Class Mean % Correct
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

TABLE XXII

SIGN TEST FOR SIGNIFICANCE OF DIFFERENCE

Subject	Memory Span		Sign	Subject	Memory Span		Sign
	Digits	Letter-Digits			Digits	Letter-Digits	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
No. + signs =							

TABLE XXIII

CRITICAL VALUES FOR THE NUMBER OF PLUS SIGNS
FOR THE SIGNS TEST FOR DIFFERENCES
BETWEEN TWO DISTRIBUTIONS WHEN
THE DIRECTION IS PREDICTED

Size of Sample	Number of Plus Signs Required	
	5% level	1% level
5	5	5
6	6	6
7	6	7
8	7	8
9	8	9
10	8	9
11	9	10
12	9	11
13	10	11
14	11	12
15	11	13
16	12	13
17	12	14
18	13	14
19	14	15
20	14	16
21	15	16
22	15	17
23	16	18
24	17	18
25	17	19

REMEMBERING A POEM¹¹⁶

This exercise is to be used in connection with "An Exercise on Reading Versus Recitation" on page 67.

Purpose: To compare recall scores on long-term retention of material which was memorized using recitation and material memorized without using recitation.

Materials: Pencil and paper.

Procedure: Earlier, two verses of a poem were learned by the students. Without again looking at this poem, see how well they can recall it in writing.

Results: How does the recall score compare with the original one? Was there better or poorer recall of the verse learned by the recitation method? Is this outcome what would be expected from the discussion in class and information in the textbook?

¹¹⁶Munn, op. cit., p. 54.

ACCURACY OF TESTIMONY¹¹⁷

Purpose: To test memory for details in a single filmed episode.

Materials: The film "Fidelity of Report."

Procedure: Following the showing of the above film, students should write answers to each question below. Answers should be as short as possible, which will often mean only one word.

1. Who appeared first in the picture, the woman or the first man?
2. When they were both present, which one was on your left?
3. Was there a gun in the woman's purse?
4. When the first man got the money from the woman, into which pocket did he start to put it?
5. Was the first man chewing or smoking, and if so, which?
6. Was the second man chewing or smoking, and if so, which?
7. Was the woman's hat light or dark colored?
8. Did her hat have any decorations such as flowers, ribbons, something made of the same material as the hat, etc? If so, what?
9. Did the woman carry her handbag under her arm, or slung from a strap over her shoulder?
10. Under which arm, or over which shoulder?
11. How much money showed in her purse?
12. Was she tall, short, or medium?
13. Was the first man's coat single or double breasted?
14. Were his trousers light or dark colored?
15. Was he tall, medium, or short?
16. Did he wear glasses?
17. Was he right or left handed?
18. What material was the second man's hat made of?
19. Was the second man's coat single or double breasted?
20. Were his trousers light or dark colored?
21. Was his necktie solid colored, or more than one color?
22. Did he wear glasses?
23. Was he right or left handed?
24. Did the extra tire on the car have white side walls?
25. Where was the extra tire; on top of the car, back, right side or where?
26. What objects showed along the curb in front of the original two people?

Correct answers are on the following page.

¹¹⁷Munn, op. cit., pp. 55 and 88.

Correct answers to questions on film, "Fidelity of Report"

1. Both, neither
2. Man, first man
3. Couldn't see, didn't see, don't think so.
4. Inside pocket on left, left pocket, inside pocket, coat pocket, vest pocket
5. Chewing
6. Neither, no
7. Dark
8. Feathers, band, ribbon
9. Slung over her shoulder
10. Left shoulder, under left arm
11. \$10.00 and over, at least \$10.00.
12. Medium
13. Double-breasted
14. Light, medium
15. Medium
16. No
17. Left
18. Straw, panama
19. None, neither
20. Dark
21. More than one
22. Yes
23. Right
24. Not visible, was covered
25. Left, front fender, side
26. Fire hydrant. Also...bus stop sign, some sort of sign, rubbish.

AN INVENTORY OF STUDY HABITS AND TECHNIQUES¹¹⁸

Purpose: To take a study-habits inventory in order to reinforce good study habits and to detect and correct undesirable habits.

Materials: The study-habits inventory provided on pages 94 through 96.

Procedure: 1. Mark T or F before each question to indicate whether the statement is true or false as far as you are concerned. In case you are uncertain, use a question mark for your response. The inventory will be of value to you only insofar as you are perfectly frank in answering the questions.

2. After indicating your responses you may determine which of your study habits are desirable and which are undesirable. The inventory was designed to measure five aspects of study efficiency. The question numbers and desired responses for each of these aspects of study efficiency are indicated on page 97. Check your responses with those answers. Do not count questioned responses as in agreement with the key. Record your scores for each section and for the total inventory in Table XXV, page 98, using the column headed "First Scores - Desirable Responses."

Copy your scores for each section and the total score on a slip of paper. Hand it in so that a committee can find the means for the class. When these are reported, fill in the "Mean for Class" column under the heading "First Scores."

3. After studying the unit on learning, or near the close of the course in psychology, answer the questions again, using the answer spaces provided at the right of the questions. Cover the answers you gave early in the course so that you will not be influenced by them. Record your scores and the means for the class.

¹¹⁸Engle, op. cit., pp. 37-40.

- 1. I have a definite, although reasonably flexible, study schedule, with times and places for studying specific lessons. 1. -----
- 2. I stick to my study schedule except for very good reasons. 2. -----
- 3. I often get to class or sit down to study only to find that I do not have necessary books, notebooks, pencils, paper, or other material. 3. -----
- 4. I have trouble settling down to work at the beginning of a period of study; I do not begin studying as soon as I sit down at my desk. 4. -----
- 5. I use the facts learned in one course to help me understand the material in other courses. 5. -----
- 6. I use the facts learned in school to help me understand events and work outside school. 6. -----
- 7. My study periods are often too short for me to get "warmed up" so that I can concentrate on the task of study. 7. -----
- 8. Sometimes I sit down to study only to discover that I do not know exactly what the assignment has been. 8. -----
- 9. I have to wait for the "mood to strike me" before attempting to study. 9. -----
- 10. I try to do some "overlearning" — working beyond the point of immediate recall. 10. -----
- 11. I work out personal examples to illustrate general principles or rules that I have learned. 11. -----
- 12. I review previous work before beginning work on an advanced assignment. 12. -----
- 13. I often study while watching television or while persons are talking in the same room. 13. -----
- 14. I review frequently. 14. -----
- 15. When studying, I frequently get up, walk about, glance at a newspaper, write a friendly note, or look at my neighbors. 15. -----
- 16. I have a tendency to indulge in daydreams when I am trying to study. 16. -----
- 17. As a rule, I finish one study task before beginning another. 17. -----
- 18. My study time is frequently interrupted by telephone calls, noises, visitors, and other distractions. 18. -----
- 19. I spend much time that I should spend on my schoolwork on dates, dances, movies, loafing, or reading cheap fiction. 19. -----
- 20. I spend too much time on some subjects and not enough on others. 20. -----

- 21. I keep a special indexed notebook or card system for recording new words and their meanings. 21. -----
- 22. I practice using new words in situations where they apply. 22. -----
- 23. Frequently I do not get enough sleep and feel sluggish in school the next day. 23. -----
- 24. I worry about my schoolwork. 24. -----
- 25. As a rule, I find my schoolwork interesting. 25. -----
- 26. For the present I prefer to remain in school rather than drop out and get a job. 26. -----
- 27. I study most subjects with the idea of remembering the material only until the course is over. 27. -----
- 28. Dislike for certain teachers and courses interferes with my school success. 28. -----
- 29. When I have difficulty with my work, I do not hesitate to talk over the matter with my teacher. 29. -----
- 30. I feel that the teachers are unsympathetic and do not understand me. 30. -----
- 31. I feel that the teachers are friends of mine. 31. -----
- 32. I am often afraid to recite in class even when I think that I know the correct answer. 32. -----
- 33. I read by indirect (diffused) light rather than by direct light. 33. -----
- 34. I pronounce the words to myself as I read, sometimes moving my lips or muttering to myself. 34. -----
- 35. In preparing my assignments, I try to memorize the exact words of a text. 35. -----
- 36. I skim over and make a preliminary survey of a chapter—for example, by reading the paragraph headings—before reading the chapter in detail. 36. -----
- 37. I pause at logical breaks in my reading, such as the close of a section or chapter, and recite to myself the principal points in that section. 37. -----
- 38. I mark important or difficult passages in books that I own, so that I can give special attention to these points when I review. 38. -----
- 39. I tend to skip the tables and graphs that I find in my reading assignments. 39. -----
- 40. I read rapidly enough so that I have no trouble in covering my assignments. 40. -----

- 41. Sometimes I discover that I have read several pages without knowing what was on them; that is, I don't know what I have been reading about when I get through. 41. -----
- 42. I have to reread material several times before I get the meaning of it. 42. -----
- 43. I have trouble in picking out the important points in material read. 43. -----
- 44. I look up in a dictionary words that I do not know or words whose meanings I cannot be sure of from the context. 44. -----
- 45. Except for important quotations, I take notes in my own words rather than use the exact words of the author. 45. -----
- 46. I take notes on odd, loose strips of paper instead of in a notebook. 46. -----
- 47. Sometimes I make simple charts or diagrams to represent points in my reading. 47. -----
- 48. I keep notes for each subject together in my notebook. 48. -----
- 49. I tend to take down in my notes material that turns out to be unimportant. 49. -----
- 50. I take notes on my reading after I have completed the reading rather than making notes on each point as I go along. 50. -----
- 51. I often do not have reports ready on time, or they are poorly done if I am forced to have them in on time. 51. -----
- 52. I have difficulty in making complete sentences when I write. 52. -----
- 53. I make an outline or plan of a report before beginning the report itself. 53. -----
- 54. I usually write reports several days before they are due, so that I can check and correct them—and rewrite them if necessary—before handing them in. 54. -----
- 55. I do most of my reviewing for a course the night before the examination. 55. -----
- 56. In preparing for an examination, I try to memorize the exact words of the text. 56. -----
- 57. When preparing for an examination, I get excited and tense and find it difficult to study. 57. -----
- 58. During an examination I get nervous and cannot do myself justice. 58. -----
- 59. I read all the questions on an essay examination before beginning to answer any of the questions. 59. -----
- 60. I plan out in my thinking, or on scratch paper, the answer to an essay question before beginning to write the answer. 60. -----

TABLE XXIV
ANSWERS FOR STUDY-HABITS INVENTORY

A. General habits and techniques of study

1. T	9. F	17. T
2. T	10. T	18. F
3. F	11. T	19. F
4. F	12. T	20. F
5. T	13. F	21. T
6. T	14. T	22. T
7. F	15. F	23. F
8. F	16. F	

B. Attitudes toward school and study

24. F	27. F	30. F
25. T	28. F	31. T
26. T	29. T	32. F

C. Reading habits and techniques

33. T	37. T	41. F
34. F	38. T	42. F
35. F	39. F	43. F
36. T	40. T	44. T

D. Taking notes and writing reports

45. T	49. F	53. T
46. F	50. T	54. T
47. T	51. F	
48. T	52. F	

E. Preparing for and taking examinations

55. F	57. F	59. T
56. F	58. F	60. T

TABLE XXV
STUDY-HABITS INVENTORY SCORES

HABITS, TECHNIQUES, AND ATTITUDES	FIRST SCORES		SCORES AFTER STUDY- ING CHAPTERS ON LEARNING OR NEAR CLOSE OF THE COURSE	
	DESIRABLE RESPONSES	MEAN FOR CLASS	DESIRABLE RESPONSES	MEAN FOR CLASS
A. General habits and techniques of study				
B. Attitudes toward school and study				
C. Reading habits and techniques				
D. Taking notes and writing reports				
E. Preparing for and taking exams				
TOTAL				

STANDARDIZED TESTS¹¹⁹

Purpose: To demonstrate to students their need to study the learning process and to demonstrate how to improve learning techniques by administering some of the well-known standardized achievement tests or one or more of the tests listed below.

Materials:

Spitzer Study Skills Test (Harcourt, Brace and World)

This test measures five important work-study skills: using the dictionary; using the index; knowledge of sources of information; understanding graphs, maps, and tables; organization of facts in note-taking. The test requires two hours and thirty minutes but may be taken in three sittings.

Survey of Study Habits and Attitudes (The Psychological Corporation)

The scores on this test are significantly related to academic success, though only moderately correlated with mental ability or scholastic aptitude. The scores serve to identify those whose habits and attitudes may prevent them from taking full advantage of their educational opportunities. Time required: about fifteen to twenty-five minutes.

Watson-Glaser Critical Thinking Appraisal (Harcourt, Brace and World)

This test measures five aspects of the ability to think critically: to draw sound inferences from a statement of facts; to recognize assumptions implied by a statement; to reason logically by deduction; to reason logically by interpretation; to discriminate between strong and weak arguments. Time required: about forty-five minutes.

Wrenn Study Habits Inventory (The Psychological Corporation)

This test is designed to identify the good and bad study habits of students, to indicate which faulty habits should be corrected first, to determine the general quality of study habits, and to educate the student to the importance of specific habits of work. No time limit but requires about twenty-five minutes.

¹¹⁹T. L. Engle, Teacher's Manual and Objective Tests to accompany Psychology: Its Principles and Applications (fourth edition; New York: Harcourt, Brace and World, 1964), pp. 36-37.

The following are only a few of the many reading and vocabulary tests that are available.

California Reading Test (California Test Bureau)

This test measures both vocabulary and comprehension and yields part scores for diagnostic purposes. Time required: sixty-eight minutes.

Davis Reading Test (The Psychological Corporation)

There are four equivalent forms for use with high school juniors and seniors and college freshmen. It measures both level of comprehension and speed of comprehension. Time required: forty minutes.

Diagnostic Reading Tests: Upper Level (Science Research Associates)

This test includes both textbook and story materials and measures vocabulary, comprehension, and reading rate. Time required: approximately forty-eight minutes, times in three units.

Durost-Center Word Mastery Test (Harcourt, Brace and World)

This test measures ability to learn meanings from context. It is in the "Evaluation and Adjustment Series." Time required: sixty minutes in two sittings.

Iowa Silent Reading Tests: New Edition. Advanced Test (Harcourt, Brace and World)

This test measures rate of reading, comprehension, and ability to use skills in locating information. Time required: forty-five minutes.

Kelley-Greene Reading Comprehension Test (Harcourt, Brace and World)

This test measures three significant reading abilities: ability to comprehend paragraphs, ability to find answers to questions, ability to retain what is read. The test is in the "Evaluation and Adjustment Series." Time required: about seventy-five minutes.

Nelson-Denny Reading Test: Revised Edition (Houghton Mifflin)

This test provides a measure of reading ability in terms of vocabulary, comprehension, and rate. There is also a self-marking form of this test. Time required: thirty minutes.

Language and ThinkingEXERCISE: FINDING A RULE¹²⁰

Purpose: To demonstrate simple human problem solving behavior.

Materials: The paired nonsense syllables and numbers below.

Procedure: Instruct students to read slowly down the columns of paired nonsense syllables and numbers below, making an attempt to solve the problem they present. Pay careful attention to the mental processes used so that they can be reconstructed later. Each nonsense syllable has something in common with the three-digit number with which it is paired. The task is to find out what it is.

feg 657	dif 496	fij 690	dah 418
bah 218	bac 213	gah 718	gej 750
gid 794	daf 416	deh 458	cab 312
ceh 358	cag 317	bif 296	gif 796
heg 857	cig 397	deg 357	def 456
fah 618	hif 896	gac 713	cib 392

Results: The code for the pairs of syllables and three-digit numbers is a = 1, b = 2, c = 3, and so on.

Discussion: (1) How many pairs did you read before you got your first hypothesis? Was it correct? (2) How many different hypotheses did you try before you got the correct answer? (3) How is this exercise related to insight? To concept formation?

¹²⁰Morgan, op. cit., pp. 78-79.

PROBLEM SOLVING: FLEXIBILITY IN THINKING. THE "INSIGHT" LEARNING CURVE¹²¹

Purpose: To observe "shift of set," flexibility in thinking, and "abstract" or concept-forming behavior, as well as conflict, ego-involvement, and levels of aspiration through the use of a problem-solving situation.

Materials: 64 colored cards of playing-card-size. There will be sixteen each of four colors: red, yellow, green and blue. Each color should have one card with the following figure(s) drawn on it: one star, two stars, three stars, four stars. Repeat with crosses, circles, and triangles.

Procedure: The experimenter will set out on the table in front of the subject four cards: one red card with a triangle, one green with two stars, one yellow with three crosses, and one blue with four circles. He will then hand the subject a pack of 60 cards consisting of fifteen each of blue, red, green, and yellow with each card containing from one to four figures. The subject is instructed to sort the cards into four groups corresponding to the four key cards. No further instructions are given.

The experimenter arbitrarily decides the basis for the first sorting (or the instructor will furnish a prearranged sorting order), and informs the subject, after each card is placed below one of the key cards, of his success or failure by saying "right" or "wrong." When the subject has sorted five successive cards correctly, the experimenter changes the basis for sorting. This continues until the subject has correctly solved nine categories of response (or until one hour has elapsed). The experimenter counts the number of errors made per category.

Results: This experiment is a duplication of one conducted by Berg¹²² so the results may be compared with her data which are included in Table XXVI, page 103. Each subject's data and the group data of the class should be inserted in the same table. Include in the results a description of the subject's behavior, signs of conflict, changes in assurance, reactions to failure, etc. Draw curves of Berg's results for her A group,

¹²¹Bugelski, op. cit., pp. 360-62.

¹²²E. Berg, "A Simple Objective Technique for Measuring Flexibility in Thinking," Journal of General Psychology, 39: 15-22, 1948.

for individual subjects in this experiment and for the group results.

Berg found three classes of subjects: (a) those who discovered that the experimenter was shifting the criterion and then solved the problems: (b) those who solved the problems but had only vague notions concerning shifts, and could not state when the shifts occurred; and (c) those who could not solve the problem.

Discussion: (1) To what Berg group do your class and individual data correspond? (2) To what do you attribute failure to solve the problems quickly, or not at all? (3) How do you account for the trend of Berg's A group, which shows a general decline in errors after the second trial? (4) Why are the first trial scores so low for all groups? (5) Did your subject learn "insight"? (6) Can the term "shift of set" be reduced to an operational definition? (7) What observations did you make relative to the "abstraction" of concepts?

TABLE XXVI

NUMBER OF ERRORS MADE BY EACH GROUP OF BERG'S SUBJECTS
AND BY SUBJECTS FROM THE INTRODUCTORY PSYCHOLOGY
CLASS ON EACH SUCCESSIVE SORTING CATEGORY IN A
THREE-CHOICE SORTING TASK

Subjects	N	Successive Sorting Categories								
		1	2	3	4	5	6	7	8	9
Berg's A	15	3.33	7.27	7.14	2.60	3.20	3.20	2.40	1.80	2.13
Berg's B	21	4.27	9.14	9.67	8.86	11.43	6.67	6.85	5.48	8.19
Berg's C		3.87	20.79	18.00	9.17	21.40	19.25	13.50	-*	-*
N in C		15	14	14	12	10	8	4		
Individual										
Group										

*Did not complete

CONCEPT FORMATION¹²³

Purpose: To encourage greater awareness of the thinking processes used in forming concepts.

Materials: The list of words and nonsense syllables in Table XXVII, page 105. Strips of heavy paper that can be used to cover up the two columns of nonsense syllables.

Procedure: In some random way, divide the class into two groups, Group A and Group B.

In the list of thirty words in Table XXVII, there are six different specific concepts, each one having five words that contribute to its formation. Members of Group A will cover up the two columns of nonsense syllables. They will look over the list of words and attempt to discover the six concepts. For example suppose the following words are found in the list: dress, hammer, telephone, coat, wagon, shirt, mathematics, tie, corn, ship, blouse, newspaper. Five of these words (dress, coat, shirt, tie, blouse) represent the concept "clothing." As each concept is discovered, write the word in Table XXVIII on page 106 under the heading "Group A" and check off the five words in the list that form the concept.

Members of Group B will use the same list of thirty words but will not cover up the nonsense syllables. Each word contributing to a specific concept is followed by the same nonsense syllable. For example, dress, coat and blouse would all be followed by "mic." As each concept is discovered, write it in the appropriate place in the table under the heading "Group B" and check off the five words in the list that form the concept.

When a number of students have completed their lists of ten concepts, the entire class will be stopped. Completion will probably take somewhere between five and ten minutes.

Results: In class, discuss the six concepts involved and write them in the "Concept" column of Table XXIX, page 106.

By a show of hands or through committee work, determine how many subjects in each group had discovered each of the concepts and write these figures in the table. Compute the percentage of Group A correctly identifying each concept. Record these data. Do the same for Group B. Compute the mean number of concepts discovered by Group A and the mean number of concepts discovered by Group B. Record these two means in the table.

¹²³Engle, Record of Activities and Experiments, op. cit., pp. 71-74.

Discussion: (1) Which group discovered the greater number of concepts? How do you account for the difference? (2) Which concepts were easiest to discover for Group A? For Group B? Can you suggest an explanation for any differences? (3) Which concepts were most difficult to discover for Group A? For Group B? Can you suggest an explanation for any differences? (4) How did you finally discover difficult concepts?

TABLE XXVII
LIST OF WORDS AND NONSENSE SYLLABLES

Word	Nonsense Syllable	Word	Nonsense Syllable
painting	gik	sculpture	gik
orange	qar	banana	qar
fir	jen	cypress	jen
apple	qar	carrot	koh
violet	jec	physics	bic
astronomy	bic	petunia	jec
beans	koh	yam	koh
poppy	jec	poetry	gik
biology	bic	psychology	bic
lettuce	koh	iris	jec
architecture	gik	fig	qar
cranberry	qar	ash	jen
anthropology	bic	birch	jen
lily	jec	music	gik
cabbage	koh	sequoia	jen

TABLE XXVIII
CONCEPTS DISCOVERED

CONCEPT NUMBER	GROUP A (ANY ORDER)	GROUP B
1		bic
2		qar
3		jen
4		koh
5		gik
6		jec

TABLE XXIX
MEAN NUMBERS AND PER CENTAGES OF CONCEPTS DISCOVERED

CONCEPT	GROUP A		GROUP B	
	NUMBER CORRECT	PERCENT CORRECT	NUMBER CORRECT	PERCENT CORRECT
MEAN NO.OF COR- RECT CONCEPTS		x		x

PROBLEM SOLVING I: CONCEPT FORMATION¹²⁴

Purpose: To demonstrate formation of concepts.

Materials: Symbols resembling Chinese ideographs shown in Figure 9, page 109, and 36 three-inch by five-inch filing cards.

Introduction: A concept is a symbol or process that represents a property common to a group of objects or events. Because our thinking behavior is based, to a large extent, on the learning of concepts, such learning has been studied extensively. Experiments with animals and small children indicate that verbalization is not necessary in concept formation; but human beings usually do form their concepts in terms of verbal symbols. The ability to discriminate and abstract a common element seems to be facilitated by labeling this element.

Psychologists have distinguished four general ways in which we learn concepts: by discrimination and abstraction of common properties, by classification of groups of objects, by definition of words, and by the context of words. They have also investigated the ease with which concepts of concrete objects, spatial forms, and numerical concepts are formed.

Procedure: A problem situation is created for a subject by asking him to learn the names of 36 symbols. The symbols are drawn on three-inch by five-inch filing cards, one to a card. The 36 cards on which the characters are printed are divided into six groups, or classes. Each class consists of six cards on which are printed ideographs based on the same "radical," or basic figure. The basic figure is obscured by additional lines and figures.

The experimenter shuffles the deck; then he exposes each card for three seconds and names it for the subject on the first run through the deck. He uses only six names (non-sense syllables of a Chinese flavor) for the 36 cards, since he names only the radical on each card. On the second and later trials, the subject is asked to anticipate the names of each card, and if he fails to do so within two seconds, he is prompted.

Trials are repeated, the deck being shuffled to prevent serial learning, until the subject names each card correctly. He is then asked to tell why he named the cards as he did, and is asked to draw the radicals if he mentions their existence. Any mistakes, additions, or omissions from his drawings and descriptions are noted by the experimenter.

¹²⁴Bugelski, op. cit., pp. 357-59.

Results: Indicate the subject's progress in Table XXX, page 110 by writing in his responses. How many trials did he take to learn each radical? Which radicals were easy; which were difficult? Why? What kinds of errors did the subject make? Did he develop incorrect concepts? Did his behavior indicate any trial-and-error activity? Did he generalize first and abstract later, or vice versa? or both at the same time?

Discussion: (1) What is a "concept"? Can you define the term operationally on the basis of this experiment? (2) Is this experiment a good one for the purpose of noting the processes of abstraction and generalization? (3) Did your subject's behavior illustrate the formation of "concepts" in everyday life? (4) Did your subject know that this was an experiment in "concept formation"? (5) Was he looking for elements to abstract? (6) Did he give the right answers before he knew the reason? (7) Does the experimental procedure qualify as a "problem" situation for the subject? Does it illustrate "thinking" behavior?

Word	Concept	Pack I	Pack II	Pack III	Pack IV	Pack V	Pack VI
oo	✓	洋	沛	咏	滢	决	滢
noo	彳	殂	殂	殂	殂	殂	殂
ii	力	勑	勑	勑	勑	勑	勑
ea	弓	弧	弧	弧	弧	弧	弧
ooj	石	砗	砗	砗	砗	砗	砗
ling	穴	窆	窆	窆	窆	窆	窆

Figure 8. Radicals with assigned nonsense names and compounds containing each radical.

TABLE XXX

THE PROGRESS IN IDENTIFICATION OF IDEOGRAPHS IN
THE HULL CONCEPT-FORMATION EXPERIMENT

Trials	Ideograph names					
	OO	YER	LI	TA	DEG	LING
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

AN EXERCISE ON CONTROLLED ASSOCIATION¹²⁵

Purpose: To demonstrate the conceptual thinking, or categorizing that is specifically involved in controlled association.

Materials: Paper and pencil and the material given below. Three separate exercises on controlled association follow.

Procedure: I. Instruct students to write the last name of every movie star which comes to mind in a period of one minute without duplicating any names. At the end of this time discuss why this is an example of controlled association. What other controlling sets might have been given?

II. For each word below, write a word which has the same or approximately the same meaning, then give the opposite of the first word.

fast
dirty
love
beautiful
sorrow

For each word below, write the name of a member of the class indicated.

opera
mammal
automobile
emotion
city

Why are these also instances of controlled association? What other types of controlled association might have been used to illustrate the phenomenon?

III. As quickly as possible, unscramble the letters in the two lists below and write in the words represented. Unscramble all of the words in Group I, then go on to Group II. Take each word as it comes, unscramble it and go on to the next.

¹²⁵Munn, op. cit., pp. 58-59.

Group I

NYPAS

FELA

KTALS

DUB

LOBSOMS

LTEPA

Group II

FINEK

OPONS

KROF

PUC

ECUSAR

LTEPA

After students have had time to unscramble the words point out that the final word is identical in each of the two lists. Check with the class to see how nearly unanimous was the tendency to give "petal" for the answer in Group I, "plate" in Group II. This is another example of more or less involuntary control of associations, or thought processes.

DELAYED FEEDBACK¹²⁶

Purpose: To test the hypothesis that normal patterns of speech, and thus probably thinking, become disrupted when an individual is subjected to delayed auditory feedback.

Materials: Delayed feedback apparatus, including tape recorder; stop watch; familiar and unfamiliar reading material. Each student will serve as experimenter and subject.

Procedure: The experimental situation will involve reading two types of material, first under normal conditions and then under delayed feedback conditions of .1, .2, and .3 second delay. Headphones should be worn during all conditions, and all readings should be recorded through the apparatus.

Present the familiar material first to S, asking him to read it aloud in a normal tone of voice at a normal rate of speech. Record the time it takes him to read the material. Then have him read the unfamiliar material and record the time.

Adjust the machine for .1 second delayed feedback, have S read the familiar material, and again record the time. Repeat for unfamiliar material. Repeat the readings of both types of material for .2 second and .3 second delay, recording the time for each reading.

Follow the same procedure for the second S except that in each step he should read the unfamiliar material first.

Results: Replay the tape for each subject and compute the number of errors for each reading. Errors will be defined as stopping, stuttering, repeating, etc. (There may be doubt as to how to count certain errors, but try to be as consistent as possible.) Present in table form the results for each subject. Make a graph of the time scores for normal and delayed feedback readings for each subject. Under which conditions did you observe maximal disruption of speech patterns?

Discussion: (1) What are the specific effects of delayed auditory feedback on speech patterns? (2) What other reactions did the subject exhibit during feedback delay? (3) Do your observations agree with those of previous investigators?

¹²⁶Roach and Sherman, op. cit., pp. 141-144.

ABSTRACTING AND GENERALIZING¹²⁷

Purpose: To demonstrate the process of abstracting and generalizing.

Materials: The two sets of figures and symbols in Table XXXI.

Procedure: Instruct students to abstract something that is common to the first three objects in the "abstract" column of Table XXXI. Abstraction is the process of developing a recognition of "commonality" in a series of objects or events; the tendency to group situations and experiences which have similar effects or make similar demands on us. Once abstraction has been effected - once a basis for recognition of a group or class has been found - one is in possession of a single symbolic referent for the group and may then recognize additional members of the group. This is generalization. After abstracting something that is common to the first three objects and writing this in the space provided, then attempt to generalize by finding, among the three objects at the right, one which fits the same category. Indicate which in the right-hand column. Challenge students to generalize further by naming or drawing another object in the same category.

¹²⁷Munn, op. cit., p. 59.

TABLE XXXI
ABSTRACTING AND GENERALIZING

	ABSTRACT				GENERALIZE			COMMON PROPERTY	ANOTHER OBJECT IN SAME CATEGORY
1									
2									
3									
4	3	S	O		X	6			
5									
6									

MECHANIZATION IN PROBLEM SOLVING¹²⁸

Purpose: To observe the phenomenon of mechanization in thinking; i.e., set, Einstellung.

Materials: For each pair of students, a stop watch and two sets of numbered problem cards, one each for Task A and B, with ten problems in each set. The problems for each set may be obtained from Tables XXXII and XXXIII on page 119. Pairs of students are also needed, each either experimenter on Task A and subject on Task B or vice versa. The data of both members of the pair will be included in the results section.

Procedure: The general method for solving the water jug and word problems will be demonstrated to the class using the following examples:

- water jug: Given jugs with units 21 (A), 127 (B), and 3 (C) and an unlimited water supply, get 100 (D) units of water; the solution is 127 minus 21 minus 3 minus 3, or $B - A - 2C$.
- word: Find a hidden four or five letter word in MASVRE without changing the order of any of the letters; the solution is MARE or 1-2-5-6.

The student-pairs then begin the data collection. After reading the instructions shown below, the experimenter will present the problem cards one at a time and in the order one through ten to the subject, who will work each problem on a separate slip of paper. The experimenter will record the time for each problem's solution and later will determine the formula used for each solution.

Instructions: "I am going to give you a series of ten problems, one at a time. You are to solve each problem as rapidly as possible using the general procedures demonstrated by the instructor. Indicate clearly your method of solution on a separate slip of paper for each problem. Here is problem one; begin." (After solution of problem one, the experimenter will say, "Problem two; being," etc.)

¹²⁸Barbara Heckman and Robert Fried, A Manual of Laboratory Studies in Psychology (New York: Oxford University Press, 1965), pp. 45-48.

Results: After both A and B data have been collected, complete the graphs in Figure 9, page 118 by entering the time required for each problem. (Note: For this study, do not attempt to smooth the curves.) In both tasks the following pattern of solutions will occur if mechanization or set in thinking is present: Problems one through seven of both the jug and word tasks will be solved by the same formula in decreasing amounts of time as the formula becomes familiar; problem eight, which cannot be solved by the standard formula, but which can be solved by an easier, more direct formula, will require more time as a new type of solution is found; problems nine and ten will be solved by the original standard formula if that set is very strong or by the easier solution of problem eight if the set is weak. A demonstration of mechanization in thinking occurs if (1) problems six and seven, which could be solved by a more direct formula than the standard one, are solved by the standard formula; (2) if there is an increase in time on problem eight, which must be solved by a formula other than the standard; and (3) if problems nine and ten are solved by the less-direct standard formula. See Luchins (1942) for a more complete discussion of the typical results and for an evaluation of the double function of facilitation and hindrance which mechanization in thinking may have.

Discussion: (1) Do the two obtained graphs show the expected relationship between time and problem number? If so, state this relationship. If not, why not? (2) The most frequently used formula for Task A, problems 1 - 5 was:. What was the most frequently used formula for Task B, problems 1 - 5? Was the same formula used in problem 6(A)? 6(B)? 7(A)? 7(B)? Assuming the same formula had been used in problems 6 and 7, is it the best formula for these problems? Why or why not? (3) What was the purpose of problem 8? (4) What influence did (or could) problem 8 have on the solution of problems 9 and 10? (5) What is set (Einstellung, mechanization) in thinking? How may it affect, positively or negatively, problem solving or thinking? (6) Were the effects of set shown as markedly in the word problems as in the jug problems? If not, why not?

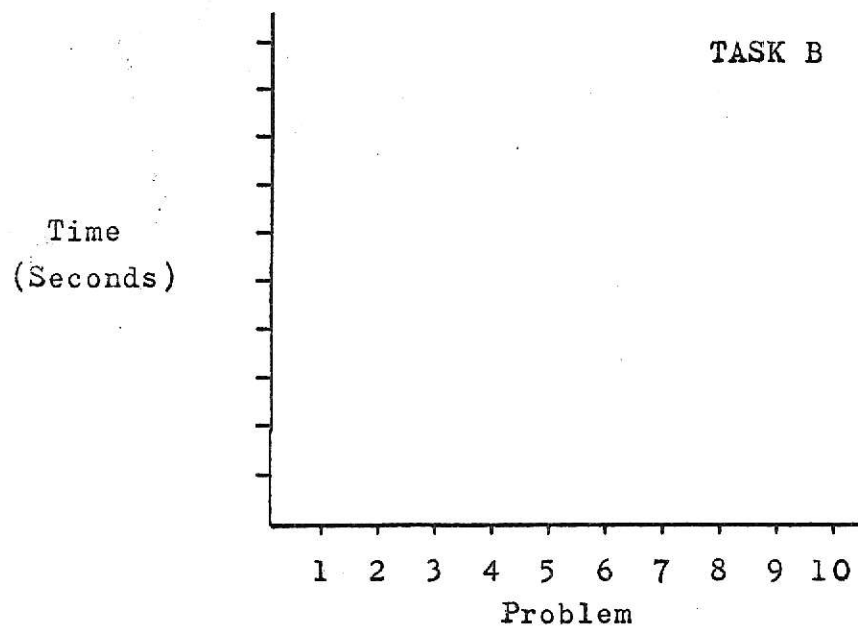
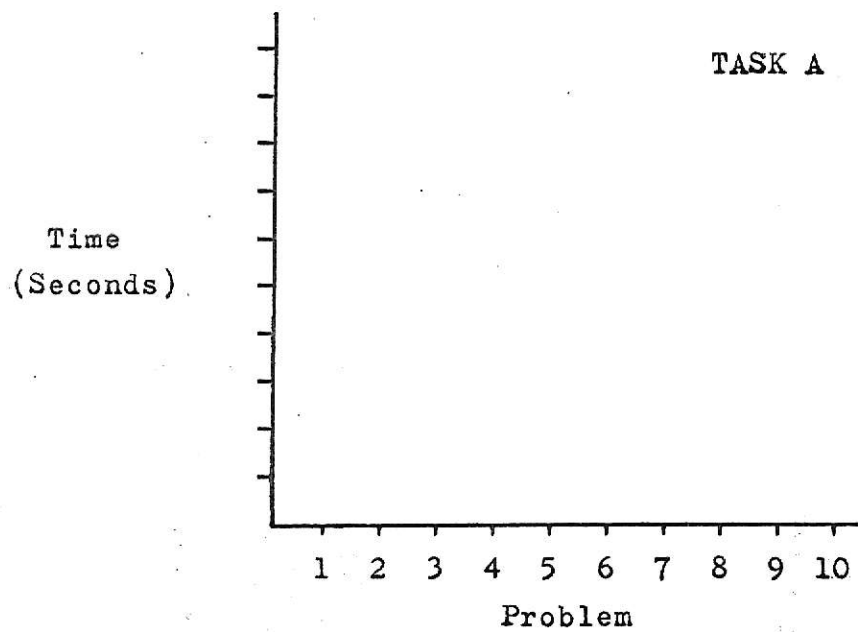


Figure 9. Comparison of time required for solution of each problem on two separate tasks.

TABLE XXXII

TASK "A" FOR MECHANIZATION IN PROBLEM
SOLVING - WATER JUG PROBLEMS

<u>Problem</u>	<u>Information Given</u>			<u>Solution</u> <u>D</u>	<u>Time</u>	<u>Formula</u>
	<u>A</u>	<u>B</u>	<u>C</u>			
1	20	57	3			
2	5	58	9			
3	5	48	8			
4	3	69	4			
5	11	42	6			
6	7	38	8			
7	4	17	3			
8	9	29	6			
9	14	52	8			
10	9	30	4			

TABLE XXXIII

TASK "B" FOR MECHANIZATION IN PROBLEM
SOLVING - WORD PROBLEMS

<u>Problem</u>	<u>Letters Given</u>	<u>Solution</u>	<u>Time</u>	<u>Formula</u>
1	GZOQART			
2	BKUFLML			
3	DZEPEWR			
4	MQUELME			
5	BXEPAUR			
6	TSINGREVR			
7	HFOURESTE			
8	GNEVERZOE			
9	SOWRITINGE			
10	CBALMVEAL			

Other experiments and demonstrations which could be used in connection with the resource unit on learning.

"(1)" designates those activities which are appropriate for use with the section on "Principles of Learning," "(2)" for "Human Learning, Remembering and Forgetting," and "(3)" with "Language and Thinking."

Bilodeau

- (1) Serial Learning of the Finger Maze p. 9
- (1) The Method of Serial Anticipation Applied to the Learning of Nonsense Syllables p. 10
- (2) Bilateral Transfer of Training in Mirror Drawing p. 7
- (2) An Investigation of the Length-Difficulty Relationship p. 8

Bugelski

- (2) Nonsense Syllable Learning p. 338

Daniel

- (1) Habit Formation in the Maze p. 42
- (1) Operant Conditioning p. 54
- (2) The Effect of Spacing of Trials in Learning p. 45
- (2) Transfer of Training in Verbal Learning p. 50
- (3) Problem Solving Behavior p. 58

Engle

- (2) Active versus Passive Learning p. 109

Engle, West, and Milton

- (2) Retention Following Three Conditions of Learning p. 61
- (2) Meaningful versus Nonsense Material p. 62

Heckman and Fried

- (1) Adult Human Maze Learning p. 25
- (1) Operant Conditioning p. 29
- (1) Avoidance Learning p. 37
- (2) Transfer of Training p. 49
- (2) Retroactive Inhibition p. 57
- (2) Retention and Organization p. 63

Jung and Bailey

- (2) Free Recall and Ordering as a Function of Similarity p. 35
- (2) Short-term Memory as a Function of Retention Interval p. 51
- (2) Learning and Retention of Prefixed, All-digit, and Mnemonic Telephone Numbers p. 93
- (2) Effects of Coding on Memory p. 103
- (2) Inverted Alphabet Printing as a Function of Distribution of Practice p. 147

Morgan

- (3) Demonstration: Set and Problem Solving p. 79

Munn

- (1) Maze Learning p. 46
- (2) Reproduction of Form p. 54
- (3) Reasoning p. 59

Roach, Sherman and Roach

- (3) Problem-Solving Behavior p. 135

Stevens, Herrnstein, and Reynolds

- (2) Set and Performance p. 74
- (2) Human Motor Skills and Transfer of Training p. 70

Films

Principles of Learning

Learning: Part I, Acquisition, Extinction and Reconditioning.

"In the film it is established that, in general, behavior which is reinforced is learned, while non-reinforced behavior is extinguished. This principle is demonstrated in the film with both humans and pigeons. The film shows laboratory experiments in which pigeons are taught by selective reinforcement of responses to go through certain motions completely foreign to their normal everyday behavior. Then it is shown that, with the removal of the reinforcement, the learned behavior is gradually extinguished, although there is a degree of spontaneous recovery of the response. Finally, it is shown that restoration of the reinforcement brings rapid reacquisition of the previously learned behavior."¹²⁹

1956, 8 minutes, sound, black and white. Rent: Psychological Cinema Register; Indiana University. Buy: McGraw-Hill Book Company. Recommended by writer

Learning: Part II, Stimulus Discrimination and Response Differentiation.

"A more detailed analysis of the learning process is made than in the film just described above. Here it is demonstrated that the learning of a skill by any organism involves two basic and closely integrated processes: discrimination among stimuli and application of this discrimination in the making of selected responses. Treating laboratory experiments in which pigeons are subjected to varying stimuli, the film shows that the pigeon in each experiment finds the response that brings reinforcement and gradually eliminates other responses. It shows that with human beings the process of learning skills is far more complex, but the basic principles of stimulus discrimination and response differentiation appear to be generally the same."¹³⁰

1956, 14 minutes, sound, black and white. Rent: Psychological Cinema Register, Pennsylvania State University or

¹²⁹Clifford T. Morgan and Richard A. King, Instructor's Manual for Introduction to Psychology (Third Edition; New York: McGraw-Hill Book Company, 1966), p. 99.

¹³⁰Ibid.

Indiana University; Buy: McGraw-Hill Book Company. Recommended by writer.

Learning: Part III, Schedules of Reinforcement

"This film shows that by reinforcing an organism on different schedules we can control not only how fast it works at any given time, but also the way it distributes that work within a given period of time. These results are demonstrated with pigeons under controlled laboratory conditions, using reinforcement schedules of fixed ratio, fixed interval, combined fixed ratio and fixed interval, and variable interval. It is shown that variable-interval reinforcement usually produces, in all organisms, behavior that is extremely persistent and quite difficult to extinguish once it has been established. Thus, the study of reinforcement schedules is an important part of our understanding of how we learn and how we can teach others."¹³¹

1956, 16 minutes, sound, black and white. Rent: Psychological Cinema Register, Pennsylvania State University or Indiana University; Buy: McGraw-Hill Book Company. Recommended by writer.

Analysis of the Forms of Animal Learning: Parts I and II

"Cats used as subjects. First learning-form, conditioned response, presented with three examples: leg flexion, running response in exercise cage, and activity stabilimeter. Second form, problem-solving, exhibited with two examples: discriminative string-pulling to obtain food, and pushing ball into hopper to open door and expose food dish."¹³²

1940, 17 minutes, silent, black and white. Rent or buy: Psychological Cinema Register, Pennsylvania State University.

Analysis of the Forms of Animal Learning: Parts III and IV

"First two learning-forms described in film above. Third learning-form, discriminative learning, presented with examples of form, brightness, and auditory discrimination. Fourth form, compound learning, shown with examples of alternating response and token-reward behavior."¹³³

1940, 13 minutes, silent, black and white. Rent or buy: Psychological Cinema Register, Pennsylvania State University.

¹³¹Ibid., pp. 99-100.

¹³²Psychological Cinema Register, 1963 (Pennsylvania State University, Audio-Visual Services, University Park, Pennsylvania), p. 12.

¹³³Ibid.

Conditioning Galvanic Skin Response

"Shows and explains operation of equipment used for obtaining galvanic skin response. Demonstrates a subject's responses to variety of stimuli: visual, verbal and electric shock. Visual stimulus alone elicits little response. Shock produces strong response. Both are administered simultaneously a number of times and then the visual stimulus is presented alone to produce a strong conditioned galvanic skin response. Gradual extinction and re-establishment of the conditioned response are demonstrated."¹³⁴

1957, 7 minutes, sound, black and white. Rent or buy: Psychological Cinema Register, Pennsylvania State University. Recommended by writer.

Maze Learning in the White Rat

"There are several films on maze learning by white rats. All show the gradual elimination of errors and acquisition of correct responses. Learning of the enclosed alley maze is illustrated in this film."¹³⁵

15 minutes, silent. Distributed by: C. H. Stoelting Company, 424 North Homan Avenue, Chicago, Illinois.

Motor Conditioning in Dogs

"This is a useful film...since it shows how the withdrawal response of dogs is conditioned by an instrumental modification of Bechterev's technique. The unconditioned stimulus is a shock to the right paw. The unconditioned response is lifting the paw, struggling and yelping. No raising of the paw to the tone is exhibited prior to conditioning. After a few presentations, the dog lifts its foot to the tone and before the shock goes on. This is instrumental conditioning because the dog escapes shock if it lifts its foot in response to the tone."¹³⁶

10 minutes, silent. Distributed by: C. H. Stoelting Co.

¹³⁴Ibid., p. 28.

¹³⁵Norman L. Munn, Instructor's Manual to Accompany Introduction to Psychology (Boston: Houghton Mifflin Co., 1962), p. 83.

¹³⁶Ibid., p. 82.

Motivation and Reward in Learning

"This film demonstrates the Skinner conditioning apparatus and also provides a good illustration of the role of reinforcement in conditioning. A hungry rat learns to get food by pressing a lever; a satiated animal fails to respond to the lever. When shocked through the floor, the satiated animal, now given a drive, learns to escape shock by pressing the lever. Animals also learn to escape shock by biting a tube, rotating a wheel, and fighting."¹³⁷

1948, 15 minutes, sound, black and white. Rent or buy: Psychological Cinema Register, Pennsylvania State University.

Squeak the Squirrel

"A trained squirrel solves some surprisingly complex problems, often with an apparent display of insight. While the dialogue is pitched at the child's level, the film is both sound and entertaining."¹³⁸

1951, 10 minutes, sound, color. Rent: Psychological Cinema Register, Pennsylvania State University. Buy: Churchill-Wexler Film Productions.

Human Learning, Remembering and Forgetting

Demonstration in Human Learning

"Gives examples of skills involving serial learning. Shows some of the ways in which serial learning of a relatively simple type is studied. Subject performs successive trials on a finger maze. Trials are timed and scored for errors and results shown graphically. Explains concepts of serial position effect, performance criterion, learning plateau, independent, dependent and intervening variables. Concludes by relating to examples from everyday life."¹³⁹

1957, 18 minutes, sound, black and white. Rent or buy: Psychological Cinema Register, Pennsylvania State University. Recommended by writer.

¹³⁷Ibid., p. 83.

¹³⁸Ibid.

¹³⁹Psychological Cinema Register, op. cit., p. 31.

Exploring the Human Nervous System

Sea anemone and hydra are used to trace what goes on in the nervous system during a "simple" reflex reaction. Planaria in a laboratory are conditioned to respond to a light (unconditioned stimulus is an electric shock), then are cut in half. After being given time to regenerate, both head and tail halves retained memory of the association between light and shock. However, when substance that destroys RNA was placed in their water, the tail half didn't "remember" the association between shock and light. Film also shows implanted electrodes for studying memory in a monkey. When the monkey learned a discrimination problem, the resistance to passage of electrical current in an essential part of the brain increased indicating some chemical change. Presumably this chemical change which took place is responsible for controlling memory.

Color. Rent: Department of Health, Education and Welfare, Atlanta, Georgia. Produced and distributed by Churchill Films. Recommended by writer.

Fidelity of Report

"Audience-participation demonstration of accuracy of observation and report. Dramatic action sequence concerns woman robbed while waiting for bus. Action takes 60 seconds, after which projector is stopped. Standard set of questions given to audience for answer. Dramatic action repeated by continuing projection and each observer asked to check accuracy of own observations. One set of questions supplied free with each film purchase, at .25¢ with each film rental."¹⁴⁰ (Questions may be found under "Activities," on page 91 in this resource unit.)

1946, 6 minutes, silent, black and white. Rent or buy: Psychological Cinema Register, Pennsylvania State University.

Focus on Behavior: Computers and Human Behavior

"Research being conducted at the Carnegie Institute of Technology with electronic computers in an effort to evolve new theories about human mental processes. Dr. Bert Green demonstrates computer experiments with perception of motion and depth. Dr. Herbert Simon, with the help of the computer, presents his theory of how human beings memorize. Dr. Allan Newell shows how the computer was responsible for creating a new theory about human problem solving."¹⁴¹

¹⁴⁰Ibid., p. 44.

¹⁴¹Ibid., PCR Supplement, 1965.

1963, 30 minutes, sound, black and white. Rent: Psychological Cinema Register. Recommended by writer.

Focus on Behavior: Learning About Learning

"Exploration of the different strategies employed in developing new theoretical concepts about man's ability to learn through the work of Drs. Howard Kendler, Kenneth Spence, Harry Harlow, and B. F. Skinner. These studies, conducted with humans and animals, have already led to changes in methods of instruction in schools and colleges."¹⁴² This film uses some of the same scenes shown in the film "Learning and Behavior."

1963, 30 minutes, sound, black and white. Rent: Psychological Cinema Register, Pennsylvania State University. Recommended by writer.

Learning and Behavior

"How learning and conditioning can be measured in the laboratory, thereby uncovering important knowledge about the fundamental processes of behavior. Shows that all learning depends upon reward as a means of reinforcing a learned response. Without this factor there is no learning, be it animal or man. Relationship between work done by Drs. Skinner and Herrnstein and that of the Russian psychologist, Dr. Pavlov."¹⁴³

1960, 26 minutes, sound, black and white. Rent or buy: Psychological Cinema Register, Pennsylvania State University. Recommended by writer.

One Step at a Time

"General introduction to teaching machine concepts for parents, teachers, and school administrators. Psychological and educational background instruction of programmed instruction, development of techniques, program construction, and classroom use. Experiments reported on the use of teaching-machine materials as a supplement to instruction provided jointly by television and the classroom teacher and on the effectiveness of these materials when used without a teacher." ¹⁴⁴ Possible implications of the programmed instruction approach."

1963, 28 minutes, sound, color. Rent: Psychological Cinema Register, Pennsylvania State University.

¹⁴²Ibid. ¹⁴³Ibid., p. 63. ¹⁴⁴Ibid., PCR Supplement, 1965.

Language and Thinking

The Information Machine

"Traces the development of the electronic computer and shows what computers can and cannot do."¹⁴⁵

1958, 11 minutes, sound, color. Rent: Psychological Cinema Register, Pennsylvania State University.

Scientific Method

"Elements of the method: how this method of problem solving is applied by scientists; value of scientific thinking in dealing with problems of everyday life. Features the discovery of penicillin by Fleming and the work of Pasteur in illustration of the contributions of scientific thinking to modern knowledge."¹⁴⁶

1954, 11 minutes, sound, black and white. Rent: Psychological Cinema Register, Pennsylvania State University.

Solution of Bent Wire Detour Problems by Children, Monkey, and Raccoon.

"Shows how to make and present various patterns of bent wire detour problems. Two-year-old child, monkey, and raccoon have difficulty in solving simple bent wire detour problems, especially if solution requires that lure be pushed away from subject. Five-year-old child easily solves even a complicated bent wire detour problem. Adult monkey can be trained to solve elaborate patterns easily. Raccoon after 45 days of practice succeeds in solving simple detour problems. Shows effect of practice and maturation on ability to solve problems."¹⁴⁷

1959, 14 minutes, sound, black and white. Produced at the State University of South Dakota.

Thinking Machine

"Highlights the TX-0 digital computer, an instrument which is enabling scientists to explore new frontiers of the

¹⁴⁵Engle, Teacher's Manual and Objective Tests, op. cit., p. 28.

¹⁴⁶Psychological Cinema Register, op. cit., p. 86.

¹⁴⁷Ibid., p. 91.

human mind. Shows what machines do that looks like "thinking" and what this may mean to the world of tomorrow. From the CBS-TV Tomorrow series."¹⁴⁸

1960, 54 minutes, sound, black and white. Rent: Psychological Cinema Register, Pennsylvania State University.

"Thinking" Machines

"Explores the question of how close to thinking modern machines come by showing demonstrations of some recent machine developments and then by comparing and contrasting these with the performance of the human brain."¹⁴⁹

1959, 19 minutes, sound, color. Rent: Psychological Cinema Register, Pennsylvania State University.

SOURCES OF INFORMATION

Bibliography

Books

See Appendix for "Bibliography for High School Psychology Teachers and Students."

Magazines, pamphlets and unpublished materials

1. American Psychological Association Periodical Publications:
 - a) American Psychologist: official Association papers and articles on psychology.
 - b) Contemporary Psychology: critical reviews of books, films and other materials in psychology.
 - c) Journal of Abnormal Psychology: theoretical and research contributions in behavior pathology.
 - d) Journal of Applied Psychology: applications of psychology to business and industry.
 - e) Journal of Comparative and Physiological Psychology: original contributions in comparative and physiological psychology.
 - f) Journal of Consulting Psychology: research in clinical psychology - psychological diagnosis, psychotherapy, personality, and psychopathology.

¹⁴⁸Ibid., p. 98.

¹⁴⁹Ibid.

- g) Journal of Educational Psychology: studies of learning and teaching.
 - h) Journal of Experimental Psychology: original contributions of an experimental character.
 - i) Journal of Personality and Social Psychology: theoretical and research papers on personality dynamics, group process, and the psychological aspects of social structure.
 - j) Psychological Abstracts: noncritical abstracts of the world's literature in psychology and related subjects.
 - k) Psychological Bulletin: evaluative reviews of research literature and discussions of research methodology in psychology.
 - l) Psychological Monographs: longer researches and laboratory studies which appear as units.
 - m) Psychological Review: original contributions of a theoretical nature.
2. Elder, J. H. "Collateral Reading List for High School Courses in Psychology, Biology or Social Science." Unpublished material. (Available from: Dr. J.H. Elder, Chairman, Department of Psychology, State College of Washington, Pullman, Washington.)
 3. Free and Inexpensive Learning Materials. Nashville, Tennessee: Division of Surveys and Field Services, George Peabody College for Teachers, 1967.
 4. Jones, D. R. "Career Conferences on Psychology for High School Students." Unpublished material. (Available from Dr. Donald R. Jones - Chairman, Standards and Training Committee of the Illinois Psychological Association - Leo Burnett Company, Inc., Prudential Plaza, Chicago, Illinois.)
 5. Psychology Today (good periodical for the high school library)
1330 Camino Del Mar
Del Mar, California 92014
 6. Ross, Sherman and Robert F. Lockman. A Career in Psychology. Washington, D.C.: American Psychological Association, Inc., 1965.
 7. Scientific American Offprints
W. H. Freeman and Company
660 Market Street
San Francisco, California 94104

Films

Almanac Films, Inc.
41 Union Square West
New York, N.Y. 10003

Association Films
347 Madison Ave.
New York, N.Y. 10036

Carousel Films, Inc.
1501 Broadway
New York, N.Y. 10036

Churchill-Wexler Film
Productions
801 N. Seward St.
Los Angeles 38, Calif.

Contemporary Films, Inc.
267 W. 25th St.
New York, N.Y. 10001

Coronet Instructional Films
65 East South Water St.
Chicago, Illinois

Department of Health, Educa-
tion and Welfare
Public Health Service
Communicable Disease Center
Atlanta, Georgia 30333

Encyclopedia Britannica
Films, Inc.
1150 Wilmette Ave.
Wilmette, Illinois

Educational Testing Service
20 Nassau Street
Princeton, New Jersey

Films in Psychiatry, Psychol-
ogy and Mental Health
Health Education Council
New York, N.Y.

Edward Harrison
1501 Broadway
New York, N.Y. 10036

International Business Machines
Corporation
590 Madison Ave.
New York, N.Y. 10022

International Film Bureau
South Michigan Ave.
Chicago 4, Illinois

Indiana University*
Audio-Visual Center
(also NET Film Service)
Bloomington, Indiana

Ogden R. Lindsey
Educational Research
4001 Easton St.
Kansas City, Kansas 66103

McGraw-Hill Book Company
Text Film Department
330 W. 42nd St.
New York, N.Y. 10036

E. J. Mauthner
P.O. Box 231
Cathedral Station
New York, N.Y. 10015

Mental Health Materials Service
1790 Broadway
New York, N.Y. 10019

Mental Health Film Board, Inc.
Film Service Department
267 W. 25th St.
New York, N.Y. 10001

Mental Health Motion Pictures
National Institute of Mental
Health, U.S. Public Health
Service
Washington, D. C. 20025

*Recommended

Motion Pictures on Child Life
Children's Bureau
U.S. Department of Health,
Education and Welfare
Washington, D. C. 20025

National Film Board of Canada
680 Fifth Avenue
New York, N.Y. 10003

New York University Film Library
26 Washington Place
New York, N.Y. 10003

Psychological Cinema Register
Pennsylvania State University
Audio-Visual Aids Library
University Park,
Pennsylvania 16802

Progressive Pictures
6351 Thornhill Drive
Oakland, California

Sterling Films, Inc.
316 W. 57th St.
New York, N.Y. 10019

Tape Recordings

AAP Tape Library
Department of Psychiatry
University Hospital
1300 University Avenue
Madison, Wisconsin

Educational Recording Services
5922 Abernathy Drive
Los Angeles, California

National Tape Repository
Bureau of Audio-Visual Instruction
Stadium Building, Room 348
University of Colorado
Boulder, Colorado

Tapes for Teaching
Audio-Visual Aids Service
University of Illinois
704 South Sixth St.
Champaign, Illinois

Tapes for Teaching
Psychological Cinema Register
Pennsylvania State University
University Park, Pennsylvania 16802

Tape Recordings
Audio-Visual Education Center
720 East Huron
Ann Arbor, Michigan

*Recommended

Tests, Inventories, and Other Measuring Devices

California Test Bureau
Del Monte Research Park
Monterey, California

Harcourt, Brace and World, Inc.
Test Department
757 Third Avenue
New York, N.Y. 10017

Houghton Mifflin Company
2 Park Street
Boston, Massachusetts 02107

The Psychological Corporation
304 East 45th Street
New York, N. Y. 10017

Psychometric Affiliates
Box 1625
Chicago 90, Illinois

Science Research Associates, Inc.
259 East Erie Street
Chicago 11, Illinois

Psychological Equipment¹⁵⁰

Only a few typical items are listed for each company rather than a complete line of products.

Davis Scientific Instruments
12137 Centura Street
Studio City, California 91601

Precise and somewhat expensive cumulative recorders and electronic equipment. However, they do have somewhat less expensive Demonstration Skinner Boxes, pellet dispensers, etc.

Deneyer Geppert Company
5235 Ravenswood Avenue
Chicago, Illinois

A wide variety of anatomical charts and models.

¹⁵⁰Louis Snellgrove, Bibliography of Companies Having Psychological Apparatus or Related Equipment (Jackson, Tennessee: Union University, 1962) (Mimeographed).

Farrall Instrument Company
P. O. Box 658

Grand Island, Nebraska 68801

An unusual and somewhat inexpensive collection of apparatuses for psychological laboratories. Some of the equipment comes in kit form and can be assembled very easily. Examples of products are: student Skinner Box in kit form, timer kit, shock scrambler in kit form.

Ralph Gerbrands Scientific Apparatuses

8 Beck Road

Arlington, Massachusetts 02174

Waxed paper polygraph, differential color mixer, serial memory drum, noise generator, electronic voice key, Harvard tachistoscope, pellet dispenser, Harvard cumulative recorder, interval timer, impulse generator, program timer, pursuit roter, operant conditioning apparatuses.

Harvard Apparatus Company

Dover, Massachusetts

Kymographs (electric and spring wound types), recording instruments and accessories (levers, tambours, ink writers, etc..)

Herbach and Rademan, Inc.

1204 Arch Street Dept. UU-67

Philadelphia, Pennsylvania 19107

Wide variety of electrical and electronic equipment, some of it government surplus (relays, motors, valves, transformers, meters of all kinds). Prices of equipment are somewhat lower than the average for such equipment.

Hunter Manufacturing Company, Inc.

1164 East Court Street

Iowa City, Iowa

Decade times, paper puller, GSR amplifiers, voice operated relays, eye-blink apparatus, shock generators, relays.

Lab-Line Laboratory Cages, Inc.

Lab-Line Plaza

15th and Bloomingdale Avenues

Melrose Park, Illinois 60160

Inert plastic Disposable Lab Cages, either self-standing when multiple cage bottoms are nested, or supported on cardboard or metal support stands.

Disposable Laboratory Cages, Inc.

Cardboard disposable cages and accessories for small animals such as rats.

Lafayette Instrument Company
North 9th and 52 By-Pass
Lafayette, Indiana 47902

Mirror tracing apparatus, pencil maze, memory drum, Muller-Lyer and Vertical-Horizontal Illusion, depth perception apparatus, simple reaction time apparatus, activity recorders, stop watches, light discrimination apparatus, rotary pursuit.

Electronic Research Lab., Inc.
715 Arch Street
Philadelphia, Pennsylvania

A wide selection of surplus electrical and electronic equipment at somewhat lower than average cost.

Lehigh Valley Electronics
Box 125
Fogelsville, Pennsylvania 18051

Precision built animal chambers (rat, monkey, cat, pigeon, etc.) with all necessary accessories, programming equipment, cumulative recorders, EEG stimulus.

Marietta Apparatus Company
118 Maple Street
Marietta, Ohio 45750

Psychological lab apparatus such as Veeder-Root counter, wink reflex apparatus, hand dynamometer, tapping test, Nine Hole Steadiness Test, mirror tracing apparatus, color mixers, color discs, algesiometer, Galton whistle, cutaneous sense (grid) stamp, illusion cards, etc.

Phipps and Bird, Inc.
303 South 6th Street
Richmond, Virginia 23205

Biophysical lab equipment - kymographs and accessories, timers, impulse markers, electric stimulators, mazes, physiological equipment, paired associate memory drum, electric mazes, tuning forks.

Buryl Payne, Ph.D.
Psychophysics Lab
Plainfield, Vermont

Relatively inexpensive GSR instrument, sonducer for audible output and illusionator for visual illusions (rotating trapezoid window, thirteen figure illusions, impossible figures, Zoellner's lines, and others)

Scientific Prototype Manufacturing Corp.
623 W. 129th Street
New York, N.Y. 10027

C. H. Stoelting Co.

424 Homan Avenue

Chicago, Illinois 60624

Psychological lab apparatuses - vision tests, color mixers and discs, memory drum, auditory and cutaneous apparatuses, time counters, polygraphs, animal apparatuses, GSR apparatus, charts and models of eye, ear and nervous systems, reaction timer, Psychological and Educational tests.

Stuart Manufacturing Co.

337 W. 5th Street

Cincinnati 2, Ohio

Inexpensive kits for building models. An excellent kit for optical illusions, including distorted room from cardboard.

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APPENDIX

BIBLIOGRAPHY FOR HIGH SCHOOL PSYCHOLOGY

TEACHERS AND STUDENTS

Revised January, 1964.

Paul R. McNeely, Lock Haven State College, Lock Haven, Pa.

The purpose of the first bibliography is to present a variety of inexpensive source materials for teachers of high school psychology and their students. All of the books listed in this bibliography are paper-bound but many of them may be obtained in hard cover editions. The psychology teacher can secure an excellent library of books at low cost. Suitable books may be ordered for the high school library in hard cover. It is not claimed that all of the books are of equal merit. The teacher will need to be discerning in his choice of material. An asterisk placed beside a name indicates present membership in the American Psychological Association. Some are written by psychiatrists and other doctors fully qualified to write authoritatively. A number of books have been personally examined and have annotations regarding their value.

Publishers' Addresses

Allen, Howard, Publisher, Box 1810, University Circle, Cleveland 6, Ohio
 APA American Psychological Association, 1333 Sixteenth St., N.W., Washington, D.C.
 ANT Antioch Press, Yellow Springs, Ohio
 APX Apex Books, Abingdon Press, 201 Eighth Ave., S., Nashville, 2, Tenn.
 APP Appleton-Century Inc., 35 W. 32nd St., New York 1, N.Y.
 AE Appolo Editions, Inc., 201 Park Ave., S., New York 3, NY
 ARCO Arco Publishing Co., Dept. Ht-1, 480 Lexington Ave., New York, 17, N.Y.
 AVON Avon Book Division, The Hearst Corp., 575 Madison Ave., New York 22, N.Y.
 BAL Ballantine Books, Inc., 101 Fifth Ave., New York 3, N.Y.
 BAN Bantam Books, Bantam Books, Inc., 25 W. 45th St., New York 36, N.Y.
 B & N Barnes and Noble, 105 Fifth Ave., New York 3, N.Y.
 BAR Barron's Educational Series, Inc., 343 Great Neck Rd., Great Neck, N.Y.
 BART Bartholomew House, 205 E. 42nd St., New York 17, N.Y.
 BEA Beacon Press, Boston 8, Mass.
 BELL Bellman Publishing Co., P. O. Box 172, Cambridge 38, Mass.
 BERK Berkley Publishing Corp., 145 W. 57th St., New York 17, N.Y.
 BSC Book Supply Co., 564 W. Monroe St., Chicago 6, Ill.
 BOW R. R. Bowker Co., 62 W. 45th St., New York 36, N.Y.
 CAR Careers, Box 522, Largo, Florida
 CHAN Channel Press, 159 Northern Blvd., Great Neck, N.Y.
 CTDL Citadel Press, 222 Park Ave., South, New York 3, N.Y.
 CCG College Course Guides, Doubleday and Co., 575 Madison Ave., New York 22, N.Y.
 CPT Chandler Publishing Co., 604 Mission St., San Francisco 5, Calif.
 COLLR Collier Press, 111 Fourth Ave., New York 3, N.Y.
 CRO Thomas Crowell Co., 432 Fourth Ave., New York 16, NY
 CUNIV Columbia University, Teachers College, New York, N.Y.
 DELL Dell Publishing Co., 750 Third Ave., New York 17, N.Y.
 DOUB Doubleday and Doran, 575 Madison Ave., New York 22, N.Y.
 DAVK David McKay Co., Inc., 119 W. 40 Street, New York 36, N.Y.
 EVM Dutton Everyman Paperbacks, E. P. Dutton Co., 330 Park Ave., S.,
 New York 10, N.Y.
 EA Educational Aids, 2208 Woodley Rd., Montgomery Alabama
 EVER Evergreen Books, Grove Press, Inc., 64 University Place, New York 3, N.Y.
 FAW Fawcett Publications, Greenwich, Connecticut
 FAM Family Service Association of America, 215 Park Ave., New York 3, N.Y.
 SPS George Peabody College for Teachers, Nashville, Tennessee
 HARP Harpers Bros., 49 E. 33rd St., New York 16, N.Y. 10016
 HAR Harvard University Press, Cambridge, Mass.
 HM Houghton Mifflin Co., 2 Park Street, Boston, Mass. 02107
 LION Lion Library Edition, 655 Madison Ave., New York, N.Y.
 LITT Littlefield, Adams and Co., 128 Olivers St., Paterson 1, N.J.
 LONG Longmans, Green Co., 119 West 40th St., New York 18, N.Y.
 McG-H McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N.Y.
 MAC MacMillan Co., 60 Fifth Ave., New York 11, N.Y.
 MER Meridian Books, 12 E. 22nd St., New York, 10, N.Y.
 MON Monarch Books, Derby, Connecticut
 NAMH National Association of Mental Health, 1790 Broadway, New York 19, N.Y.
 NEA National Education Association, 1201 Sixteenth St., N.W., Washington, D.C.
 NAL New American Library, 501 Madison Ave., New York 22, N.Y.

NOON Noonday Press, 19 Union Square, West, New York 3, N.Y.
 OX Oxford University Press, 417 Fifth Ave., New York 16, N.Y.
 OWL Owl Press Paperbacks, Owl Press, Bay Ridge, Annapolis, Maryland
 PAC Pacific Books, Box 558, Palo Alto, Calif.
 PEND Pendle Hill Pamphlets, Wallingford, Pennsylvania
 PEN Penguin Books, Inc., 3300 Clipper Mill Rd., Baltimore 11, Maryland
 PHIL Philosophical Library, 352 Park Ave., S., New York 10, N.Y.
 POC Pocket Books, Inc., 630 Fifth Ave., New York, N.Y.
 PER Permabooks, Pocketbooks, Inc., 630 Fifth Ave., New York 20, N.Y.
 POP Popular Library, Pines Publications, Inc., 355 Lexington Ave., New York
 P-H Prentice-Hall Inc., Englewood Cliffs, N.J.
 PAP Public Affairs Pamphlets, 22 East 38th St., New York 16, N.Y.
 PYRA Pyramid Books, 44 Madison St., New York 22, N.Y.
 RAND Random House Paperbacks, Random House, 457 Madison Ave., New York 22, N.Y.
 REFL Reflection Books, Association Press, 291 Broadway, New York 7, N.Y.
 SCRIB Scribners Library, Charles Scribner's Sons, 597 Fifth Ave., New York 17, N.Y.
 SHP Science and Health Publications, 5024 - 214th St., Bayside, 64, N.Y.
 SRA Better Living Booklets, Science Research Associates, 259 E. Erie St., Chicago 11, Ill.
 SA Scientific American, Reprint Department, 415 Madison Ave., New York 17, N.Y.
 SF Scott Foresman and Co., 433 East Erie St., Chicago 11, Ill.
 S & S Simon and Schuster, Inc., 630 Fifth Ave., New York, 20, N.Y.
 SPRIN Springer Publishing Co., 44 East 23rd St., New York 10, N.Y.
 UCP United Church Press, Schaff Building, 1505 Race St., Philadelphia 2, Pennsylvania
 USBL United States Bureau of Labor Statistics, Washington, D.C.
 UM University of Michigan Press, Ann Arbor, Michigan
 VN Van Nostrand Co., 120 Alexander St., Princeton, N.J.
 WSP Washington Square Press Inc., 630 Fifth Ave., New York 20, N.Y.
 WEST Westminster Press, Witherspoon Building, Philadelphia 7, Pennsylvania
 WBC Wilshire Book Co., 8721 Sunset Blvd., Hollywood 46, Calif.
 WIL H. W. Wilson Co., 950-972 University Ave., New York 52, N.Y.
 WILY Wiley and Co., 605 Third Ave., New York 16, N.Y.
 WOR World Trade Academy Press, 50 E. 42nd St., New York 17, N.Y.
 YALE Yale University Press, 149 York St., New Haven, Connecticut

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very useful.

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Schain and Murray. Where To Get and How To Use Free and Inexpensive Teaching Aids. P-H \$2.00

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*Abt and Bellak. Projective Psychology. EVER \$2.95 Cloth \$6.75 1950

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128 p. \$2.00 Hard Cover \$3.75. Assesses more than 100 published
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The above two books written by one of the founders of psychoanalysis

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- Britton, Edward. Growing From Infancy to Adulthood. 1958 APP \$1.00
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- Cohen, D. and Stern, V. Observing and Recording the Behavior of Young Children. 1958 CUNIV
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- *Haimowitz, Morris. Human Development, Selected Readings. 1960 816 p. CRO \$4.25. Very helpful to both teacher and student.
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- Stafford-Clark, David. Psychiatry Today. 1952 PEN
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- *Frank, Lawrence and Mary. Your Adolescent at Home and in School. 1956 NAL 50¢
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 *Staton, Thomas. How to Study. 1954 EA
 *Staton, Thomas. How to Learn Faster and Better. 1958 EA 62 pp.
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 United States Bureau of Labor Statistics, Washington, D. C. Occupational Outlook Handbook. Dec. 1963 \$5.00 This is the most extensive and most
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 *Ross, S. and Lockman, R. A Career in Psychology. 1963 APA

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Kuder, G. F. Exploring Children's Interests.
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BIBLIOGRAPHY FOR HIGH SCHOOL PSYCHOLOGY

TEACHERS AND STUDENTS

August, 1965

Paul R. McNeely, Lock Haven State College, Lock Haven, Pennsylvania

The purpose of this supplemental edition of the revised January, 1964 edition is to bring to the attention of teachers and students paperbacks published since the revised edition (published by the American Psychological Association, 1200 Seventeenth Street, N.W., Washington, D.C. 20036.) It was our purpose to present a variety of inexpensive source materials for teachers of high school psychology and their students. All of the books listed in this bibliography are paperbacks but many of them may be obtained in hard cover editions. The psychology teacher can secure an excellent library of books at low cost. Suitable books may be ordered for the high school library in hard cover. It is not claimed that all of the books are of equal merit. The teacher will need to be discerning in his choice of material. An asterisk placed beside a name indicates present membership in the American Psychological Association. Some are written by psychiatrists and other doctors fully qualified to write authoritatively. A number of books have been personally examined and have annotations regarding their value. These books are indicated by a capital R. Books that were judged appropriate for teachers are marked T, those for the student S, and those appropriate for both TS. The code letters in parentheses refer to the publishers addresses.

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APP	Appleton-Century Inc., 35 W. 32nd St., New York 1, N.Y.
BAN	Bantam Books, Bantam Books, Inc., 271 Madison Ave., New York 16
BAR	Barren's Educational Series, Inc., 343 Great Neck Rd., Great Neck, N.Y.
BEA	Bacon Press, Boston 6, Mass.
CN	Cliff's Notes, Bethany Station, Lincoln 5, Nebraska
CTDL	Citadel Press, 222 Park Ave., South, New York 3, N.Y.
CPC	Chandler Publishing Co., 604 Mission St., San Francisco 5, Calif.
COLLR	Collier Press, 111 Fourth Ave., New York 3, N.Y.
CUNIV	Columbis University, Teachers College, New York, N.Y.
COR	Cornerstone Library, 630 Fifth Ave., New York 20, N.Y.
DELL	Dell Publishing Co., 750 Third Ave., New York 17, N.Y.
DOUB	Doubleday and Doran, 575 Madison Ave., New York 22, N.Y.
DAVK	David McKay Co., Inc., 119 W. 40 Street, New York 36, N.Y.
FAW	Fawcett Publications, Greenwich, Connecticut
GRO	Grove Press, 80 University Place, New York 11, N.Y.
HARP	Harper Bros., 49 E. 33rd St., New York 16, N.Y.
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HOL	Holt, Rinehart, and Co.
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LIPP	Lippincott, East Washington Square, Philadelphia, Pa.
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McG-H	McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N.Y.
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NAL	New American Library, 501 Madison Ave., New York 22, N.Y.
NOR	W. W. Norton Co., 55 Fifth Avenue, New York 3, N.Y.
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PEN	Penguin Books, Inc., 3300 Clipper Mill Rd., Baltimore 11, Maryland
POC	Pocket Books, Inc., 630 Fifth Ave., New York, N.Y.
P-H	Prentice-Hall Inc., Englewood Cliffs, N.J.
RAND	Random House Paperbacks, Random House, 457 Madison Ave., N.Y. 22
SBB	Science Behavior Books, 1407 Hamilton Ave., Palo Alto, Calif.
SCH	Schenkman Publishing Co., Cambridge, Mass.
SF	Scott Foresman and Co., 433 East Erie St., Chicago 11, Illinois
TOW	Tower Publications, 505 Eighth Ave., N.Y.
UC	University of Chicago Press, 5750 Ellis Ave., Chicago, Ill.
USD	United States Superintendent of Documents, Washington, D.C.
WEST	Westminster Press, Witherspoon Building, Philadelphia 7, Pa.
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A SUGGESTED RESOURCE UNIT ON LEARNING FOR AN
INTRODUCTORY PSYCHOLOGY COURSE

by

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The psychology course today, like the science of psychology itself, is experiencing a great amount of growth. The suggested resource unit on learning was prepared to help cope with the greater research efforts that are providing a growing amount of knowledge to be mastered by an increasing number of interested students. These students will learn, through the teacher's use of this and similar material, that the scientific method can be effectively applied to the study of human behavior.

There is, of course, more material on the subject of learning than the writer could possibly include in this unit, however, it was intended to be broad enough in scope and contain enough material in depth to be of value to the teacher in preparing his own lesson plans.

The suggested unit was divided into three major topics in the area of learning: Principles of Learning; Human Learning, Remembering, and Forgetting; and Language and Thinking. The purpose was to include material which is considered essential to the scientific study of human behavior and to make it possible for the teacher to present this valuable information in such a way that it will be most easily assimilated by the student, and in such a way that the appropriate attitudes will be most readily engendered.

The emphasis is placed upon "learning by doing" and maintaining students' interest and enthusiasm by employing a wide variety of methods for presenting the unit on learning.