

**LIPPINCOTT'S EDUCATIONAL GUIDES**

**EDITED BY WILLIAM F. RUSSELL, Ph.D.**

**DEAN OF THE COLLEGE OF EDUCATION, UNIVERSITY OF IOWA**

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# **LEARNING AND TEACHING**

**PSYCHOLOGICAL FOUNDATIONS OF  
EDUCATIONAL TECHNIQUE**

**BY**

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## PREFACE

WHATEVER may be the disagreement among theorists as to the objectives of teacher-training, there is agreement in one thing at least, that the skillful teacher must be able to make facts, information, and theories function in practice. Much criticism has been given in recent years to courses in education and psychology intended for teachers, and in many cases the adverse criticism is that much of the data secured from these courses bore no obvious, direct, and useful relationship to the teacher's work. In an ideal situation, such instruction would be given not only in the classroom, but it would be followed by seeing it in the school and using it in the school. The material presented in this volume and the methods suggested for its use have as their chief aim the identification of theory with practice, or the application of information to actual problems of the school. The author is aware that it does not do it perfectly, for it does not utilize all the facts known about economical learning. The chief law of learning herein utilized is named the law of use by Thorndike, the law of self-activity by the Herbartians, and is frequently referred to in elementary psychology as the law of repetition or association. Under any of its names it assumes that the learner must **learn by doing** the thing to be learned.

The material in the volume is the result of the teaching of educational psychology, covering a period of eight years, at Ohio Wesleyan University and several summers teaching in other institutions, and the study of the subject at Miami University and Teachers College, Columbia

University. Thorndike has said that psychological data can help to clarify our educational aims, to indicate the probability of attainment of aims, to cause us to change our aims, to discover the means of education, and to identify and evaluate methods and content in education. (See *Journal of Educational Psychology*, I: 5-12, 1910.) The writer hopes that the material included and the procedures suggested will help to do some of the things mentioned.

The determination of the content included and its sequence is the result of two problems continually faced by the teacher. First, how do my pupils learn? Second, what may I do to increase their efficiency as learners? The material in chapters I-X is devoted very largely to answering the first question. Some of the material of chapters I-X, and all of the other chapters, are devoted to helping teachers solve the second problem.

Students will do better work if the use of this book has been preceded by a course which has provided the meanings of such terms as habits, imagery, memories, percepts, concepts, emotions, thinking, "feelings of relationship," judgments, sensations, and provided the learner with the theory of "connection-forming" with synopses. But the experience of the writer is that students can do the work without such preliminary study. The work has been tried out on students varying in rank from college freshmen to post-graduate students.

The material of this book may be used in either beginning or advanced classes. In the former the emphasis should be placed upon use of the body of the text, the use of a few of the simpler exercises, and the instructor should be liberal in the use of explanation and illustration. In advanced classes, this procedure should be supplemented by the study of relevant collateral reading and by the

discussion of the more difficult exercises. In either case, it will be apparent to the instructor that some exercises will have more than one valid solution, depending on the situation involved in the exercise as understood by the learner.

The material suggested for beginners is sufficient in quantity for a three semester hour course; with the more advanced group, the material is sufficient for six semester hours. For the latter type of work, it is assumed that students will have access to a library containing much of the material listed in the references.

The writer has tried to make each chapter a brief treatment of a few things mentioned in the opening paragraph of the chapter, and to end the chapter with a summary pertaining to the same items.

Some experiments are listed, and when it is possible, the instructor is urged to use some of them. The rôle played by the use of the lists of exercises at the end of each chapter is a very important one. They are designed to serve three purposes: (1) to secure review to make more permanent the learner's acquisitions, (2) to help the learner to widen the knowledge already possessed, and (3) to train the learner in applying psychological data to the problems of learning, teaching, organization of subject-matter, methods, discipline, and classroom supervision. It is the writer's conviction based on eight years of experience that neither prospective teachers nor teachers in service will do much to unite psychological data and educational practice unless they are taught to do so. The exercises should be studied by the learner after presentation of material in text, as a usual thing, but to whet the interest, it is a very desirable practice to start a new chapter by a class discussion of these, then use the data

of the chapter, and then return to the exercises. The exercises may be written out by the student before the period of the class, supplemented by results from class discussion, and then checked by the instructor.

The writer's obligations are very numerous. First, to the many students who have patiently submitted to the writer's experiment of teaching, he is indebted for the great privilege and opportunity to do the work represented in the volume. Likewise, the writer feels an obligation to Ohio Wesleyan University for very material aid in the work. To Mr. H. W. Nisonger of Ohio State University and to Mr. Waldo W. Brown of the East Liverpool, Ohio, high school, he is indebted for aid in preparing the exercises on agriculture and chemistry. The debt to Dr. E. L. Thorndike is very great and the content of the book reveals it in many cases. The encouragement and direct assistance of the writer's life companion, Mrs. Grace Johnson Mead, have spurred him on to do the work when zeal flagged and more attractive tasks beckoned.

A. R. M.

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# LEARNING AND TEACHING

## CHAPTER I

### WHAT IS THE FIELD TO BE STUDIED?

A TEACHER of English in a high school came into the writer's office, and with exclamations and gestures of despair said: "What must I do to get my children to use better English? How can I keep them from unnecessary disorder? I have appealed for help to the principal and he told me to do as I judged best and I don't know what to do. I left college last spring and secured a position in X—— high school. I had made A grades in all my work in English, and you know I wear the Phi Beta Kappa key. But somehow I can't get results. My pupils say they don't like to read the classics I require them to read, and they don't like to write the themes I assign. They protest against the analytical study of Macbeth and are glad when they have finished it, etc., etc." What would you say was her difficulty, or were her difficulties? How would you remedy the situation? Why was she having such trouble? Because she was unlikable personally? No, that was not the cause. The pupils liked her and disliked and tried to evade her work. Why, then, had she had these troubles? Well, one prominent cause was that she did not understand how children learn most efficiently. She had never given that matter any serious consideration, and found herself so situated that she had to face it. After all, that is the first and the

last important question any teacher must face. To be successful, the teacher must have practical means of answering it.

Let us, then, examine in further detail such a situation and identify the types of problems involved. What are the laws of learning that favor efficient learning? What are the laws of learning that hinder economical learning? What factors influence learning? How do these factors influence learning? What should be done with subject-matter in order that children can learn it economically? What is the general rôle of the curriculum in learning? Does this function vary with different subjects of the curriculum? Why did the teacher receive no help from the principal? What is the relation of supervision of teaching to economical learning? Is there any body of principles that can be used by teachers in the government of pupils? What is the rôle of method in teaching? What are the relations between different types of methods and psychological changes to be made in learning? And what are the kinds of psychological changes that teachers can help to bring about? This does not begin to exhaust the questions that are necessarily involved in a case like that of the teacher of English.

It is the plan of the book to make the relations between learning and influencing factors in learning the constant line of study. While at one time laws of learning will be stressed, it will be for the purpose of relating them to teaching technique. At other times, the curriculum assumes importance, but only to secure a working conception of how the curriculum and efficient learning can be united in practice. At another time, supervision is studied, but only to make clear how it aids learning.



## EXERCISES

1. Write a summary of five or six sentences for the chapter.
2. Did you ever study a subject you disliked?
3. What subjects that you have studied have you liked most?
4. In which subjects have you learned most readily, those you disliked or those you liked?
5. Write out the procedures actually followed by one teacher during one class period. Then answer, if you can: "Why did the teacher use these procedures?"
6. Read the preface to Pyle, *The Psychology of Learning*, and write a statement of his main points.
7. Do likewise for one of the other references listed below.
8. State a difficulty that you encountered as a pupil and for which you received no help and no solution. Why is such a condition possible?

## REFERENCES

- \* Freeman, F. N., *How Children Learn*.
- Parker, S. C., *Methods of Teaching in High Schools*.
- Pyle, W. H., *The Psychology of Learning*.
- Starch, D., *Educational Psychology*.
- \* Strayer, G. D., and Norsworthy, N., *How to Teach*.

## CHAPTER II

### LEARNING: ITS FUNDAMENTAL CHARACTER IN THE SIMPLER TYPES

This chapter seeks to provide (1) a brief description of an actual example of learning to illustrate the more fundamental laws, (2) two lists of exercises to supplement this information with data from animal learning, to enable the student to make some applications of knowledge gained, (3) an experiment which will objectify and give repetitions of the laws together with related data, and (4) a brief list of well-known references from which related material can be secured. Emphasis is placed on learning commonly designated as sensori-motor.

Experimenters have found that the learning of such animals as cats, chickens, monkeys, white rats, and raccoons, under experimental conditions, reveals some of the most fundamental laws of learning. Watson, Ruger, Washburn, and Thorndike have performed experiments, and they are in essential agreement as to the fundamental conditions necessary for such animals to learn. Furthermore, it is true that the same fundamental laws operate in human learning. The child learning to manipulate wooden blocks, the monkey learning to get out of a box to get food placed nearby, and the rat or chicken learning to follow a maze to secure food, are cases in which the fundamental laws of learning are the same. A simple example of learning by a child will be given.

L. at about eighteen months of age, being in a room containing an electric light chandelier suspended from the ceiling, was noticed to watch the chandelier, point to it,

and make sounds with her voice. The brightness of the chandelier evidently attracted her. One day her sister of five years said to her while pointing to the lighted chandelier, "Say 'pretty light,'" and repeated the admonition on various occasions. L.'s first response to this that was like a word was "plä," evidently an attempt to say "pretty." Each time the sister directed her to say "pretty light," L. would respond with "plä." In a very few days L. used this combination of sounds to indicate the chandelier when in that room, and only when in that room and seeing the chandelier, and with the sister's aid. Thus L. had learned "plä" for the object "electric light chandelier in a particular room." Mother, father, and sister, then, all began to participate in this affair by trying to have L. say "pretty light," or by saying "pretty" or "light" alone. This process continued through a period of about two months. When L. was in the particular room, she was frequently urged to say "pretty," "light," or "pretty light," but more frequently to say "pretty." Whenever L. made any attempt to speak the word she was smiled at, patted, cuddled, and otherwise made happy for so trying. If she succeeded in making a clear approach to "pretty," she was urged to say it again. Thus, L. started with "plä," and by slow successive steps used the following: "plä," "plet," "pret," "itty," "pitty," and "pritty." To get her to say "pretty light" was abandoned until long after she was able to say "pritty." Thus, she learned to say "pritty" for the particular chandelier referred to. In a similar manner she was urged to say "pretty" for bright colors on paper, cloth, sunshine, flowers, colored pictures, colored playthings. When she did so, she usually found that she was smiled at, cuddled, or rewarded for her effort

in some way. At twenty-two months of age, she used the sound "pritty" to indicate the chandelier, and the other colored objects mentioned above. Each was to her a "pretty."

The first thing to be noticed in this example of learning is that something started L. to making a sound, "plä," and that "plä" was made only in a certain situation. Here, then, are the two elements of all mental activity, stimulus (situation), and reaction (response), and, as the learning proceeded, the particular situation was more sure to bring the response.

Let us then indicate these three elements as follows: S—R, in which S is stimulus (stimuli, situation), R is the response (reaction) made to S, and — is connection (bond) between the two. In this case this connection is known to exist because S did arouse L. to make R, and as time went on, it became quite easy for L. to make R, and the observers were much more sure that if S existed in close surroundings of L., she would make R. We may then call S—R the elements of a mental function (trait, skill, ability).

Next, we may note that L. never began to learn "pretty" until she began to try to say it. And with repeated trials, she became more sure of making some one of the R's (plä, itty, pritty). Thus two facts or laws are shown: (1) that one learns by doing, or using responses, (2) and that the learning is perfected by repeating the responses. Thorndike has named the first the Law of Use, and the second the Corollary of Frequency to the Law of Use. S. C. Parker refers to the first as the Law of Self-Activity. We shall call them the Law of Use and the Corollary of Frequency.

In the course of the process, the erroneous R's (plä, itty, plit, plitty) disappeared. L. stopped using them, and she does not now use them for "pretty." Had she continued to repeat each one of them, she would, because of the Laws of Use and Frequency, still use them. However, since she did not repeat them (use them), we may say she "disused them." Because she did so, she did not retain those particular S—R's. This lack of doing the R, or disuse of it, Thorndike has called the Law of Disuse. We shall use that name for it.

Going back again to the example itself, it is observed that some form of a satisfaction or reward, or enjoyment, was associated with L.'s attempts to say "pretty," and especially with those more accurate attempts; and that no satisfaction was provided (in fact, sometimes L. received frowns, and "No's" for her mistakes) with the errors. Thus satisfaction was associated with correct R, and annoyance with incorrect R. Together, they had the effect of encouraging L. to do the correct R and to omit the errors. These two influences in learning are named the Law of Effect by Thorndike.

At the outset L. made many different R's to S. These we will call Multiple Responses or Varied Reaction. Gradually, she began to pick out the more correct. She thus "shifted" from S—R equals "plä," to S—R equals "plit," to S—R equals "itty," to S—R equals "pitty," to S—R equals "pretty." She thus became more partial to the better forms, and eliminated the incorrect forms. She became active in making responses R equals "pretty," when she had started with R equals "plä." The — had thus shifted from S—R equals "plä" to S—R equals "pretty." This shifting and elimination of errors we will call Associative Shifting. The tendency to respond

to the S equals the chandelier with a more accurate R, we will call Selection of Correct Response or Partial Activity.

Above, has been described the Law of Effect, and it included both the influence of satisfaction and annoyance. But these are not the only factors that helped or hindered L. in learning "pretty." On some days, L. had a cold. We could not get her to try to say "pretty" very well then. Sometimes she was more interested in playing with her blocks, or other children, and this did not favor the learning of "pretty." All of these conditions (including the Law of Effect), we shall call the Influence of "Set," or "Attitude." It is quite synonymous with what Herbartians termed Apperception.

Had a more complete record been kept, probably other laws might have been observed, for example what Thorndike calls the Law of Analogy. Briefly stated it is that in a new S for which the learner has no R, R which he has connected with some S that resembles the new S will be made. For example, to the S equals the printed German word "HAUS," one tends to respond as he has done to the printed English word "house."

This chapter asserts that these laws are found in both animal and human learning. Next, it gives a simple example of a child learning to say "pretty," and illustrates the following laws: Use, Frequency, Disuse, Effect (including both satisfaction and annoyance), Multiple Response, Associative Shifting, Partial Activity, Influence of "Set" or Attitude, and Analogy. We shall make the further distinction of referring to Multiple Response, Partial Activity, Associative Shifting, Analogy, and Influence of "Set" or Attitude as secondary laws, for reasons which can be made more apparent later.

## EXERCISES, PART I

## Some Features of Learning by Lower Animals

## Review Questions:

1. Recall the following laws and illustrations of each: Use, Disuse, Effect, the Corollary of Frequency.
2. Explain the meaning of the symbol S—R and give three illustrations.
3. What are the elements of a mental trait?
4. What are the characteristics of human nature that make interest possible?

## Animal Learning:

1. Select one of the examples of animal learning described in Thorndike's writings, Washburn, Kirkpatrick, or Watson. Study the example until you are familiar with the details.
2. State one phase of the example in terms of S—R.
3. From your example of learning, show the operation of each of the following: Multiple response, piecemeal activity, or partial activity. Associative shifting. "Set, attitude, determination." Analogy.
4. From the same example show the operation of the Laws of Use, Disuse, Effect.
5. Similarly, show the operation of the corollaries of the Law of Use, as given by Thorndike.
6. Make a list of ten examples of human beings teaching lower animals.
7. From these examples, show the operation of the Law of Effect.
8. The assumption is made that human and animal learning have many like elements and laws. Is such an assumption valid?
9. A dog fancier who had some experience in training dogs said, "The secret of my success in training dogs is that I give them the idea of what to do before they do it." How does this view accord with the psychologists who have studied animal learning?
10. Is imitation a very common type of activity among lower forms of animal life?
11. Do animals possess ideas? Do they think?

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- Thorndike, *Educational Psychology*, Vol. II, Ch. I, II.
- Thorndike, *Animal Intelligence*.
- Washburn, *The Animal Mind*.
- Watson, J. B., *Behavior: An Introduction to Comparative Psychology*, Ch. I, IV, V, VI-XIV. Especially Ch. VII, VIII.

## EXERCISES, PART II

## Associative Phases of Human Learning

1. Consult Thorndike (Brief Course), page 138, Parker, Chapters VI-VIII, and Freeman, Chapters VIII-XI. Make lists of the different classes of learning which they describe. Identify those that are identical.

2. Perform the experiment described below, make records and retain them for use in class discussion.

- (a) Take 20 sheets of paper about 8 in. by 11 in. and with the use of a ruler draw a five-pointed star on each sheet, making the star about 4-5 inches in width.
- (b) Provide yourself with a mirror that you can place on a table in front of you so that the surface of the mirror faces you and that the mirror is at right angles (perpendicular) to the table-top.
- (c) Place the sheet with the star drawn on it in front of the mirror so that you can easily see the reflection of the star in the mirror.
- (d) Then take a book, or paper, and hold it directly above the drawing of the star so that you cannot see the drawing, but you can see its reflection in the mirror.
- (e) Then, with a pencil, use your free hand and trace the outline of the star by seeing only its reflection in the mirror.
- (f) When you have thus traced the first, remove it and number it 1. Do likewise with all other sheets.
- (g) Then count and record the number of times your pencil left the outline of the star on each sheet of paper.
- (h) Make a table giving these scores.
- (i) Make a curve showing the data thus tabulated.
- (j) Then study your data and compare the results with Thorndike's description of the characteristics of associative learning.

3. Give four general synonyms of associative learning.

4. Consult Thorndike (Brief Course), pages 141-143. Then restate without use of the book the two laws of association, or habit-formation.

5. What does he mean by "Put together, etc." ? Give examples that he uses. Select three other examples. Do you find any limitation to the operation of this law?

6. This material was copied in one minute on an Underwood typewriter by Mr. Hossfeld. Explain how it was possible for him to become so skillful.

"So far so good. I liked my new job or at least I would have done so but for one thing, I was made paymaster as well and it was my duty to pay the tribe at the end of each week, but to do so I had to send the pay roll to the city and get the money put up ready to hand to the men at the close of the day. Not one of them had much left on Monday, but so long as they came back on the job fairly



sober no one thought much about it—no one except me that is. I used to go to the city on an early train and did not get back until late in the afternoon, and I had to bring with me a bag in which I had something like \$9000. I had" (147 words. George L. Hossfeld, World's Champion Typist.)

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