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A SURVEY OF THEORIES PROPOSED FOR THE BASIS OF THE
TRANSFER OF TRAINING AND THEIR APPLICATION
IN LUTHERAN RELIGIOUS EDUCATION

A Thesis Presented To
The Faculty of Concordia Seminary
Department of Philosophy and Education

In Partial Fulfillment
of the Requirements for the Degree
Bachelor of Divinity

by
Allen Henry Nauss

May 1948

Approved by: Arthur C. Repp
Richard R. Casperson

A SURVEY OF THEORIES PROPOSED FOR THE BASIS OF THE
TRANSFER OF TRAINING AND THEIR APPLICATION
IN GENERAL RELIGIOUS EDUCATION

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CHAPTER I

INTRODUCTION

This paper presents a survey of several of the important theories which have been offered as solutions to the problem of the transfer of training.

The fact that theories have been proposed for the explanation of the transfer of training indicates that it has constituted a problem in the past. It has been a problem which has received a great amount of attention. Peter Sandiford measured interest in the matter in 1941 when he counted more than 800 studies of transfer in his bibliographical file. But educational and psychological literature will undoubtedly continue to reflect that interest, for the transfer of training is still a problem; it remains unsolved. However, the need for a solution to the matter only enhances the importance which the trans-

fer of training already owns as a vital issue in education.

Definition of transfer of training. Substitution of the term learning for training would probably help to describe the problem of transfer more accurately. Since much of the literature still uses the original term training, we shall use it as well as the other more accurate designation. The two will then be considered synonymous unless otherwise noted, with the meaning derived from learning and referring to the acquisition of a skill, an item of knowledge, or an emotional response.

Transfer of training occurs when, for example, an item of knowledge is learned in one situation and used later in another situation. The problem lies in the explanation of the entire process from the learning to the actual act of transfer.

The transfer of training does seem to be a process, rather than just an act which takes place at one time and is then laid aside for recall. The obvious act of transfer, as it is noticed in the case of the student who defines a strange word of Latin derivation outside the classroom, had its beginning before the strange word was encountered. All the incidents and conditions which contributed to the learning of the Latin word and to the recognition of the derivative are involved in this one appearance of transfer. Since a progressive combination of various experiences and conditions seems to be re-

quired in any evidence of transfer, we describe the transfer of training as a process. The definition given by Davis keeps this point in mind. He defines transfer as

a process of acquiring ideas, information, or skills in some situation and applying this knowledge to other situations, whether similar or different. Specifically, it is the utilization of previously gained knowledge in a practical situation; generally, it is the utilization and application of education in the solution of life problems.¹

We must be certain that we do not limit transfer to intellectual learning. Skills, habits, knowledge, understandings, judgments, and other corresponding results of education must not be the only objectives of teachers. The results of affective learning, such as emotions, sentiments, interests, desires, and some aspects of attitudes, can also be transferred. It may be well to point out in addition that learning may take place without one's positive awareness of it. In other words, learning may be "consciously" or "unconsciously" accepted.

Transfer of training may then be defined as the process by means of which an individual carries over something he has consciously or unconsciously learned in one or a number of situations to its use in another situation.

Transfer in current affairs. It seems unlikely that anyone would deny that transfer of training or learning

1. Robert Davis, Psychology of Learning, p.235.

is possible. It is a fact of every-day experience that a person often uses in new situations the knowledge or skill he has learned in another situation. An individual is expected to be able to apply what he knows. Yet, that is all that transfer involves: some knowledge, skill, attitude, or emotion, and the application of the same knowledge, skill, attitude, or emotion.

Schools exist, one must admit, in order that students may receive the training and learning they need for use in life. Certainly then, if one could not apply what he has learned, there would be no need of schools or churches or other educational agencies. If one continues to ponder the matter of transfer, he should conclude finally that there could hardly be any progress in learning or even in civilization as a whole if there were no possibility of transfer.

The problem of the transfer of training is especially vital to those who are engaged in teaching. All people who teach (in the general sense of the term), from mothers to personnel workers in industries, will have some interest in the manner by which they intend to make their instruction and counsel effective. But classroom teachers should be concerned most directly with the problem and the theories for its solution, for the supporters of organized education, or in other words, the people, expect their instruction above all others to transfer.

Need for clarification of the problem. In 1941 George Hartmann of Teachers College at Columbia University observed that there were few problems in educational psychology more persistent and disturbing than the problem of the transfer of training. He added:

Most educators at present are seriously confused on this point. . . . To be clear and "straight" on the topic is evidently a difficult achievement, but there is no good reason why the basic concepts and findings should not lend themselves to simple treatment.²

The procession of world events after 1941 and Pearl Harbor shifted the center of attention in educational circles to problems more directly concerned with the state of the nation and its people in the world society than that of the transfer of training. Since the war's end and the onset of more normal conditions, progress seems to have been resumed once again in the experimentation with and discussion of the more personal questions in the work of the teacher. But the general situation today appears to be little different from Hartmann's description in 1941. Many educators still appear to be "seriously confused" on the transfer problem. Although no definite solution can be given yet, any who write on this problem should attempt to develop as clear a picture of the process of transfer as is possible on the basis of experimental and other evidence.

2. George Hartmann, Educational Psychology, p.310.

Method of treatment. The problem can be treated in several different ways. Many investigators first examine the records of the experiments in an order determined by the types of activity tested. Thus Webb, Whipple, Kingsley, Woodworth, and others separate the mass of experiments into types of materials employed, such as those dealing with sensori-motor learning, perceptual learning, memory, reasoning, ideals, and school subjects. These writers also explain the chief theories of transfer proposed and then formulate their own solution to the problem upon the basis of the experimental evidence. Such is the scientific method of attacking the problem. The present writer of necessity had to be content with presenting merely a survey of the most important theories. Experimental evidence and representative views which tend to evaluate these theories will be given wherever possible. No concerted attempt has been made to review the subjects of cross education (transfer of training to corresponding members of the opposite side of the body) and negative transfer (training which interferes with learning or behavior in another activity). Both of these are problems in their own right. Positive transfer (that carry-over of training which aids in the performance of another activity) is the concern of this paper.

In 1928 Pedro Orata listed all the theories of transfer proposed and found almost as many specific theories

as there were men who had written about the problem. However, he found it possible to place each of the suggested solutions into either one of two categories. These categories were the commonly accepted (in print) solutions of that day, as they are still today apparently among the majority of educators - the theory of identical elements, and the theory of generalization. Besides investigating these theories, the writer has studied the doctrine of formal discipline which held sway in education before the twentieth century. These three types of solutions to the transfer problem are reviewed in separate chapters.

The transfer problem in religious education. Every type of education, religious or secular, must deal with individuals, be they children, adolescents, or adults. If it is to be effective, every type of education must make certain that its objectives are realized in the lives of its students. Every type of education must therefore be concerned with the problem of the transfer of training, for transfer concerns itself with the effectiveness of the teaching methods which would make the objectives of education "come true." A discussion of transfer must therefore be very important to religious education, also.

It is true that in religious education the Holy Spirit plays a definite role in the transfer of training.

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But God has not outlined in Scripture an all-sufficient plan of transfer which makes all teaching methods superfluous or makes the realization of objectives automatic upon the discharge of words from the mouth of the teacher. God has given men their reason and senses. With such abilities to observe, to investigate, and to judge, and with the endless amount of materials God has placed upon earth at their disposal, men can devise and revise for the purpose of discovering the intricate processes of learning which were created in man at the beginning of all things. With a greater knowledge of these processes educators become better able to serve as more effective instruments in the work of the Holy Spirit among men.

The writer has limited the scope of this portion of the paper to Lutheran religious education (and specifically to that of the Missouri Synod) in order to present a more comprehensive and concentrated survey of one phase of religious thinking on the transfer problem. Official educational periodicals of the Missouri Synod and other relevant material in use in its circles were investigated. In none of the religious literature read by the writer was there any mention made of applying to religious education any of the theories of transfer proposed by secular educators. This does not mean that these religious educators did not consider transfer a problem. It may reflect, however, a hesitancy upon their part to

use theories in vogue in secular education for religious education, or it may indicate a lack of knowledge of such theories. Whatever the specific reason or reasons may have been, experience and sound reasoning still led most of these educators to a knowledge of the same principles which underlay the transfer theories set up by men in the secular field.

Explanation of the Theory

Formal discipline in formal education. Some traditionally-minded educators think of the pupil as an individual whose thinking needs to be trained or disciplined. They have identified within the mind of the child various mental powers, such as memory, imagination, reasoning, will, attention, judgment, observation, accuracy, quickness, and the like. These, they say, are real abilities which, like the body muscles, need only exercise to be strengthened.

Once the child has trained any one of his inherent powers, he can use that ability in any other situation. Each ability has a universal transfer. For example, when the capacity has been trained in school the child may apply it to all other situations in school and throughout life which require the use of that same ability. For example, the pupil who memorizes arithmetic and poetry or grammar may thereby be said to have developed his memory; following the formal discipline theory through, that pupil will be better able in later life to remember his car license

CHAPTER II

THE THEORY OF FORMAL DISCIPLINE

Explanation of the Theory

Formal discipline in formal education. Some traditionally-minded educators think of the pupil as an individual whose thinking needs to be trained or disciplined. They have identified within the mind of the child various mental powers, such as memory, imagination, reasoning, will, attention, judgment, observation, accuracy, quickness, and the like. These, they say, are real abilities which, like the body muscles, need only exercise to be strengthened. X

Once the child has trained any one of his inherent powers, he can use that ability in any other situation. Each ability has a universal transfer, i.e., after the capacity has been trained in school the child may apply it to all other situations in school and throughout life which require the use of that same ability. For example, the pupil who memorizes orations and poetry of great men thereby is said to have developed his memory; following the formal discipline theory through, that pupil will be better able in later life to remember his car license

number, his house number, social security number, names of people and even their faces.

The mind and its powers are to be disciplined. Certain school subjects, chiefly the classics and mathematics, are said to be better suited for this training than others. Mathematics develops the reasoning ability; names and dates in history, vocabulary of a foreign language and its case-endings train the memory; practically any kind of distasteful task, the more it is disliked the better, will develop will-power. The subject matter, however, is really only of secondary importance. The fact learned may soon be forgotten, but the effect of the training or learning is the hoped-for-result of this type of education. So it is not the specific content (as the history of any one country), but the form of the material studied (memory or reasoning material, for example) which helps to determine the value of the formal discipline theory in practice.

The connection with psychology. Advocates of the traditional education have been ably supported by psychologists of the pre-twentieth century period. The mental powers and capacities of the individual were identified by them as faculties. Each faculty was localized in a specific area of the brain. The mind, or brain, became like a machine with the faculties as parts; the teacher in the school needed only to train the machine to work quickly and efficiently. According to the disciplinarians

the teacher was to exercise the parts of this mental machinery so that they would be ready for service whenever needed. The mind was also likened to a storage battery which could be loaded with powers of observation, accuracy, will, memory, and the like. These powers would then be stored away for future use. X

From Aristotle to William James. Aristotle was the first to use the term faculties in its psychological sense. The practical counterpart of his introspective psychology with the faculties, the doctrine of formal discipline, may be traced as far back as Plato who felt that philosophers should study mathematics, but not for its utilitarian value. X

Although disciplinarians may have taught regularly in schools after the time of Aristotle, the theory itself was revived only after the first effects of the humanism in the Renaissance had grown out of the people. Latin had been the language of the Church and of the professions, and as such had been of practical value to the students in the schools. The culture of a great civilization, and the science, literature, philosophy, and politics of the Middle Ages and Renaissance were all recorded in the Latin language. The classics constituted the content of the education of the day which was reserved for the members of the upper classes. Thus it was

also socially expedient for the favored few that they be acquainted with the classics and, naturally, the language in which they were written.

But when the people began taking more democratic privileges, when class barriers began to be less difficult to overcome, and when vernacular languages began to be developed, a training in the classics was no longer absolutely demanded as a basis for social equality among the members of the favored groups. In order to make the schools more practical for the benefit of the new and poorer students, educators therefore had to revise their whole philosophy and curriculum or attempt in some way to devise a justification for the old form. The latter was the easier path and it was taken. The educators then appealed to formal discipline and its basis, faculty psychology.¹

The objectives of mind discipline and character building were easily achieved, or rather easily understood, by the faculty psychologists. They merely prescribed exercise of the particular faculty. Educators

1. Cf. Frank Graves, A Student's History of Education, pp.184-85; Boyd Bode, Modern Educational Theories, pp.74-75. These sources give the explanation used in this paper for the introduction of formal discipline into the schools. For another approach see William Burton, The Guidance of Learning Activities, pp.24-25.

Some writers hold that John Locke is the philosopher and educator responsible for the introduction of faculty psychology and its educational implications into the post-Renaissance schools. Others, however, see Locke as more of an exponent of the modern educational theory which

grabbed at the theory and its prescription. They established claims for their classical subjects and languages, arguing that

every one should take these all-important studies, regardless of his interest, ability, or purpose in life, since he would thus best prepare himself for any field of labor. All who proved unfitted for these particular subjects have, therefore, been supposed to be not qualified for the higher duties and responsibilities and to be unworthy of consideration in higher education.²

Formal discipline continued to dominate educational practice after the seventeenth century. The literary expressions of the classical culture were regularly employed as material for mechanical use and memorization, since this type of learning was considered the best kind of mental discipline. If teachers expected the students to absorb the spirit of the culture they were studying, they were reassured that it transferred automatically upon contact with the words and through the discipline.³

Many traditional schools have borne the formal spirit even into the twentieth century. The development of schools in the United States began with the Latin grammar school with its verbalistic learning. This was

opposes formal discipline. Cf. Graves, op.cit., pp.184-87; Frederick Eby and Charles Arrowood, The Development of Modern Education, pp.408-24.

2. Graves, op.cit., p. 185.

3. Boyd Bode, How We Learn, pp.49-50.

followed by the more liberal, but still classical, academy. These two, together with the public high school, which is still college-preparatory to a certain extent, have helped to form the traditional thinking and practice of many educators. But a new influence was felt especially at the end of the nineteenth century when William James began to rouse some school-leaders with his psychological studies.

Formal discipline in current life. If popularity were the criterion for selecting the best method of transfer today, the theory of formal discipline would probably rate a very high comparative score. Although this is an old doctrine, it is very much in evidence. X

Despite, or because of, its age and traditional character, the formal discipline theory is even being transmitted today. In the student editorial of an Omaha newspaper for January 5, 1948, a high school senior claimed that the study of the Greek language "develops concentration, precise and logical thinking, . . . the power to think in the abstract, to understand the interrelationships of thoughts. . . . It will . . . teach you how to think, how to live."⁴ In other words, this high school lad, who was perhaps just echoing the claims of his teachers, would urge others to study Greek because

⁴ Omaha Evening World Herald, January 5, 1948.

Greek disciplines the mind.

Education in its basic sense pervades all the activities of life. Although people commonly restrict formal education to the schools, they carry its theories, which they have imbibed, into other educational activities and agencies. For example, a feature writer in the St. Louis Globe-Democrat advised her readers to get their minds off food and to eat less at meal time if they would have slimmer waists. She continued: "Granted it takes practice, but the more you do it, the easier it is. Will-power, like muscle, gets stronger with exercise."⁵ Exercise or discipline - whichever term is used, it indicates the same type of training.

The doctrine of formal discipline is apparently an influence in these days also.

Opposing Arguments and Evidence

The theory of formal discipline owes its recent fall in number of adherents among prominent educators to the scientific investigation of the problems which were facing educators and psychologists at the turn of the last century. Arguments which urge one to reject the traditional transfer theory are based upon experiments testing the spread of training in the general functions or "faculties" and experiments in physiology.

5. The Globe-Democrat, St. Louis, February 28, 1948.

The effect of memory training. The pioneer in the experimental investigation of disciplinarian claims was William James. In his Principles of Psychology, published in 1890, he told of his attempt to discover whether practice in memorizing did improve a general ability of memory. ⁶ After he had noted the time he required to commit to memory 158 lines from Victor Hugo's Satyr, he trained his memory with twenty minutes of practice a day for the next thirty-eight days. During this time he memorized the entire first book of Milton's Paradise Lost. Immediately after this period he tested his ability to memorize by selecting another 158 lines from the Satyr. He found that it took him more time to learn the second selection than the first! At James' request four other persons made a similar test. Three of them required slightly less time for memorizing after the practice, while the fourth showed a slight increase. The exercise of the memory "muscle" seemingly had not helped.

Besides opening the flood-gate for complaints against formal discipline with his study James also prompted many other investigations of transfer in the field of memory. Sleight, an English psychologist, conducted one of the best experiments in this field. He had one control and three practice groups undergo an experiment similar

6. William James, Principles of Psychology, Volume I, pp.666-68, cited in Howard Kingsley, The Nature and Conditions of Learning, p.525.

in form to that of James. Before and after a practice period all the groups were tested in their ability to memorize dates, nonsense syllables, poetry, prose, and letters. The practice consisted of memorizing poetry for one group, "tables" for another, and prose substance for the third. Members of the control group did not practice or attempt to train their memory between tests. Varied results appeared. No group showed consistent results. Some individuals manifested a slight amount of positive transfer, others negative transfer, and still others even none at all. In some cases the practice groups gained less in the final score than the controlled class. Sleight concluded that the practice did not seem to produce any general memory improvement. The experiment, moreover, did not present any evidence, as it might have been expected to do, for the theory positing a general memory function.⁷

According to these and other experiments there appears to be agreement that practice on one kind of material or memory task does not in itself improve the memory ability of a person. The varied results seem to indicate that positive transfer in this function must be due to other conditions in the learning situation. Other experimenters, some of whose findings are included in later sections and chapters, have provided evidence that methods

7. W.G.Sleight, "Memory and Formal Training," British Journal of Psychology, 1911, 4, pp.386-457, in Howard Kingsley, op.cit., p.532.

of memorizing, such as making meaningful associations and learning by the whole method, are partially and directly responsible for transfer.

Training problem-solving or reasoning functions.

Experiments in this phase of learning are related in other portions of this paper. Also these show that routine practice per se will not guarantee transfer.

Result of learning ideals. By ideals is here meant those faculties, such as accuracy, neatness, and quickness, which the disciplinarians claim will be transferred to all areas of life even if they are developed in only one area.

The experiment recorded by Bagley⁸ was the first celebrated test of the learning of ideals. The teacher emphasized neatness and accuracy in a third grade arithmetic class. No mention was made about being neat and accurate in other subjects. After a three weeks' drill twelve of the thirteen pupils tested showed improvement in the subject of arithmetic. The last paper of one showed a difference of .02 below his first paper in accuracy, but he had improved in neatness. The average gain for the group was 3.69% in accuracy and 4.9% in neatness. The language and spelling papers which had been saved and graded for the same period showed on the other hand

8. The single tests were planned and supervised by Dr. Carrie Squire of the Montana State Normal College and the reports and results were published by Bagley in his books. Cf. William Bagley, Educational Values, p.189.

in every case except one a decrease in both accuracy and neatness. The ideals learned in only one area with no mention made of their value elsewhere did not transfer to other areas.

Value of school subjects. A large number of studies has been made in the attempt to determine the transfer value of elementary and high school subjects. Several of these investigations have been selected for inclusion in this paper.

Thorndike's study⁹ involving more than 8500 students was concerned with the problem of determining "the amount of disciplinary values of high school studies. For, example, what is the relative merit of algebra as compared with physics or sewing in developing the pupils' ability to think?"¹⁰

An elaborate test of general intelligence and several other tests which were to measure ability to think were administered to the students in one form in May, 1922, and in an alternative form in May, 1923. Following two criteria, similarity of subject content and similarity of effect, Thorndike divided the cases into nine different study group sections. After attempting to equalize other varying factors, he compared the

9. Edward L. Thorndike, "Mental Discipline in High School Studies," Journal of Educational Psychology, 1924, 15, pp.1-22, 83-98, in Pedro Orata, The Theory of Identical Elements, pp.32-35.

10. Orata, op.cit., p.32.

effect of the study groups upon the intelligence and thinking ability measured by the tests. For example, he would take two groups, equated in respect to scores on the first tests, and alike in their study program with geometry, English, and history, but different in that one group was taking Latin while the other took chemistry. After allowing for all other factors it would be possible to compare the effects of Latin and chemistry by comparing the scores of the second group of tests.

The differences found were practically negligible. No one subject revealed any significant effect upon the test gains. Thorndike concluded that the results were

in pronounced opposition to the traditional view that certain subjects produce much more general improvement in ability to think than others, and that among the subjects taught in high schools, languages and mathematics are the two that do this to the greatest degree.¹¹

Results of a later similar investigation with 5000 students¹² were combined with those of the earlier study. Kingsley observed from these scores:

The differences are so slight that there is no convincing evidence of the superiority for mental discipline of any one subject or group of subjects. It is significant that Latin, so long held up as the supreme instrument of mental discipline, should, when subjected to a fair comparison with other subjects, fall to the middle of the list.¹³

11. Thorndike, op.cit., p.94, in Orata, Identical Elements, op.cit., p.35.

12. Cecil Broyler, E.L.Thorndike, and Ella Woodyard, "A Second Study of Mental Discipline in High School Studies," Journal of Educational Psychology, 1927, 18, pp.377-404, in Kingsley, op.cit., pp.544-45.

13. Kingsley, op.cit., p.544.

Disciplinary values are claimed for mathematics, and also for some science courses. Rugg investigated the supposedly inherent transfer ability of a course in descriptive geometry. He found that the transfer amounted to 32% in other geometrical materials, while it was only 7% in non-geometrical materials.¹⁴

Another investigator measured her botany students' ability to observe. Afterward during a training period, she instructed them in observing botanical materials. Scores in a final test revealed a transfer of 33.9% to other botanical materials and only 5.4% to non-botanical materials.¹⁵

The experimental results concerning the values of school subjects indicates that no one subject can be assumed to have all the disciplinary effects accorded to it in the past. Any course may have transfer value, but that seems to be due to the type of instruction rather than to anything in the subject matter itself.

Formal discipline and evidence from physiology.

One of the most shattering blows to the theories of faculty psychology and formal discipline came in 1929 with the publication of Karl Lashley's Brain Mechanisms and Intelligence, which is also recognized as one of the

14. H.O.Rugg, Experimental Determination of Mental Discipline in School Studies, in Charles Skinner, editor, Educational Psychology, p.258.

15. Nellie Hewins, Doctrine of Formal Discipline in the Light of Experimental Investigation, in Skinner, op.cit., pp.258-59.

major contributions to modern psychology. Through a grant from the "Behavior Research Fund" Lashley was able to devote his entire attention for an extended period to making a thorough study of the effect of brain injuries of various degrees on the behavior and learning power of rats. The results of these experiments tested the validity of faculty psychology which claimed that the various learning functions were localized in specific areas of the brain.

The question may arise first concerning the adaptability of experimental results with rats to use in problems which have to do with man. In studies of cerebral function in man Lashley found nothing that would oppose the results with the rats. He writes:

The statement is often made, chiefly from studies of the excitability of the motor cortex, that with ascent in the evolutionary scale there is an increasing specialization and fineness of localization within the cerebral cortex. In one respect only does the evidence corroborate this: in the mammalian series the higher forms have a greater capacity to discriminate differences in the spacial distribution of stimuli on sensory surfaces (skin, retina, organ of Corti) and a greater independence of control of motor segments. Corresponding to this increased capacity for spacial adjustments, there is a finer differentiation within the sensory and motor projection fields of the cortex. But, aside from this function of spacial orientation, there is little evidence of a finer cortical differentiation in man than in the rat.¹⁶

16. Karl Lashley, Brain Mechanisms and Intelligence, p.156.

In the main Lashley used the maze to measure his subjects' ability to learn.¹⁷ In order to determine the capacity or function of various sections of the brain he made lesions in varying degrees of size in all parts of the cortex. The rats were placed in the starting box to run the maze before and after the operations. The time consumed in running the maze plus notations on observable behavior were criteria for determining the functioning of an ability which might have been localized in the injured cortical area.

According to the localization theory, if a lesion were made to that section of the brain which holds the function controlling the running of a maze, the rat should then be unable to get from the entrance to the food. If the rat's memory were to be injured by an operation, it would be unable to retain the habit once it had been learned, or it would lose the habit more quickly than normal animals in proportion, perhaps, to the extent of the injury to the one vital section.

17. As it is used by psychologists the animal maze is usually in the form of a square or rectangular court. Sizes vary; the reproduction of the Hampton Court maze used by Small in 1899 and 1900 was 6 x 8 feet.

Between the animal in the starting box and the food, which serves as an incentive and is placed in a central room or on another side of the court, is a series of hallways with blind alleys at various points. The animal is to learn the correct and shortest pathway to the food.

The results of the experiment revealed that the capacities to learn and to retain were reduced by cerebral lesions. This reduction of either capacity, however, was not a result of a lesion in any specific area, but it occurred after operation in any cerebral area. After further experiments Lashley found that the reduction was "roughly proportional to the amount of destruction."¹⁸

In addition, he was unable to notice any difference in behavior in the maze situations after operations in the different parts of the cortex. The rats were able to learn to run new mazes after cerebral lesions to any parts of the cortex, and they were able to retain an old maze habit learned before an operation in any portion of the brain. Accuracy in running a maze was as great for many of the operated animals, even though they learned the habit after brain injury, as it was for the normal rats.

In his results Lashley was unable to find any evidence at all supporting the localization theory. After analyzing studies and investigations of human cerebral lesions he concluded that the problem of learning presented there was similar to that of the rats with the mazes. The facts in both cases indicated in no way that the general functions of learning were localized in specific areas of the brain.¹⁹

18. Lashley, op.cit., p. 175.

19. Ibid., pp.161-63; 175-176.

Formal Discipline in Lutheran Religious
Education

Lutheran educators have been just as concerned about the problem of transfer as secular educators. Their explanations of the process cover as wide a range as is found in secular educational literature. Although they are not stated directly, they ordinarily may be easily aligned with the generally accepted theories. Few Lutheran writers in education, however, have been quite as honest, perhaps, as the one who admitted his inability to explain transfer when he wrote, with a reference to the methods of teaching English: "The aim of all is in some way to add some value to the child's education. . . ." *[italics mine]*²⁰

Advocates of the theory. Acceptance of the dogma of formal discipline before 1900 was just as general and uncritical among Lutherans as it was elsewhere. One evidence of the prevailing attitude was given by a writer for the Schulblatt in 1877 who indicated that "the chief purpose of mathematics was the development of the intellect, and not necessarily the preparation for business life and life in the world."²¹

20. "The Conversion of Subject Material into Educational Values," Lutheran School Journal, LXIV, 4, (April, 1929), p.129.

21. Schulblatt, XII, (February, 1877), pp.50-53, quoted by Lutheran Education Association, 100 Years of Christian Education, Fourth Yearbook, ed.A.C.Repp, p.120.

For nearly thirty-five years after the turn of the century Lutheran educational literature did not reflect the same change of thinking about transfer which was manifested by secular writers. Although the leading Lutheran educators stressed parts of opposing theories, they still clung faithfully to the old principles by which they had been educated. Martin Reu, the well-known educator of the American Lutheran Church, whose books have been frequently used and quoted by teachers in the Missouri Synod, employed the educational principles of the introspective psychology as they had been developed especially in the nineteenth century.²² He differentiated between the intellectual, emotional, and volitional manifestations of the individual. From Reu's viewpoint each had certain innate powers or faculties, such as the memory, phantasy or imagination, and reason in the intellect, the esthetic and moral and social feelings in the emotional life, and the will in the volitional life. These faculties, he advised, should be cultivated and strengthened in the most appropriate manner - by exercise. The faculty called memory

can and should be strengthened by appropriate exercise.

But as the young oak tree can develop its peculiar powers only where weather, soil, nurture, etc., are favorable, so also the thinking activity of the soul

22. Martin Reu, Catechetics, and How To Teach in the Sunday School.

will be developed to the highest degree of efficiency only where sensations and concepts are normally formed and where instruction and training constantly exercise and improve this innate faculty.

Cultivation of the esthetic emotions enriches . . . the inner life.

Religious instruction exists for the purpose of training the religious feelings.

If it is agreed that moral conduct and the development of character are possible only on the basis of volition, the transcendent importance of the training of the will in education, especially in religious education, is readily seen.²³

In a more recent publication (1939)²⁴ Reu reiterated the same basic features of formal discipline - the innate character of all the faculties and exercise, the method by which they should be trained.

The disciplinarians' doctrine has been fostered in recent times in the Missouri Synod also. Koehler writes:

As the muscles of the body, so the mind must be exercised. We learn to use the mind by using it, to think by thinking, to remember by remembering, to reason by reasoning, etc. The mental efficiency resulting from such methodical exercise of the several functions of the mind is the objective of intellectual training.²⁵

The training and cultivation of the faculties or powers of the mind by proper exercise was advocated by Paul Kretzmann in his Psychology and the Christian Day-

238. 23. Reu, Catechetics, op.cit., pp.209.217.222.225.

24. Martin Reu, How To Teach in the Sunday School.

25. Edward Koehler, A Christian Pedagogy, p.4.

School, published apparently about 1930,²⁶ and implied in another, later volume by him.²⁷

Current Lutheran educational literature is still not free of direct and indirect references suggesting the use of disciplinary methods in transfer. A recent volume in the Concordia Teacher Training Series states:

Memory is, however, rather easy to train. Like the muscles of the body, it grows stronger by exercise. One who carefully memorizes a given amount of material every day, beginning with small amounts that can easily be committed, and who keeps this material alive by frequent repetition, will be surprised to find how rapidly his memory will gain in power of registration and retention.²⁸

Another current help for Sunday School and Bible class teachers seems to imply the need for exercising the mind.

Of what value to God, to mankind, to ourselves, is a mind that has been diligently trained and disciplined and that has been stocked with much useful knowledge? . . . As a faithful steward of God the Christian should place at the service of God a well-stocked, disciplined, and clean mind. The person who willfully permits his mind to stagnate and deteriorate is not a faithful steward.²⁹

The writers mentioned above as advocates of the theory of formal discipline should not be condemned in toto on the basis of the citations offered here. These

26. Paul Kretzmann, Psychology and the Christian Day-School, pp.35ff.

27. Paul Kretzmann, The Teaching of Religion, pp.89ff.

28. Ad.Haentszchel, Learning To Know the Child, pp.29-30.

29. J.M.Weidenschilling, editor, Concordia Bible Teacher, VIII, 4, (July, 1947), pp.266.267.

men, it is true, claim or imply that mental and emotional powers are innate and that they are developed by exercise. In other words, they make absolute statements of claims which may not be true at all or just at all times. But by a fortunate inconsistency they do not restrict themselves to claiming an automatic transfer via the method of exercise as strict disciplinarians should do. Instead, they add to the terms exercise and discipline connotations which are suited to other more accurate theories of transfer. A realization of their unfortunate prejudice for the terminology and theories of the older psychology and education should help us to understand these men and their writings better.

References directed against formal discipline. Outside of brief remarks in the two articles on the transfer of training printed by the Lutheran School Journal,³⁰ very little has been written in Lutheran circles directly against the oldest theory of transfer.

In the preface to Haentszchel's brochure Kraeft noted with pleasure that books on psychology acceptable from the Christian viewpoint were "getting away from the

30. Paul Kretzmann, "Transfer of Training," Lutheran School Journal, LXXV, 3, (November, 1939), pp. 108-12.
 Frank Miller, "Transfer of Training," Lutheran School Journal, LXXVIII, 8, (April, 1943), pp. 349-354.

language of 'temperaments' and 'faculty psychology.'³¹
 Schmieding writes in his Understanding the Child:

The idea that the mind is merely the sum of special abilities must be rejected. The many abilities cannot be compared to so many separate faculties stored in a place called mind. Mind involves interrelationships. Mind is a unit. This is true even if the function of mind may be general and specific.³²

Both of the foregoing quotations involve faculty psychology only. But since formal discipline rests its case on the old psychology, it may be considered weakened if its basis is effectually attacked.

The golden age of memory and verbalism. At some point in the development and practice of the faculty psychology, there originated an idea that the period of an individual's life from about the sixth to the twelfth years must be the "golden age of memory." It was a logical deduction, for since the powers of the mind were assumed to be developed only by exercise, it was natural for educators to think that childhood and adolescence would be the ideal periods for such development. But believers in the "golden age" seemed to feel that, in addition to the benefit the child received by

31. W.O.Kraeft, in preface to Haentszchel, op.cit., p. IV.

32. Alfred Schmieding, Understanding the Child, p.58.

the exercise, he was also able to retain much of what he had memorized.³³ Teachers therefore could take advantage of this wonderful period in the child's life and have him memorize endless amounts of material; they would expect that he could call forth the material whenever he would need it later in life. Transfer was assumed to be automatic once the child had learned the words.

Such reasoning influenced Lutheran thinking and resulted in loading the course in religious instruction with an unbelievable amount of memory material. It was only after 1900 that the large detailed exposition of Luther's Small Catechism by Dietrich began to be replaced in the children's catechumen classes by the more abbreviated version by Schwan.³⁴

But even in the second decade of the twentieth century, some pastors and parochial school teachers were requiring their pupils to memorize all the 548 Bible passages listed in the Synodical Catechism. Besides the above

33. The notion of the "golden age of memory" is somewhat similar to the theory set around the maxim "repetitio est mater studiorum," which is discussed below in the next chapter. However, since the "golden age" idea is or rather seems to be derived directly from faculty psychology and formal discipline, it is being treated here. Formal disciplinarians, of course, might not consider the content of the material studied as important as is indicated by advocates of this notion.

34. Lutheran Education Association, 100 Years of Christian Education, op.cit., p.156.

Rommelmann³⁵ found a course of instruction for 1926 which required the memorization of 423 Bible texts, 144 stanzas of hymns, the text of the Small Catechism, the Christian Questions and Answers, the Table of Duties, and a number of prayers. X

The only result of this instruction could be a recitation by the pupils, perhaps somewhat glib, but with very little, if any, understanding of the words, since there would be hardly sufficient time for any thorough explanations. Assertions supporting the meaningless rattling of words would state that understanding of the passages and of their application to life would strike the pupil later in life. Thus, through some uncanny means the passages learned in childhood, whether understood or not, would be of value and available for recall in adulthood. But as far as the children who did the memorizing were concerned, it was verbalistic patter. The dangers of this verbalistic education were sensed, it seems, by one writer in the Lutheran School Journal in 1927. He wrote: X

Did we not all observe during the World War how indifferent men and women proved to be spiritually? It showed us that the knowledge of God and His Word was not rooted in the hearts of men and women, as many were wont to boast.³⁶

35. H.C.Rommelmann, "Memory Work in Our Religious Instruction, with Special Reference to the Functional Viewpoint," Lutheran School Journal, LXVI, 6, (February, 1931), pp.246 ff.

36. W.R.Schmidt, "Bible Study in School," Lutheran School Journal, LXII, 7, (July, 1927), p.242.

Although verbalism need not be assumed to have been the only cause for such indifference, yet because it seems to have been the chief result of a prevalent type of instruction, we may, unless contradictory evidence is presented, condemn it more readily than anything else.

The favorite notion about the "golden age of memory" could not be given up so easily, however. Prominent Lutheran educators³⁷ continued to foster the idea, and one adduced support from the childhood memories of aged people. Results of psychological experiments were recognized but seemingly thrown to the winds, as, for example, when one declared:

. . . in the face of these claims [those of recent psychological experiments] we venture to say that the period of late childhood is that of the most retentive memory. It has been shown in a large number of cases that the lessons learned in this period of childhood were those that were retained and recalled even in old age with comparative ease.³⁸

We may resolve the problem discussed above into two phases: the truth in the assumption of a "golden age of memory," and the place of meaning in memorizing.

Studies of age differences in learning ability do not substantiate the popular assumption concerning a "golden age of memory." They rather show that the ability

37. Reu, How To Teach in the Sunday School, op.cit., pp.87ff. Kretzmann, Psychology. . .Day-School, op.cit., p.105.
 38. Kretzmann, Psychology. . .Day-School, op.cit., p.105.

to memorize increases in the individual until about the age of twenty. It appears to remain on the same level until twenty-five or later. Thereafter the ability decreases gradually, but very slightly.³⁹ Thus there appears to be little reason to believe that childhood is a golden period for memory. In fact, adults should, because of their greater number of experiences, be able to memorize much better than children.

The present writer located one reference in Lutheran literature which discounts the notion favoring late childhood as the ideal period for memorizing.⁴⁰

Carrying the formal discipline theory with respect to memory to its logical result means first of all that the ability must be exercised if the person is to retain anything. The theory indicates also that the more the memory is developed by exercise, the greater retentive power it should have. Therefore, if a child or adolescent whose memory appears to be well-developed, that is, if he can learn with comparative ease, he should be able to retain whatever he does memorize probably for an indefinite period.

Meaning has no special place in this concept of memory. Meaning belongs to the "faculties" of reasoning

39. Kingsley, The Nature and Conditions of Learning, op.cit., pp.323-24.

40. Schmieding, op.cit., pp.89-90.

and judgment. It is not especially necessary to require it therefore, at the time when the material is committed to memory, since it can be added at any suitable time later in life. Of course, if the teacher is able to help the child understand the material when he first meets it, so much the better; the child can then begin applying the lesson immediately. But if the words are somewhat difficult, or if the child has not experienced or will not experience for some years the occasions necessary for application of the lesson, then the teacher need not be especially worried. If the child has memorized the material, he will retain it and will be able to use it when he gains enough knowledge to understand it or when he meets an experience in which he can use it. This is a general description of the formal discipline theory in practice. Verbalism, the speaking of words without a knowledge of their meaning, is a result of this form of education. X

It may be said to the credit of all Lutheran educators investigated by the writer who attached themselves to principles of the theory of formal discipline, that they have stressed memorizing with understanding. Mechanical, or rote learning has been opposed bitterly. At the same time, however, the loophole is left open for mechanical learning and verbalism when memory work is approved which, although it cannot be really compre-

hended by the children, is preceded by only an explanation of words and not of their relationship to the meaning of the whole nor of their relation to the experiences of the learner. Thus Runge bewails the situation of immature children who must memorize such material as the following:

O holy, blessed Trinity,
 Divine essential Unity,
 God Father, Son, and Holy Ghost,
 Be Thou this day my Guide and Host.

All our knowledge, sense, and sight
 Lie in deepest darkness shrouded
 Till Thy Spirit breaks our night
 With the beams of truth unclouded;
 Thou alone to God canst win use,
 Thou must work all good within us.

Such stanzas as these contain a heavy dose of concentrated theology, and certain prerequisites are necessary before they can be appreciated as they should. There is really no good reason why such material should be introduced prematurely, - before children are ready for it.⁴¹

Experimental evidence in this phase of the problem indicates, as in the other, that it is inadvisable to follow the claims and opinions of the disciplinarians. Evidence has already been presented above which tends to disprove rather definitely the existence of a memory faculty localized in some area of the brain. It has also been shown that exercise per se cannot be said to improve the memory. Evidence concerning the place of meaning

41. J.M.Runge, "Integrating Religious Truths with the Experiences of Life," Lutheran School Journal, LXXV, 1, (September, 1939), p.21.

in memorizing indicates clearly that we remember material which is meaningful much more easily and for a longer time than that which is meaningless. A word of explanation is in place: meaningful material implies that there must have been some previous experience and some associations connected with it. In order then to be as economical as possible in memorizing, teachers should ask the pupil to memorize only that material which he comprehends and which is related to his experiences. In the case of material which is not understood the teacher should give a full explanation. In the case of material in connection with which the pupil may not have had experiences or associations, the teacher should provide experiences to which it may be related.⁴²

Lutheran educators outside the fold of formal discipline (if such a distinction may be made) have not been silent on the question concerning the importance of meaning in memorizing. Only within the last decade, however, has this more specific point in the disciplinarians' platform been especially attacked.⁴³

42. Kingsley, op.cit., pp.310-13.464.

43. Cf. H. Boettcher, Instructor's Manual for Luther's Small Catechism, p.XXI. W.Kraeft, "Testing in Religion," Lutheran School Journal, LXXVIII, 4, (December, 1942), pp.164-68. Theo. Kuehnert, Directing the Learner, p.54. Schmieding, Understanding the Child, op.cit., pp.89-90. Wm. Kramer, and others, General Course of Study for Lutheran Elementary Schools, pp.45ff.

Summary and Concluding Remarks

Formal discipline is the traditional theory of transfer. It postulates an automatic and universal transfer through the use of innate faculties of the mind which are developed by exercise.

The basis of formal discipline was laid by faculty psychologists who localized each of the mental powers in a specific area of the brain.

Educators of the post-Renaissance period used the faculty psychology and the formal discipline theory to justify the retention of their classical curriculum whose content was being questioned during a democratic movement among the people. The traditional doctrine continued to dominate educational practices without much opposition until William James began his investigations at the close of the nineteenth century.

Opposing evidence is taken from experiments in memory training, problem-solving, the learning of ideals, and evaluation of school subjects. Results show that transfer need not occur through the exercise of a mental function. In addition, it cannot be assumed that one school subject has more transfer value than another. Lashley's experiments with rats offer quite conclusive evidence against the localization aspect of the formal discipline theory.

Leading Lutheran educators maintained principles of formal discipline for nearly thirty-five years after the turn of the century. Evidences still appear in current Lutheran literature. References directed against the theory have appeared especially within the last ten years.

The assertion that late childhood is the "golden age of memory" or "the age of most retentive memory" found support among many Lutheran pastors and teachers. They required so much memory work, however, that verbalistic learning resulted. Several educators attempted to "compromise" by holding both to the "golden period" notion, a vestige of formal discipline, and to an emphasis upon memorizing with understanding. The results of scientific investigations in this area have come to be recognized and accepted in recent years.

Before we think of tossing formal discipline out the back window because of the mountain of decisive evidence raised against it, we should do well to ponder the remaining literature on the transfer problem. Before we finish, we might conclude with Lashley "that far from being a dead issue, as most people at present are inclined to believe, the theory of formal discipline is still an open question."⁴⁴

44. A statement given by Lashley in an interview with Orata; recorded by Orata, "Transfer of Training and Educational Pseudo-Science," The Mathematics Teacher, XXVIII, 5, (May, 1935), p.271.

Bare formal discipline of its objectionable and unscientific features - the localization idea and the use of exercise - and a theory of transfer may emerge which can speak of mental abilities being performed and made effective by some dynamic function of the mind or brain as a whole.⁴⁵

45. Cf. Lashley, Brain Mechanisms and Intelligence, op.cit., pp.172-174.

CHAPTER III

THE THEORY OF IDENTICAL ELEMENTS

Explanation of the Theory

Origin. The formulation of the theory of identical elements was a reaction against the older theory of transfer endeared to many by tradition. It was a move seemingly well justified, for the faculties assumed to exist by advocates of the "general" training had, after all, never existed. The natural reaction then was to turn to specific objectives and specific activities which could be foreseen and actually accomplished. It was much more logical to think of education as a training in these important specific activities which the pupils would definitely be engaged in when they took their turn in the world than to think of it as a training in vague, general functions or abilities which seemed to have no direct bearing upon people's behavior in many situations.

It was 1901 when two psychologists, Edward Thorndike and Robert Woodworth, first attempted to test experimentally the hypothesis which was to take the place of the doctrine of formal discipline. The theory which

was finally set up claimed that transfer could occur only when an element in one situation was identical with an element in another situation. Thus, if a person had learned how to add, he could transfer that skill to his work in multiplication, for addition is identical with a part of multiplication.

Experimental evidence. The first tests attempted to determine whether or not the function (formerly called faculty) of "observation was really a group of functions varying with the thing observed."¹ The experimenters practiced their subjects in certain types of observation and gave them tests of similar tasks before and after the practice. In the first experiment the subjects were tested in estimating the areas of similarly shaped rectangles of varying sizes and of triangles, circles, and irregular figures of the same size limits. Next they practiced estimating the areas of rectangles ranging in size from ten to 100 square centimeters and of the same shape as those in the test series. They were given the opportunity to improve themselves when they received the correct answers after each guess. The retest was given with the first test series. Improvement from the first to the last test was evident in almost all cases, but the amounts were very irregular.

Other following experiments were concerned with

1. Robert S. Woodworth, Experimental Psychology, p.194.

estimating weights of objects and lengths of lines, and with perceiving words with certain letters. The results caused Thorndike and Woodworth to conclude the following:

Improvement in any single mental function rarely brings about equal improvement in any other function, no matter how similar, for the working of every mental function-group is conditioned by the nature of the data in each particular case.²

In a second experiment which attempted to locate correlations among perceptive processes it was concluded again that these functions, too, though very similar, could be independent specializations. Training in one did not carry over to another.³

Thorndike also tested the function or faculty of accuracy in drawing lines to equal 100 and 50 millimeter lines. He concluded that the two activities represented two different abilities, since there was no relation between the results on the test.⁴

More complex mental processes were tested when Thorndike asked his subjects to solve algebra problems presented in pairs, one of the pair being in an habitual form as "What is the square of $x \div y$?" and the corresponding problem in a changed form as "What is the square of $b_1 \div b_2$?" Of the 97 graduate students used as subjects, 6% gave the wrong answer to the first form of the pair

2. Ibid., pp.194-95.

3. Orata, The Theory of Identical Elements, op.cit., pp.26.28.

4. Ibid., p.29.

given above, and 28% were wrong on the corresponding changed form. The conclusion offered was: "Any disturbance whatsoever in the concrete particulars reasoned about will interfere somewhat with the reasoning, making it less correct or slower or both."⁵

The most significant point in these experiments offered as evidence for the new theory seems to be

that the amount of transfer is very limited even in functions which are very much alike, such as the estimation of magnitudes. Consequently, it appears as if mental functions were specialized and highly specific.⁶

Formulation of the theory. All training seems to be specific. The mind does not consist of a group of general powers or functions as, for example, reasoning, judgment, and memory. The mind is composed of countless particular operations or capacities. The teacher must train these specific functions and not the general powers. But when he trains one of the particular functions, he has trained that alone and no other function: "What you do to the mind by way of education knows its place; it never spreads. You train what you train."⁷

Accuracy in spelling is independent of accuracy

5. Ibid., p.33.

6. Ibid., p.35.

7. G.M.Stratton, Developing Mental Power, p.5, cited by Orata, Identical Elements, op.cit., p.6.

in multiplication. Quickness in arithmetic is entirely different from quickness in recognizing misspelled words. The experiment of Bagley and Squire in the training of arithmetic pupils in neatness and accuracy⁸ showed that these ideals were independent of the same ideals in language and spelling.

Thorndike related the specificity of functions to transfer in this way:

The very slight amount of variation in the nature of the data necessary to affect the efficiency of a function group makes it fair to infer that no change in data, however slight, is without effect upon the function. The loss in the efficiency of a function trained with certain data, as we pass to data more and more unlike the first, makes it fair to infer that there is always a point where loss is complete, a point beyond which the influence of training has not extended. The rapidity of this loss - that is, its amount in the case of data very similar to the data on which the function has been trained - makes it fair to infer that this point is nearer than has been supposed.

The general consideration of the cases of retention, or of loss of practice effect, seem to make it likely that spread of practice occurs only where identical elements are concerned in the influencing and influenced function.⁹

Transfer may occur then only when elements in one activity are identical with elements in another. Thus addition should improve multiplication because multiplication involves addition. A knowledge of Latin should aid in learning a Romance language because there

8. Cf. supra, pp.19-20.

9. Edward Thorndike, Educational Psychology, first edition, p.91, cited by W.C.Bagley, Educational Values, p.186.

are so many identical facts required in the learning of each. Thorndike also asserted that

the study of geometry may lead a pupil to be more logical in all respects, for one element of being logical in all respects is to realize that facts can be absolutely proven and to admire and desire this certain and unquestionable sort of demonstration.¹⁰

Transfer then according to the theory of identical elements would depend upon the number of common elements existing in two situations.

Identities of substance and procedure. In order to be able to recognize the kinds of identical elements more readily, Thorndike differentiated between the identity of substance and the identity of procedure.

The identity of substance refers to the stuff or substance which is common to the composition of two situations.

Thus special training in the ability to handle numbers gives an ability useful in many acts of life outside of school classes because of identity of substance, because of the fact that the stuff of the world is so often numbered and counted.¹¹

This identity may be seen also in the relation between two school subjects like mathematics and physics, or English composition and spelling. The identity of substance would refer to the material to be used in figuring with numbers in the one case, and in the other,

10. Edward Thorndike, The Principles of Teaching, p.243.

11. Ibid., pp.244-45.

that which is identified by words, or the words themselves.

The second identity refers to a procedure or manner of acting which is common to two situations. This may be seen in the relation between school subjects employing similar types of laboratory procedure like chemistry and botany. Each would employ the scientific method in searching for facts. Whereas the identical element to be transferred in a case involving the identity of substance would be an ability or skill or a specific physical reaction, the element transferable in situations identical in procedure would be especially a specific attitude.

The habit acquired in a laboratory course of looking to see how chemicals do behave, instead of guessing at the matter or learning statements about it out of a book, may make a girl's methods of cooking or a boy's methods of manufacturing more scientific because the attitude of distrust of opinion and search for facts may so possess one as to be carried over from the narrower to the wider field.¹²

Psychological basis. In the terms of Thorndike's connectionist psychology, the identical elements existent in two situations involve specific stimuli to which specific responses may be made. Transfer occurs when the person perceives in a second situation something which existed in a previous situation and which now acts again as a stimulus. Transfer may be viewed external-

12. Ibid., p.245.

ly then as the repetition of a response in a second situation.

Connectionists conceived of the stimulus as first being received by a sensory nerve ending and then being carried into the person over a series of neurons or nerve fibers. It reaches a junction point, the synapse, which offers resistance. If it is able to traverse the synapse, it is directed to another series of neurons which carry it out to the muscles as a response. Once the entire pathway has been covered, a stimulus-response bond (S→R bond) has been formed. If the same stimulus should occur later, it will use the pathway or bond previously formed. It will have easier going each succeeding time, for each time it will lower the synaptic resistance and strengthen the bond.

The bonds themselves vary in degrees of complexity and so use different levels in the spinal cord or brain.

On the lowest level the S→R bond or sensori-motor arc is simple and direct, passing with few exceptions directly through the spinal cord with no recourse at all to higher centers. On the second level the impulse travels up the cord to the lower brain centers before being redirected to the proper motor neurones. This happens in the case of habits and simple coordinated acts. In the highest type the impulse travels to the association areas where presumably thought takes place and the impulse is then redirected in terms of the analysis and discrimination which have taken place. In this case the complexity of the bond is enormously increased.¹³

Many situations in life which may seem new pre-

13. William Burton, The Nature and Direction of Learning, pp.37-38.

sent stimuli which the individual has already met at other times and to which he has reacted. He can now respond in the same way, but very likely more quickly and more accurately, because the bond has already been formed and offers less resistance than on the first occasion. Transfer will then be effected, because in the new situation the person perceives and responds to a stimulus to which he has responded in the past.

To the connectionist, learning becomes a matter of bond formation while transfer involves the re-use of completed bonds.

Opposing Arguments and Evidence

Evidence from experiments in physiology.¹⁴ Proponents of the theory of identical elements assume that a first response made by a person leaves some trace in, or on, his nervous system. Especially the earlier advocates have felt or have implied that this trace involves definite connections between certain receptors, nerve cells, and effectors. This would indicate the formation of a restricted path over which the nerve impulse is to travel. If the theory is meant to be one worth propounding, it must be led eventually to the conclusion just mentioned

14. Lashley, op.cit., pp.123-24;125-27;129.131; 163-64; 172-73.

or at least to a similar one. Otherwise it can assert only a fact already recognized that the response always follows its stimulus. But this limitation of the conduction of an impulse to a definite pathway is the point which is not compatible with results of experiments in physiology.

Evidence has been given above¹⁵ to show that general functions, or, as might be claimed in connection with the present theory, bonds for performing specific abilities, are not localized in special areas of the brain. Injuries to the cortical areas did not produce a variety of types of hindrance in the initial learning of maze habits by rats. However, it has been suggested that in the learning of a habit and in its improvement equivalent bonds are formed which contribute to the efficiency of performance of the habit. If this assumption is granted, it would follow that a partial destruction of the bonds composing one habit, either before or after it has been learned, should result in a loss of efficiency in its performance. Lesions to the brains of rats failed to give any indication of such a loss. A visual discrimination habit, for example, which under normal conditions is formed only through the occipi-

15. Cf. supra, pp.22-25.

tal cortex, was formed just as easily when this area was removed. Again, as Lashley states:

it is still more difficult to understand, in terms of reduplication of bonds, how a habit which has been learned to equal efficiency of performance (i.e., to the establishment of equal numbers of bonds) by two animals with unequal amounts of cortex should be more effectively retained by one than by the other, in accord with the amount of functional tissue.¹⁶

Those who favor the theory of identical elements in its literal and original sense may assume the presence of synapses in the nervous system. Learning is said to take place when the resistance power of a synapse is lowered. It is felt that once such a change does occur, the condition of the bond with its synapse becomes established and retention of the response becomes relatively permanent. The retention of a habit after it has been formed would depend then upon the stability of its synapse or synapses. One should be forced to assume in line with the theory then, it seems, that if a habit has been learned equally well by two individuals, that is, if the synaptic resistances have been lowered to an equal extent, the stability of the synapses should be equal and retention of the habit should be the same for two persons. But experimental evidence reveals the following:

16. Lashley, op.cit., p.131.

In the experiments upon the retention of habits formed after brain injury the accuracy of performance after initial learning was for many of the operated animals as great as that of the normal controls. Their time for traversing the maze was slightly greater, but this was obviously a function of the general rate of running and not of time consumed by integration at the critical points in the maze. The peculiarities of behavior observable during learning almost entirely disappeared with the perfecting of the habit, and in final performance there were no significant differences between the operated and control animals. For the learning of the maze we have no evidence that one part of the cortex rather than another is primarily concerned, and hence cannot conclude, as we do for the habit of brightness discrimination, that after the destruction of one part another part learns vicariously. Thus there are no reasons for believing that the fundamental mechanism of the habit, once formed, differs in the normal and operated cases. The lowering of synaptic resistances to produce equal efficiencies should be equal, and equal changes should be equally stable.

But the habit of Maze III was lost more rapidly by animals with brain lesions than by normals, and to an extent somewhat proportional to the amount of cerebral destruction. This can only mean that the retention of the habit is conditioned by the total amount of functional tissue in the cortex and not, primarily, by the inherent properties of the synapses themselves. We seem confronted with the alternatives of devising some new hypothesis concerning the nature of the synaptic mechanism which will admit that its stability depends upon extrinsic factors or of facing the improbability of our whole theory of the mechanism of learning.¹⁷

The evidence presented here and the fuller explanation in the original source lend no support to a theory of learning which claims that transfer involves the use of previously formed conduction paths definitely located in the nervous system. Elements common to two

17. Ibid., p.126.

stimulus-response situations may exist in the nervous system, but in Lashley's opinion it seems that they should be defined in terms of dynamic patterns rather than neurons, synapses, or bonds.

Proportionality of transfer. Thorndike had assumed that transfer occurs in proportion to the degree of identity or similarity between two functions. Orata compared the results of several tests to determine the correctness of the assumption.¹⁸

In the experiment in the training in estimation of magnitudes,¹⁹ the improvement in accuracy in estimating areas of the same size but of a different shape was 44% as great as the accuracy for areas of the same shape and size. The improvement for areas of the same shape but of different sizes was 30% as great. For areas of different shape and different sizes the improvement was 52% as great. If the results were to support the original contention of proportionality altogether, the score of the improvement in estimating areas of different shape and size should have been the lowest, while the remaining two might better have been reversed.

Another experiment was performed to determine the influence of training in addition and subtraction upon

18. Orata, Identical Elements, op.cit., pp.56-67.

19. Cf. supra, p.43.

multiplication. The differences found were not large enough to be significant. In fact, interference occurred. These results therefore could not be used to substantiate the assumption that training in addition would improve one's ability to multiply because addition is identical with a part of multiplication.

Reference to cases of trauma or emotional learning is made by Gordon Allport to prove the falseness of the idea of proportionality of transfer. "In these instances," he writes, "transfer passes all bounds of expectation. In such cases identities cannot be involved, for the whole personal life is saturated with the effects."²⁰

Methods of procedure in experiments. It was Orata's contention, after investigating transfer experiments performed between 1890 and 1927, that the type of training given subjects to a great extent determines the amount of transfer which results. In order to show that a difference in amount did result because of the training given, he compared the experimental procedure employed by Thorndike and that used in the experiments of Woodrow, Meredith, and Judd. Thorndike trained his subjects in a routine manner in very specific items. Only small amounts of transfer resulted in most cases. Woodrow, Meredith, and Judd found this to be true with groups

20. Gordon Allport, Personality, p.285.

which they drilled in the routine fashion. But in addition to this practice group they used also another group which they trained "in conscious formulation of guiding principles or generalizations" (Judd), "in techniques of memorizing" (Woodrow), or in a "critical analysis of the important features of a definition" (Meredith). More transfer did appear.²¹

Orata attributed the small transfer and even interference resulting from Thorndike's training to the formation of mechanical habits without meaningful direction.

The reason why there is interference between squaring $x \neq y$ and $a_1 \neq b_1$ is not that the two processes are antagonistic or even lacking in identical elements. The fact is that the habit involved in solving $x \neq y$ has either to be controlled by meaning that $x \neq y$ is the same as $a_1 \neq b_1$, or else it has to be broken before another habit is formed. The identical [sic] element is there but it is not perceived. The result is that having formed one habit means the shutting off of other modes of action that go through the same channel.

The upshot of the above discussion is that mechanical habits are the opposite of transfer and unless they are directed and controlled by meanings of intelligence, they interfere with the acquisition of other habits just as surely as facility of type-writing with two fingers will interfere with learning the touch system, or of training with one kind of keyboard will interfere with learning to operate other keyboards.²²

One experiment may be described here which shows the superior effects of a generalized procedure. The reader may find others in the chapter on The Theory of

21. Orata, Identical Elements, op.cit., p.99.

22. Ibid., p.90. The experiment Orata refers to here is recorded above on pp.44-45.

Generalization. Woodrow selected three groups of university sophomores as his subjects in an experiment which was to compare two methods of training in memorizing. The 106 students in the control group took only the beginning and end tests. Between the two tests Woodrow trained the 34 subjects in the practice group in rote drill according to the traditional method of practice. The members of the training group, 42 in all, were given some practice in memorizing. In addition they received specific instruction in the techniques of memorizing and in their application. The results show little difference in improvement between the practice and control groups. The straight memory practice proved to be of aid in some cases and a detriment in others. The training group, on the other hand, averaged 31.6% more gain in the end tests than did the members of the control group. Woodrow felt that the experiment showed the "difference" between unenlightened drill and intelligent teaching."²²

We may conclude from the above at least this one point that the routine drill used by Thorndike in training subjects in his experiments resulted in the formation of mechanical habits which prevented any large amounts of transfer. The results of these ex-

²²Woodrow, "The Effect of Type of Training Upon Transference," Journal of Educational Psychology, 18: (March, 1927), pp.159-72, reported by Guy Whipple, "The Transfer of Training," The Twenty-Seventh Yearbook, Nature and Nurture, Part II, ed. G.Whipple, p.189.

periments showing the small transfer serve as the basis for the theory of identical elements. If a different type of training procedure is employed, an experiment can show greater transfer and serve as the basis for an opposing for an opposing theory of transfer.

Specific versus general nature of functions. According to Orata, Thorndike based his conclusion of the specificity of mental functions partially and indirectly on the grounds that transfer is limited. In his study of all the transfer experiments performed and reported from 1890 to 1935, Orata found that more than 75% showed appreciable or considerable amounts of transfer. The discrepancy could indicate that the conditions differed under which the experiments were carried on and also, perhaps, that mental functions are not always specific but may be generalized.²³

If bond psychology and the theory of identical elements are assumed to be true, one should be permitted to assume as a result that a complex act like the reasoning out of a complicated problem can be broken up into its specific parts, such as the "reasoning" involved in the connections in or separate portions of the problem. A person who learns the specific parts of an act should then be able to perform the complete act. The learning

23. Orata, "Transfer of Training. . .," The Mathematics Teacher, op.cit., p.268; Identical Elements, op.cit., p.38.

of specific functions should enable the person to perform a complex act involving a number of the functions.

Ruger performed a test to discover whether an ability to solve the separate parts of a puzzle included the ability to solve the puzzle as a whole.²⁴ The subject was first tested with the puzzle in a given form. Then he was taught the various separate acts necessary for solving it. The subject also practiced making the connections between the elements or acts at the points of their successive appearances. When the complete form of the puzzle was given, the subject did not recognize it as being related to the practice he had gone through before. The habits he had learned then were not brought into use to solve the problem placed before him.

At another time Ruger practiced his subject in taking the puzzle apart and found that this practice gave him definite transfer value in putting the puzzle together. This change of procedure meant that the subject had to reverse his movements when he attempted to put the puzzle together. Because of this requirement of reversal, it seems very probable that the habits gained in the practice in taking the puzzle apart would interfere rather than aid in the transfer. Ruger therefore believed that, since there was a positive transfer from the prac-

24. Henry Ruger, The Psychology of Efficiency, chapter VI, reported in Kingsley, op.cit., pp.533-34.

tice, it was due to an understanding of the puzzle's construction gained during the practice.

Another student carried out an experiment with a hen, which showed that an element common to two situations, though apparently perceived and recognized as such, did not transfer. The experimenter placed food on two pieces of gray paper which could be distinguished by the different shades of coloring. During the experiment he drove the hen away when she attempted to take food from the darker background. She was permitted to eat undisturbed from the food placed on the lighter background. After she had learned to avoid the first or darker colored paper, the experiment was continued by placing this first shade of paper alongside a still darker paper. The hen immediately transferred her training to the new situation by taking food from the first paper, which she had learned to avoid just a short time before. The food which was placed on the third or darkest paper was left alone. The same type of experiment was later repeated with apes and infants and revealed similar results.²⁵ This evidence which is used in the support of the Gestalt psychology tends to prove that mental functions used in learning and in the transference of

25. Wolfgang Koehler, "Nachweis einfacher Strukturfunktionen beim Schimpansen und beim Haushuhn" Abhandlungen der K. Preuss. Akad. d. Wiss., 1918, 2, reported in Judd, Psychology of Secondary Education, pp. 439-40.

learning cannot be limited in definition to specific activities as, for example, in the case of the hen, reasoning that food must be taken from only one shade of colored paper.

As it is understood today, the psychology of personality involves general traits or dispositions such as friendliness, kindness, courtesy.²⁶ The theory of identical elements would seem to infer that personality consists of countless, specific activities and that the trait of friendliness, for example, is just a common name given to a group of acts or habits of acting in a certain way in certain situations. According to this theory training should then eliminate all teaching of general principles and abstract ideals, since responses can after all be only specific. But maintaining the specific character of such a generalized sentiment as "regard for the scientific method," with regard to a rigid location in the nervous system represents quite an absurdity to Allport for whom the generalized dispositions "are the utmost in trait psychology."²⁷ He asserts:

To maintain a scientific attitude, for example, requires many different associations, movements, and mental operations. The only common factor is a thoroughly generalized attitude or interest, ver-

26. Allport, op.cit., p.262.

27. Ibid., pp.269-70.

satile in expression, employing now this neural mechanism and now that, characterized by more flexibility than the theory of identical elements can admit with consistency in its open position.

The inclusion of general attitudes and volitional dispositions under the list of "identities" is a necessary but futile subterfuge to save the theory.²⁸

Moreover, a personality trait which must be mechanized as the theory of identical elements seems to require can hardly be classified as a true personality trait.

Friendliness, courtesy, neatness, etc., however ingrained they may be as a result of previous practice, require a certain measure of adaptation to the particular situation. If friendliness or grouchiness were to become absolutely fixed and mechanical forms of response, like digestion, they would cease to be what they are. An organism that reacts in this fashion has no more friendliness than a shotgun or a spring shower.²⁹

The reports in this section treat the functions as both specific and general, and show the value, according to this experimental and observational evidence, of the general nature over the specific.

Transfer only named by identical element theory.³⁰

The educational worth of Thorndike's explanation of transfer seems to reside in the definition or interpretation of an oft-repeated phrase, "specific ability." "Specific ability" could, on the one hand, refer to a sub-

28. Ibid., p.275.

29. Bode, Modern Educational Theories, p.199.

30. Orata, Identical Elements, op.cit., pp.10.11.
18.22. Allport, op.cit., p.285.

division of a general faculty. Thus, instead of just one general function labeled "attention," there would be an endless number of specific functions or abilities of attending to different kinds of facts. But one cannot help but feel that this is just a re-interpretation of the old faculty psychology with specific instead of general faculties. Thorndike, it seems, would not favor this view, for it would be too reminiscent of formal discipline.

We could attempt to define "specific ability" in another way by referring to it as the ability for performing a certain specific act. For educators this would involve a search for all the acts in which children should be trained. Such a search could be an endless task, with the elements or acts continually becoming more minute and more difficult to identify. But the two situations held in question by the present theory would have their identical elements. But if one claims that transfer may take place when identical elements exist in two situations, he is doing no more than naming the process, for transfer is essentially the process of perceiving or identifying the common character existing between a new and an old situation. In order to explain transfer, one must explain how the elements are identified.

The theory of identical elements appears to be in approximately the same position today. Woodworth, one

of its earlier proponents, in order to avoid the confusion which the use of the word "element" seems to have caused, suggests the substitution of the word "constituent" or "component" in its place. Common components could be interpreted to include anything from specific acts to ideals and abstract principles. Woodworth would restrict its meaning to concrete performances.³¹ He writes:

We think of principles as "abstract." But if they are embodied in words they are concrete bits of behavior and their transfer from one situation to another creates no difficulty for the theory of identical components. Any idea that can be recalled, or any attitude that can be reinstated, is concrete enough to qualify. Perhaps anything that can be learned can be transferred. But does not everything that can be learned have the concrete character of an act or way of acting?³²

Such efforts to define principles or attitudes are of definite value in helping to clarify the picture which surrounds transfer, but the problem of explaining the actual process still remains.

Educational implications of the theory. The implications involved in applying the theory of identical elements to actual schoolroom situations seem to be rather generally recognized among the educational leaders of today. Orata, who wrote the first outstanding criticism of the theory, felt that in practice it manifests itself in a "mechanistic conception of behavior, over-emphasis upon

31. Woodworth, op.cit., p.177.

32. Ibid., p.207.

habit formation and drill, and confinement to the practical."³³ It is difficult to see how such concepts as "bond formation" and "specific abilities" could be interpreted otherwise in the instruction of classroom teachers.

Although side-explanations have been given to include them, the basic tenets of Thorndike's explanation of transfer seem to provide no justifiable basis for the carry-over of the more important educational objectives in the areas of understandings and attitudes. The theory supplies a very logical description of the transfer of information and of simple skills in terms of elements, but even these, it is indicated, give a very limited transfer. One cause for the limited transfer of these simple elements lies in instruction which treats them as isolated facts or habits. Routine drill which may be employed in connection with the theory of identical elements is the main method of such instruction.

For detached bits of information, impressions and habits give an intellectual content that is not flexible, not adaptable and transferable, hence not fruitful in the solution of new problems.

. . . we must, therefore, take care to see that the training given eventuates in needed concepts and philosophies as well as in particular informations and specific habits.³⁴

33. Crata, Identical Elements, op.cit., p.153.

34. Charles Peters, Teaching High School History and Social Studies for Citizenship Training, 1948, p.78.

The emphasis which followers of the elemental theory laid upon items of knowledge may have had its influence in the placing of so much faith in the transfer value of civics courses when they were first introduced. Teachers and administrators seemed to feel that if the students would learn the makeup of the government, the names and functions of the men in office, etc., they should be good citizens. The result of the training is described by Dewey.

And many of them - many of us, I fear - having learned these facts went out into adult life and became the easy prey of skilful politicians and political machines; the victims of political misrepresentation, say, on the part of the newspapers we happen to read.³⁵

If knowledge and skills are to be of any value, it appears that they must be logically organized and trained toward definite purposes. Advocates of the theory of identical elements are able to make no suitable provision for such logical organization.

The "elements" are to include also habits or specific acts besides skills involving items of knowledge. The question now is whether the formation of habits will greatly aid the cause of transfer. Training in these will likely show little transfer, too, if the acts remain isolated from each other or from a general purpose.

35. John Dewey, Problems of Men, in pp.48-51, cited by Peters, op.cit., p.77.

Peters was able to see that "stressing habits of behaving in practical civic situations"³⁶ in his experimental classes without developing the principles of behavior did not produce the desired results.

Monitorial services, or making gift baskets, or aiding mendicants should not end in the pupils' minds with just the "lark" of a present activity; they should be thought of critically by the pupil as right or wrong ways of being kind and helpful to others. The operation of pupil government should be often connected in the pupil's mind with its relation to the whole process of political democracy in our society. Correspondingly, the techniques of open-minded discussion, of the use of books and other sources in getting information needed for the solution of problems, and of effective leadership and followership practiced in the classes in school, should become a part, in the pupil's mind, of the process of democratic living that he purposes to continue to exercise throughout his life. Unless these acts which he is now performing, and the particularized thinking which now accompanies them, are thus shaping up into a conceptualized philosophy of life, they are likely to leave only a transient effect upon him. *[italics mine]*³⁷

If mechanical habit formation and routine drill are the chief methods of the theory of identical elements in practice, and it is hard to escape this fact, transfer must remain limited in amount. The theory therefore remains ineffective in practice.

36. Peters, op.cit., p.78/

37. Ibid., pp.78-79.

The Theory in Lutheran Religious Education

The connectionist psychology. The Lutheran educational literature reviewed by the writer contains no references directly approving the psychology which serves as the basis for the theory of identical elements. Schmieding has submitted the only direct, although brief, criticism of the connectionist psychology in his Understanding the Child.³⁸ He agrees with those psychologists who see in it too simple an explanation, one which renders human behavior very mechanical and is unable to explain suitably the processes involved on the higher levels of mental activity.

Placing an emphasis on the learning of facts. As it has been noted above, the theory of identical elements indicates the necessity of learning specific elements in order that they may be perceived through the identities of substance and procedure in succeeding situations. Such elements identified as substance would include specific functions involving definite items of information. When specificity is stressed as in this theory, the items of information are very apt to be over-emphasized as objectives of the instruction. The following examples should help to point out this danger.

38. Schmieding, op.cit., pp.54.77.

The mental function employed most frequently, it seems, in religious instruction has been the memory. One group of elements of substance identified as this type of function would be the memories of all the parts of the Apostles' Creed. If the child has committed the creed to memory in his instruction class and has recited it there, he should be able to recognize the identical elements in a different situation, the regular Sunday morning worship service. Once he recognizes the stimulus, which is a request to recite, he should be able to use his previously learned memory functions and repeat the creed from memory along with the entire congregation. A slip at some point in his recitation would indicate that the memory function for that particular word or phrase had not been learned well enough. X

A Sunday School teacher may teach her pupils a Bible story. They learn the facts which make up the story. When she quizzes them the next Sunday she finds that they have forgotten certain parts. If the teacher is an exponent of the theory of identical elements, she explains the gaps in the pupils' knowledge by stating first that the learning of each fact or point required the performance of a separate mental function. Some of the functions and the facts to which they were connected were not drilled enough and did not make a deep enough impression upon the pupils.

The use of more complex mental processes may be explained in a similar way. The instructor may be able to lead the pupil through a process of specific reasoning to understand as fully as possible the first article of the Apostles' Creed: "I believe in God the Father Almighty, Maker of heaven and earth." A comprehension of this sentence requires much more than the reasoning out of an answer to one specific question about it, such as: What kind of being is God? Many specific questions demanding the use of specific reasoning functions must be answered before the article is understood. As much as he is able the pupil must understand from Bible passages the extent of God's power, how He has used it and does use it on earth and with men. If the knowledge is to be still more practical He must understand the relation of man, God's creature, to God Himself. Each general point in the reasoning process, however, must be divided into its specific points of reasoning, so that each may be drilled until it is learned.

The danger connected with the use of such a type of instruction is evident. The more specific the points become, the more the learning of facts can be over-emphasized. When functions can be so broken down into "countless capacities" in the manner which the theory of identical elements calls for, the instruction of definite subject matter becomes nothing less than the drilling of

X

specific facts, and the more specific they are made, the better. Even in the example of the reasoning function given above, the learning can be so analyzed as to involve practically an infinite number of specific functions connected with specific facts. Some of the questions with their answers, which are given in connection with the First Article, are:

105. What is God? God is a spirit. He is eternal, everywhere present, all-knowing, almighty, holy, just, faithful, kind, merciful, and gracious.
111. Why is God called "Father Almighty"? Because He is the Maker and Preserver of all things.
112. What was made by the word of the Lord? Heaven and earth. (Gen.1.)
113. Hence, what do you believe concerning yourself? God has made me.
120. How may all creatures be classified? As visible and invisible.
125. What is the foremost among the visible creatures? Man.
126. In whose image was man made? In God's image.
127. In what respect was he like God? He was holy and righteous. Eph.4:24.³⁹

The answers to these and other similar and perhaps more specific questions about this article and its application could legitimately, it seems, be required of adolescent confirmands, if the words of the article are to be more than just verbalized. According to the theory of identical elements each of the answers to the different questions should require the use of a separate, specific, mental function. Because of its specificity each function

39.A.H.Lange, Catechetical Review, pp.8.9.

while it is being learned cannot be influenced by the learning of another function. Each must therefore be learned separately by the most appropriate method. The best method is assumed to be drill, since that employs frequent repetition and thereby strengthens the bond formed in the nervous system. X

When the functions connected with the answering of the questions become so particular, the questions asked by the teacher in order to obtain the use of the functions must be particular. Questions which must be very particular become very factual, for particular or specific questions require specific answers, or, in another word, facts. Even when a question requires one to use a reasoning function in order to answer it, as it is most evident in #111, #120, and #127 above, the answer itself is nothing more than a fact. The interrogatives like "why" and "how", which are ordinarily used in such thought questions are just general interpretations of the more specific interrogative phrases like "for what reason," "for what purpose," and "in what way," all of which indicate more definitely that a specific answer or fact should follow.

To repeat, because of its specificity each function must be learned separately and by the most appropriate method - drill, or repetition. Because the fact becomes more prominent in the use of a separate function X

when that function in following the basic theory has been made more specific, the learning of the function becomes the learning of its fact to a greater degree now than when the function had been more general. Moreover, the use of routine drill to reinforce the original impression in the nervous system helps to de-emphasize the meaningful use of the mental function and its objective, the fact, by making it more like a habit. Both the drill and the emphasis upon specificity tend to disallow any necessity for the logical organization of facts. The learning or memorization of the specific fact is thereby emphasized to the virtual exclusion of other objectives.

Kuehnert wrote in 1942 that the over-emphasis placed upon facts as instructional objectives "characterized much of the religious instruction given in our Lutheran schools in former times, so that children's training was measured only in terms of doctrinal and historical facts acquired."⁴⁰ It seems quite improbable that these Lutheran teachers knew about the theory of identical elements and were putting it into practice. It would be more probable of assumption that they had been influenced by the educational thinking and methods of their time which had developed directly or indirectly through the theory.

40. Theodore Kuehnert, Directing the Learner, p.38.

Classroom practices in Lutheran schools were observed by Schmieding for several years before 1932 and were then listed in the Lutheran School Journal. One practice reflects the undue emphasis which some teachers placed upon the learning of facts.

They [the teachers] expect an immediate reply from pupils to their questions and thereby discourage and hinder thinking and intellectual development. One danger of the catechizations with too many small questions. ⁴¹

Kochler had noticed the same teaching method similarly abused in 1929. He wrote then that the use of only fact-questions or others, too, which required little thinking on the part of the pupils resulted in ineffective teaching. He added:

. . . the answer of the child should not merely give the fact that is printed in the book, but a thought, an idea, opinion, a judgment, which the child has formed on the basis of what the text or story says. ⁴²

Some teachers have been making catechizations the chief form of instruction at least as early as the second century after Christ when the so-called catechetical schools were founded. In this modern era their abuse seems to have been noticed especially in the first decades

41. Alfred Schmieding, "Thirty Classroom Practices Injurious to Good Teaching," Lutheran School Journal, LXVII, 9, (May, 1932), p.416.

42. E.W.Kochler, "Is Our Method of Teaching Religion as Effective as It Might Be?" Lutheran School Journal, LXIV, 7, (July, 1929), p.245. 4

of the present century. The portion of the catechization given below shows how fact-questions and repetition may be unduly (as it appears to the writer) be emphasized.

A Catechesis with Which to Begin the Instruction
of the Catechumens.

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Aim: Dear Children! We would hear today that the Saviour wants to have also you children with Him to bless you.

I. Developing the truth from the intuitional material. /Story of Jesus blessing the little children./ Finally came the mothers, pressing through the crowd and bringing their children to Jesus. The larger ones they led by the hand; the smaller ones they carried in their arms. What was the Lord Jesus to do for these little ones? He was to touch and bless them. That was a pious wish. Those mothers had seen that the sick were healed; that the blind received their sight, and that the lame walked when Jesus laid His hand upon them. They had also seen that it was good to be in the presence of Jesus, and had beheld how great a blessing came from Jesus upon all whom He touched. Was there something lacking, or were they sick? No. Then what kind of blessing did these mothers want for their children if they were not sick? A blessing for their souls. Such it would have been, even if these mothers had not known what they wished for their children. They surely wished their children to become good, pious children. But Jesus had labored the whole day and was weary. What does one desire when he is weary? He seeks rest. What would Jesus then gladly have done? He would gladly have rested. . . . Therefore we learn from this story: Jesus wants the children to be with Him, even when He is weary. He always has time for them. Let us say that together. Again! Again! Anna, say it alone. Frank, repeat it. Now I shall write it on the blackboard.

The disciples did not wish to let the mothers come to Jesus with their children because He was tired and needed rest. Can you give another reason why they probably wanted to turn these mothers away? Because they thought that Jesus could do nothing for these children. That He could be a Saviour for grown folk they had learned from His dealings with

them and others, but how could He help these little ones, who could not even understand what He said? However, who must have trusted that He could give something to these children? The mothers must have so trusted. Otherwise what would they certainly not have done? They would not have tried so hard to force their way to Him with their children. Upon whose side did Jesus place Himself, that of the disciples or that of the mothers? Upon the side of the mothers. What did He say that He could and would give the children? The Kingdom of Heaven. What are His exact words? . . . Let us note: Jesus can and will give also children His heavenly gifts. Let us repeat that together a number of times. Wahn, say it alone. Louis, do the same. And now I shall also write this upon the blackboard. How many things have we thus far learned from our history? Two. What is the first? Jesus wants the children to be with Him, even when He is weary. What is the second? Jesus ⁴³can and will give also children His heavenly gifts.

The same lesson continues in a similar vein with four more pages of small type. It covers the three remaining Herbartian steps of comparison, valuation, and application. The lesson is concluded in the following manner:

Yes, children, remain with Him, with Jesus, with God your Father. And to this end may these hours of religious instruction help - that you remain the children of God!

Now open your catechisms and read, page 27: ("That . . . I may remain a child of God") ^[sic] (the lesson to be assigned). Also read the three Scripture passages found in that connection. You can all understand this now very well. Memorize the Scripture passages for tomorrow. But we first want to repeat each of them several times together. Read carefully that which is printed in large type. I shall ask you about it tomorrow. And now, since we have been brought to Jesus by Baptism, have God as our Father, and therewith are in possession of salvation, let us sing a hymn on Baptism. I will read the first verses and then you may read them. (Here the catechist should paraphrase the difficult words.) And finally we will sing them together.⁴⁴

43. Reu, Catechetics, op.cit., pp.584-87.

44. Ibid., p.591.

The subject matter of this lesson is developed and presented in a logical order. We need not just assume then that the writer fully understood his material. But could we be sure, or even fairly sure, that also the pupils understood this lesson after they had heard it? That, it seems, we are expected to assume, for at no point were the pupils required or asked to state their own ideas of the story and its application.⁴⁵ The only evidence which the instructor might set forth to support the claim of comprehension consists of the answers given by the children to his questions and also their repetition of the summary points given at the conclusion of each section. The place of repetition in learning will be discussed in a later section of this paper. Because of the simple questions the great majority of the answers should have required little mental effort for their formulation and repetition. They consisted of simple facts which could be represented in single words or in simple phrases or sentences. The question to be asked in this connection is: Does the knowledge of a number of specific facts necessarily imply the under-

45. There is no indication that the pupils' comprehension of the material would be measured at any later time other than in terms of the verbalization of three Scripture passages. It seems to be assumed that these passages are understood because the previously related subject matter is assumed to have been understood.

standing of the meaning which the facts might give as a whole? The answer is obvious.⁴⁶ Learning of facts is not hereby condemned. Certainly, comprehension or logical organization would be empty without the facts, for facts must be used as a basis for a judgment or suggestion or idea. But the learning of isolated items of information can be over-emphasized and result in harm rather than in good as it was intended to be.

Impression alone. . . leads to highly undesirable results in teaching. The "learning" of the child is apt to become mere memorizing of facts, which are often forgotten faster than they were learned.⁴⁷

By its demands for specificity the theory of identical elements reduces subject matter to separate facts which must be learned separately. Because its foundation is the mechanical connectionist psychology the theory cannot find suitable explanations for behavior on the higher mental levels. Its followers have therefore continued to emphasize specificity, and as a result in many cases, the learning of facts. This thinking may have been one influence which caused practice in Lutheran religious education to reflect the tendency toward factual learning as it has been evidenced in past years.

The emphasis placed upon habit formation. Lutheran

46. Cf. Ruger's experiment, supra, pp.59-60.

47. Kuehnert, Directing the Learner, op.cit.,p.38.

educators and homileticians have frequently stressed the necessity of applying the Word of God to the lives of people. The application itself may be of a general or specific nature, that is, the teaching may involve on the one hand the development of ideals, attitudes, and insights, or on the other the performance of certain specified acts of behavior. Educational objectives would ordinarily include both types.

Some teachers, however, might lay an undue emphasis upon the specific character of the application of their instruction by requiring that the behavior of their pupils become a matter of habit. If that behavior which is termed moral must be stereotyped, there is good reason to believe that the relationship which is generally believed to exist between the two types of application has been discarded in favor of a different relationship. The attitudes, ideals, and insights are not considered the forces which motivate the individual to perform specific deeds. By frequent repetition the specific acts of behavior are to become habitual. The acts become self-motivating. If attitudes, ideals, and insights are considered valid objectives, it is likely assumed that they are developed automatically at the same time. Thus the specific type of application receives a much greater emphasis than the general type.

The over-emphasis of the specific form of applica-

tion may be explained in terms of the theory under consideration in the following manner. To a religious educator who favors the theory of identical elements as it was originally propounded, honesty, for example, would not refer to a general, abstract ideal or attitude, but rather to a number of observable acts of similar behavior performed in various situations. Each act of honesty is a specific piece of behavior. A child's honesty in returning to his mother the few pennies of loose change after purchasing groceries for her is different than the same child's behavior in being honest with his mother when he tells her that he has eaten the cookies which she had wanted to save for dessert at the next meal. One is also forced to admit that returning two dollars received as change in a purchase of groceries involves a different act of honesty than the returning of only ten cents. Since these acts are not identical, each must be learned separately, for the learning of one cannot influence the learning of the other. In order to reinforce the bond or bonds necessary for each response, the act should be repeated frequently until it becomes a habit. If one is a consistent advocate of the theory of identical elements, he would submit this as his method of instruction for the training of character. Of course, the more different elements of behavior the instruction would include, the greater opportunity there should be for transfer. Thus

all application is specific; there are no such things as general attitudes or ideals. The whole emphasis is placed upon the performance of specific deeds.

Lutheran literature has not raised the banner for a religion of deeds alone. It has pointed out, however, such tendencies in the practice of its teachers and pastors. In 1943 Stelhorn wrote that "we are now probably inclined toward pressure on deeds, legalistic driving, and moralization."⁴⁸ Legalism denotes a slavish keeping of regulations, while moralization involves an attempt to build character by the use of "Thou shalt. . . ." and "Thou shalt not. . . ."⁴⁹ Any religious instruction based upon such concepts can tend to make of religion only a "mere code of action and body of religious exercises."⁵⁰

The tendencies in Lutheran circles noted or intimated by the men cited above very probably do not reflect the placement of an exclusive emphasis upon the learning of specific behavior as demanded by the theory of identical elements. But the fact that there have been

48. A.C.Stelhorn, "Intellectualism in Religion," Lutheran School Journal, LXXVIII, 8, (April, 1943), p.349.

49. E. Froehlich, "Distinction Between Moralizing and Christian Training," Lutheran School Journal, LXXXI, 10, (June, 1946), pp. 438-40.

50. R.Caemmerer, "A Wonderful and Horrible Thing," The Lutheran Witness, LXVII, 3, (February 10, 1948), p.38.

and are notices of trends in that direction is enough to justify the warnings that have been given.

Repetition is the mother of all learning. Repetition has been regarded generally as a fundamental factor in the learning process. Repetition is fundamental, but only if it is understood correctly.

The connectionist and the believer in the theory of identical elements conceive of learning as the formation of bonds. In order that these bonds might be strengthened, the elements of behavior which they represent must be repeated frequently until they have become fixated. Thorndike's law of exercise was formed on the basis of this reasoning. According to this law, if real learning is to take place, the bond must be exercised, that is, the person must repeatedly make the same response to one stimulus.

The law of exercise, or the law of use, or frequency, as it has been otherwise stated, has been found to be inaccurate when considered as an absolute rule. Experiments reveal that such exercise or repetition does not in and of itself produce learning. Thorndike himself has been very prominent in showing that the law should be qualified.⁵¹

51. Cf. Edward Thorndike, The Psychology of Wants, Interests and Attitudes, 1935, p. 145. Also see Kingsley, The Nature and Conditions of Learning, op.cit., pp. 70-71.

52. Cf. Kingsley, op.cit., pp. 69-70.

A more accurate picture may be gained of the role which repetition should play in education if learning is viewed in one sense as the modification of behavior. Thus learning requires that a change take place in the mental, emotional, or physical activity of an individual. If an identical element of behavior is repeated over and over again without a change in any phase of that performance in the individual, learning does not occur. Behavior will be modified only when the performance is altered in some way. If repetition is interpreted broadly and not as an identical recurrence of a stimulus-response element, it may be recognized as a fundamental condition of learning because it can provide opportunities for the alteration of a function and its performance through stabilization, revision, or other forms of modification. A skillful teacher should therefore employ reviews which give the learner a chance, for example, to correct the errors in his previous response. He should offer drills which enable the pupil to improve his own method of performance or to develop a more efficient one. A skillful teacher should also counteract the possible ineffectiveness of any type of repetition by providing for attention, interest, and purpose on the part of the pupil.⁵²

52. Cf. Kingsley, op.cit., pp.69-75.

The old maxim, Repetition is the mother of learning, seems to be well-known among Lutheran educators. It has also ordinarily been interpreted correctly.⁵³ The cases in which repetition is advocated without the proper and necessary explanation, such as that in a recent Lutheran Witness editorial,⁵⁴ appear to be exceptions to the general practice.

A seemingly improper use of repetition was referred to in connection with Reu's example of a catechization cited in part in a previous section. Although this example did not reflect it, Reu elsewhere in his books does appear to sense the value of a broad, non-literal definition of repetition.⁵⁵ He also realizes the place of purpose in learning, but he seems to have subordinated it too greatly to general terms which have not been clearly defined and which therefore may call forth connotations of mechanical practice in the minds of his readers.

The teacher will remember the vast importance of

53. Cf. Kuehnert, Directing the Learner, op.cit., pp.51.52.79. Also see "The Conversion of Subject Material into Educational Values," Lutheran School Journal, op.cit., p.126

54. Martin Sommer, "Repetitions Are Important," The Lutheran Witness, LXVI, 26, (December 30, 1947), p.423.

55. Reu, How To Teach in the Sunday School, op.cit., pp.308ff.

repetition, of exercise in well-doing, of familiar acquaintance with it, and will thus, by purposeful habituation, lay the foundations of a Christian character.⁵⁶

Of special interest is the fact that in 1926 one contributor to the Lutheran School Journal set forth a principle of learning which affected repetition. The principle was recognized at the time but was not accorded due prominence until about five years later. He supported the law of effect which Thorndike later found upon the basis of his experiments should precede the law of exercise in importance.⁵⁷

It is not the length of time spent on a lesson nor the number of repetitions alone that fixes a lesson in the pupil's mind, but it is the "vividness of the impression" which causes him to remember.⁵⁸

Repetition has been and is an important factor in the instruction of Lutheran religious educators. However, it would be unwise to attempt from the few articles at hand to determine a prevailing attitude toward it. We can say only that a knowledge of its implications as it is employed by the connectionist psychology and by the theory of identical elements demands that all educators make a thorough study of its true place in the learning process.

56. Reu, Catechetics, op.cit., p.239.

57. Cf. Thorndike, The Psychology of Wants . . . , op.cit., p.145.

58. George Jung, "Interest an Important Factor in Education," Lutheran School Journal, LXI, 12, (October, 1926), p.364.

Summary and Concluding Remarks

Explanation of the theory. In their experiments Thorndike and Woodworth found that mental functions were highly specialized. Their experimental results also showed very little transfer, indicating to them that the use of one mental power did not influence or carry over to the use of another. They concluded that transfer occurred only when specific, identical elements, which involved the use of the specific functions, appeared in two situations.

The elements themselves are characterized according to the identity of substance and the identity of procedure. The connectionist psychology, which explains behavior by the formation of bonds or pathways in the nervous system reaching from the stimulus point through the synapse to the point of the response, is the basis for the theory of identical elements.

Opposing evidence and arguments. Lashley's experiments produced striking evidence against the connectionist's picture of a definite bond and its reinforcement by exercise, and a correlative theory postulating the formation of equivalent bonds during the repetition of a specific act of behavior. He also reported evidence which showed that the stability of a synapse did not depend upon the degree to which its resistance had been

lowered by repetition of the response.

The claim that transfer should occur in proportion to the degree of similarity between two functions was contested by Orata after he had reviewed several pertinent experiments, and by Allport who referred to emotional learning and its extensive transfer.

The small amount of transfer which resulted from Thorndike's experiments is shown to have been caused apparently by his method of training his subjects. His routine drill is contrasted with other methods of procedure which produced large amounts of transfer.

The experimental results of Ruger, Koehler, and others reveal that mental functions need not be only specific. Allport and Bode point out that generalized personality traits cannot be localized in the nervous system nor should they be allowed to become mechanical responses.

Stating that transfer may occur when identical elements exist in two situations is no more than a name for the fact of what may happen. A true theory of transfer must actually explain the process by which the identical elements are perceived or identified.

Routine drill and habit formation appear to be the chief methods applied by followers of the theory of identical elements. The ineffectiveness and apparent falsity of the theory is seen when such a type of instruction which allows little or no opportunity for

logical organization and the learning of principles of behavior regularly develops products who show little transfer even in the important areas of character and civic responsibility.

The theory in Lutheran religious education. In the writer's knowledge of Lutheran educational literature, Schmieding has entered the only direct reference - a criticism - to the connectionist psychology.

The requirement of specificity of mental functions in the theory of identical elements ordinarily leads to the placing of an over-emphasis upon the learning or memorization of facts. Lutheran religious instruction appears to have reflected this tendency in its use of catechizations in past years.

The formation of habits which the identical element theory of transfer desires implies that an intensive emphasis be placed upon the performance of specific deeds. Several writers have noted trends in this direction in Lutheran circles.

If repetition is to serve as an effective factor in the learning process of an individual, it should provide occasions for him to modify his behavior. Most of the Lutheran writers who have referred to repetition have advised that it be used in this manner.

Concluding remarks. The idea that transfer depends upon the community between two activities has been a

valuable contribution of the theory of identical elements to the further study of the transfer problem. The fact that this theory rested its case upon a mechanically-directed interpretation of behavior was its chief objectionable feature. We cannot, however, discount entirely all the findings and suggestions of the connectionist just because he has given his psychology too particular an explanation, and also because we have counter evidence presented by Lashley's experiments. More recent investigations combine with past findings to produce a somewhat clearer picture of man's neurological structure and its role in the learning process.

The synaptic resistance theory of learning, for example, is now explained in such a manner that it seems to fit in with the more recently recognized principles of learning. Ruch would consider it still a hunch, however, much less a hypothesis, since it has not been tested by any crucial experiments.⁵⁹

After considering other similar studies, some neurologists and psychologists interpret Lashley's experimental results in a way which differs slightly from his conclusions. Although learning in general has

59. Floyd Ruch, Psychology and Life, pp. 691-95.

been observed to be independent of definite connections between specific neurons in the human cerebral cortex, certain general association areas which control phases of learning appear to be localized there. Instead of going to the extreme, therefore, and following Lashley's concept of a "mass-action theory" of the brain, these men suggest hypotheses which are more in line with the generally accepted conception of the neural arc.⁶⁰

It is possible that the transfer process may yet be explained in neurological terms which will be more agreeable to modern psychologists and educators than were those employed by the theory of identical elements.

60. E. Boring, H. Langfeld, H. Weld, et al., Introduction to Psychology, p. 244. Ruch, op.cit., pp. 701-713.

that a limitation of transfer could be placed upon all learning. Their experiments bore witness to the truth behind their doubts and resulted in the formulation of the theory of generalization.

According to this theory transfer is the effect of a thought process known as generalization by which the individual is able to identify elements common to two or more situations. Charles Judd defines this process in this way:

Generalization is another name for the relating of experiences in such a way that what is gained at one point will redound to the advantage of the individual in every phase of thought and action.

1. Charles Judd, Identical Psychology, p. 214.

CHAPTER IV

THE THEORY OF GENERALIZATION

Explanation of the Theory

Origin. The early educators and psychologists who were faced with the problem of combatting formal discipline had devised a form of education whose content was defined in specific terms. Specific knowledge and specific habits were emphasized, and, as was expected, a limited amount of the training transferred.

Later educators and psychologists began to doubt that a limitation of transfer could be placed upon all learning. Their experiments bore witness to the truth behind their doubts and resulted in the formulation of the theory of generalization.

According to this theory transfer is the effect of a thought process known as generalization by which the individual is able to identify elements common to two or more situations. Charles Judd defines this process in this way:

Generalization is another name for the relating of experiences in such a way that what is gained at one point will redound to the advantage of the individual in many spheres of thought and action.¹

1. Charles Judd, Educational Psychology, p.514.

This theory with its supporting evidence states that generalization is a conscious process. There is no direct assertion that the result of the process, which is ordinarily some type of principle, be verbalized or un verbalized, although most of the experiments and the conclusions drawn from them appear to have the former in mind.

Experimental evidence for conscious generalization.

Judd's experiment with two groups of fifth and sixth grade boys and their attempts to hit an under-water target with darts is a classic in this field.² The test required a certain amount of adjustment on the part of the subjects, since they first had to get used to the apparent displacement of the target caused by the refraction of the light from the object.

The first of the two equated groups gained experience without instruction. Explanation of the principle of refraction with reference to the case at hand was given the second group first before they were permitted to acquire experience. Scores on the first trial revealed that both took the same length of time to achieve skill in hitting the target which was twelve inches beneath the water level.

For the second trial the target was placed only

2. Ibid., pp.507-09.

four inches under the water, causing a change in its apparent displacement. This became a source of confusion to the boys who had not received instruction in the principle of refraction. The others, however, adapted themselves readily. With the skill they had acquired while making the necessary adjustment to a new situation in the first case, they were now ready to apply with ease and speed the pattern of association which they had perceived existed between the principle and the practical case of the situation similar to the previous one.

After they had mastered one practical situation and had comprehended it in the light of their theoretical knowledge, they were able to solve rapidly and with all the advantages of generalized experience a new problem which involved both practical adjustment and analysis.³

Judd distinguishes between learning of the progressive type, which involves an ability to make generalizations and so have transfer, and learning of the non-progressive type which he describes as the acquisition of an item of knowledge stored away in the memory in some way that renders it of no practical value in the future. In this connection he relates the example of an examination question given to pupils with a suitable background of courses in arithmetic, algebra, geometry,

3. Ibid., p.509.

and physics: "The specific gravity of the earth is 5.6. What is the weight of the earth?"⁴

The majority of the pupils felt that they did not have the knowledge required for the problem's solution and so did not even try to give an answer. Others stayed with the problem longer until they found that they needed to know the weight of an amount of water which was equal in size to the dimensions or volume of the earth. Some dropped out at this point.

Still others, a very small minority, recognized a relation to facts which they had learned before; one gram of water is the weight of one cubic centimeter of water, and a meter is one ten-millionth of the earth's quadrant. They went on to solve the problem. All the pupils knew the metric system, but only a few had an appreciation of its possible applications and had done more than just memorize the contents of a set of tables.

They had more intellectual associations and more possibilities of new associations than did the pupils whose ideas were limited to specific knowledge. Their knowledge was of a form which made possible generalizations.

This case makes clear the conclusion that the most effective use of knowledge is assured not through the acquisition of any particular item of experience but only through the establishment of associations which illuminate and expand an item of experience so that it has general value.⁵

4. *Ibid.*, pp.498-99.

5. *Ibid.*, pp.499-500.

These test results indicate a superiority of generalized over specialized experience.

Available data dealing with the methods by which transfer is effected in various mental processes were surveyed by Davis. He found that when techniques of memorizing were consciously generalized, greater transfer resulted than when some vague, general training or system of improvement was employed.⁶

In his study of perception, observation, and discrimination he located some evidence which favored the generalized training slightly.⁷

Gray compared two types of learning when he tested two groups of subjects after practicing them on different types of material.⁸ The first group worked with subject matter in which they had little or no opportunity to discover any relationships or to apply generalized principles. The second set practiced with material which required the use of systematic relationships for its understanding. In the final test Group I made a score of 31.9% of the possible transfer effects while Group II showed a tally of 51%. Davis writes:

The students who had discovered the advantages of ap-

6. Robert Davis, Psychology of Learning, p. 240.

7. Ibid., p. 242.

8. C.T.Gray, "A comparison of two types of learning by means of a substitution test," Journal of Educational Psychology, 1918, 9, pp.143-58, reported in Davis, op.cit., pp.243-44.

plying a general principle to one situation, when faced with a new situation of a problematic nature, began immediately to search for a general scheme or design in the material to which they could relate the individual items for purpose of ready memorization and recall. Their plan was to learn quickly the general scheme; later they used it as a means of finding the separate items.⁹

When another student practiced her geometry pupils in the solution of problems according to Dewey's five steps in logical thinking, she found that they revealed greater improvement than a control group which did not receive the special training. They also showed ability to use the same thinking techniques in solving problems in other situations.¹⁰

Meredith attempted to find the influence which training in the defining of scientific words would show upon the subject's ability to define ordinary words. Of the three groups used, one received no training; the second was trained in a routine method in defining scientific terms; and the third or experimental group spent part of its practice period in instruction in the techniques of definition and in understanding the process of defining. The last group was the best not only in a test of the definition of the scientific words, but also in the transference of their ability to

9. Davis, op.cit., pp.243-44.

10. E.P.Johnson, "Teaching pupils the conscious use of the techniques of thinking," Mathematics Teacher, 1924, 17, pp.191-201, reported in Davis, op.cit., pp.244-45.

defining the ordinary words.¹¹

From his investigation Davis concluded that a training in the conscious use of learning techniques will transfer to many situations.

Experiments with animals show a similar ability to generalize. A standard test trains the animal to go to one of the three illuminated windows before which it is placed. (See the figure.)

a.	20	40	80
b.	10	20	40
c.	40	80	100

Examples of three sets of lights used in a visual discrimination test for animals.¹²

If the animal is trained to go to the forty-watt light in the first set, in the retests it will generalize its experience and advance to that light which possesses the same gradient relation to the rest of the set of three lights despite the difference in intensity or possible different position.¹³

Lashley performed an unusual test with a number of normal rats which had learned one of the mazes. He re-

11. G. Meredith, "Consciousness of method as a means of transfer of training," Forum of Education, 1927, 5, pp.37-45, reported in Davis, op.cit., p.245.

12. Cf. George Hartmann, Educational Psychology, p.319.

13. Ibid., pp.318-19.

moved the wire mesh cover from the entire maze box and then blocked the entrance to the maze. Of the twenty animals placed in turn in the starting compartment, five leaped across the tops of the partitions in a nearly direct line to the food box, while most of the others jumped into the first alley and took the regular course. The five, it seems, must have formed some sort of generalization through their previous practice as to the line between the starting and end boxes, for they had never travelled the direct route before.

Lashley also observed the behavior of animals traversing a previously learned maze after spinal or cerebellar injuries to their motor areas. He saw one fall at every step but still reach the food box by a series of lunges; another could use only his forepaws to drag himself through; another made a perfect run without entering any blind alleys even though he had to roll over completely to make each turn. Each retained the sense of the general direction despite his inability to use needed motor responses. Lashley concluded:

The available evidence seems to justify the conclusion that the most important features of the maze habit are a generalization of direction from the specific turns of the maze and the development of some central organization by which the sense of general direction can be maintained in spite of great variations of posture and of specific direction in running.¹⁴

14. Lashley, Brain Mechanisms and Intelligence, op.cit., pp.136-38.

Further evidence for the theory of generalization is taken from statistics on the agencies of transfer. In his 1935 study Orata calculated that 70% of all the experiments and investigations performed since 1900 affirmed the general character of experience and therefore supported conscious generalization as the most effective means of transfer.¹⁵

Definition of the theory. With such evidence on their side as that given above, Charles Judd and other prominent psychologists have been able to formulate a theory which will allow for the transfer of unlimited amounts of learning.

They recognize, first of all, the fact that the subjects in their tests who exhibited the most transfer effects are those who learned a principle, or an effective method of working with their subject matter. Neither the principles nor the methods learned can be described as specific items of information or specific habits which must be restricted in their use as reactions to one stimulus; rather they are generalized forms which can be called forth by any number of different stimuli. The new theory, now, does not explain transfer by substituting these forms for the specific elements.

15. Orata, "Transfer of Training. . . ," The Mathematics Teacher, op.cit., p.267.

The identical elements still remain in the situations ready to be perceived. The new theory attempts to explain, however, how the identical elements are identified by suggesting that the identification is effected through a process or type of behavior called generalization. Thus it is not the result of the mental process - the generalized form in terms of a principle or method, one interpretation of the word generalization - but it is the process itself which forms the essence of the theory of generalization.

In the words of Judd, "generalization is the search for, and the discovery of, the same characteristic in many situations that at first sight do not appear to be alike."¹⁶

On the basis of this definition the pupils who took the physics examination, the observation of which is recorded in the previous section, may be divided into three groups. The first group did not even attempt to search for any facts which might be known to them and which could help them solve the problem. The second set displayed some transfer effects from their previous courses, but they did not continue their search; they stopped short of total discovery. The last few searched for and discovered all the facts necessary for solution

16. Judd, Educational Psychology, op.cit., p.253.

of the problem. They used the process of generalization and through it transferred knowledge learned at another time to a current situation. In other words, in generalizing they grouped the facts they had learned and the experiences they had had into a certain pattern or around a certain principle which caused them to see that characteristics in the problem before them were the same as those in their own knowledge and experience.

A comparison of the two prominent theories of transfer should help to clarify the meaning of generalization still more. Both explanations of transfer involve the perception of identical elements in two situations. The distinction between the two from this point on is well stated by Orata:

The difference between Thorndike and Judd is this: To Thorndike the identical elements are the cause, whereas to Judd they are the effect of transfer. When two situations are identical the problem of transfer disappears, and as Judd points out the process of discovering the identical elements by generalization and application is what constitutes transfer of training. The only entity that is identical in both situations before transfer takes place is the individual himself. Thorndike maintains that the identical elements are inherent in nature awaiting notice, whereas Judd holds that they are to be discovered in much the same way that a scientist discovers scientific laws and principles. If Thorndike is right then all generalizations should have been made at the beginning of time except those that arise as a result of natural evolution. In final analysis, Thorndike holds that the identical elements are logical in nature, whereas Judd maintains that they are psychological; in the former transfer takes place automatically if it takes place

at all, whereas to the latter, transfer is very largely consciously and deliberately worked for.¹⁷

Judd's theory demands then that the student be actively engaged in finding the identical elements. The transfer is not considered a force in itself which imposes itself upon the student, thereby causing the appearance of transfer effects. The theory of generaliza-

17. Orata, "Transfer of Training. . .," The Mathematics Teacher, op.cit., p.270.

In recent years Thorndike seems to have drawn closer to the theory of generalization. Some of his statements appear almost foreign to the original theory of identical elements. The following quotation is taken from Orata. He begins by citing a paragraph taken from Elementary Principles of Education written by Thorndike and Gates in 1929: "Studies of the transfer of training also have shown that the methods used in guiding the pupils' learning activities have marked effect upon the degree of transfer. The more clearly the crucial elements or fact or principle in a situation is brought to the pupil's attention the more readily the same element or fact or principle may be identified in another situation. . . . If a child observes, despite many differences in details in a new mechanical puzzle, that the vital principle is the same as in puzzles previously solved, the solution is more likely to be achieved than when the common principle is not identified." *Italics are Orata's* Note the terms 'principle,' 'despite many differences in details,' and the proviso with reference to the effect of methods of teaching upon the 'degree of transfer.' The quotation sounds very much like one from Judd, so much in fact that several writers have made a claim to the effect that Thorndike and Judd are in fundamental agreement on this issue. This reminds us of the reply made by Judd to a question raised by a student in his class, after Judd commented on the theory of identical elements as to whether or not he and Thorndike are not really in agreement. Like a flash of lightning Judd said: 'Maybe so, and it pleases me immensely to learn from you that New York is coming closer to Chicago.'" Orata, ibid., pp.270-71.

tion retains the human element. The transfer remains dependent upon the individual himself. If he generalizes, he will be able to display transfer effects.

Judd describes the methods employed in the process of generalization by referring to the type of instruction given in classrooms. The blame for the failure of so many science and mathematics courses of the past can be laid at the feet of teachers who merely drilled on isolated facts and authoritative statements. If students are to derive benefit from such courses, they should be led through the instruction to see that the various points of mathematics and science "all group themselves into related systems of generalizations."¹⁸ In order that the points and their "generalizations" or principles might be transferred, the students should learn them through the use of the same modes of thought and behavior employed by the mathematicians and scientists who formulated the subject content.

Some of the types of mental activity to be developed are abstraction, analysis, comparison, and judgment. These are not specific items of experience, but rather general methods of thought. They are evidences of, or they are themselves, the chief functions of the mind.

18. Judd, Educational Psychology, op.cit., pp.513-14.

They and the results they produce are "the highest achievements of the mind," to which conclusion "all the findings of psychology and all the experiences of the school contribute."¹⁹ Their development should be among the prominent objectives of all instruction.

The highest powers of the mind are general, not particular. . . mental development consists not in storing the mind with items of knowledge nor in training the nervous system to perform with readiness particular habitual acts but rather in equipping the individual with the power to think abstractly and to form general ideas.²⁰

The process of generalization may be defined then as the functioning of the modes of thought described above and of similar ones. General ideas, principles, or also "generalizations," are the results of the functioning of such mental powers. Thus transfer occurs when an individual, through the process of generalization, forms a general principle or "generalization" which enables him to recognize a characteristic in a second situation which is identical with a characteristic noted in a previous situation.

Educational implications. It is obvious that teachers should so instruct students that they will be able to adjust themselves intelligently to all situations of life. Placing the emphasis of the instruction upon the acqui-

19. Judd, Psychology of Secondary Education, p.441.

20. Ibid.

sition of specific items of information and of specific acts of behavior cannot possibly prove to anticipate correctly all conditions that may arise. Students should rather be taught general methods of intelligent adjustment which will fit all points of life. According to Judd teachers should, in other words, develop in their students the mental process of generalization. They should emphasize general principles, and methods of analysis and of abstract thinking.²¹ Achievement of these objectives would depend, of course, more upon the method of instruction than upon any subject matter content.

In arithmetic, for example, teachers should not find it most important to teach the simple facts and processes. They should understand that students should be aided above all in generalizing and applying their arithmetical knowledge and the fundamental processes of mathematics which they have learned. They should teach directly for transfer.

Sorenson points out the importance of applying knowledge and of noting relationships in all subjects.

In order to get the most out of any topic of study, its relationship to others should be pointed out by the teacher. In addition, she should encourage her pupils to look for relationships. Experimentation on transfer has made it clear that we cannot expect much unless teacher and pupil are conscious of the

21. Ibid., pp.414-15.

interrelationship of knowledge and attempt to generalize knowledge or apply it widely.²²

Teachers should work for wide application of the facts, theories, and principles discussed in the classroom. The teacher who has a faculty of drawing her examples from many fields makes her pupils conscious of the interrelationships of facts and principles and their wide application.²³

The few educational implications of the theory of generalization which have been noted here can be summed up by supplying the correct references to the steps in the following general instructional procedure. Once teachers have indoctrinated themselves well in the chief objectives of education, they should organize their subject matter accordingly. The next point of procedure in the process of achieving transfer results in the student is the use of effective methods of presentation which should be devised with the express purpose in mind of attaining the ultimate educational aims which were set up previously. The objectives cannot be achieved automatically. If there is to be transfer, it should be taught for directly by the best means possible. For Judd and his followers, these means are all conditions which give opportunity for generalizing and applying knowledge. Measurement of the attainment of the objectives should continue throughout the period of instruction.

22. Herbert Sorenson, Psychology in Education, p.395.

23. Ibid., p.380.

Generalization as the development of concepts and meanings.²⁴ So far in this chapter we have presented evidence for, defined, and discussed some implications of, the theory of generalization. We have considered generalization a mental process which operates with various modes of thinking, or methods of thought-behavior. Several educators have developed this theory still more by investigating and defining more clearly the materials with which abstract thinking is carried on. Words are ordinarily considered the chief instruments most commonly employed in thinking, especially on higher levels of mental activity. Language is therefore understood to be the most important tool of generalization, also.

Peter Sandiford, Boyd Bode, and Pedro Orata were among the first to point language to its proper place in the process of the transfer of training.²⁵ It has been the latter two men especially who have explained transfer in terms of meanings and concepts. By explaining these terms and describing their development we shall be able to see their connection with generalization and transfer.

24. Cf. Boyd Bode, Modern Educational Theories, pp.202-218; Pedro Orata, The Theory of Identical Elements, pp.158.165-67.170-71; Herbert Sorenson, op.cit., p.385; Frank Miller, "Transfer of Training," Lutheran School Journal, LXXVIII, 8, (April, 1943), pp.352-54.

25. Its importance had been recognized by Judd in 1927. Cf. his Psychology of Secondary Education, pp.417.419.

Meaning refers to the significance which something has for an individual. Meaning must be interpreted in terms of individual persons since an object like a tree, for example, need not mean the same thing to any two persons. A tree may mean shade from the blazing sunlight to one individual, while to another the same tree may represent a good example of a certain species of plant life. The importance of meaning is this that it can be detached from the object to which it refers. It can be abstracted and used by the individual in his thinking without having the object itself present. Such a detached meaning is what is commonly called a concept.

The importance of a concept for the transfer process is that it need not be restricted to only one meaning. One concept may include any number of different meanings. To one person the concept of tree may include, besides the two meanings given above, others such as a beautiful sight with the white snow lying on its evergreen branches; an object under which it may be dangerous to stand during a certain type of storm; and an excellent opportunity to provide the border needed in the photographing of a scene. Every time the person adds a new meaning of tree to his total experience, his concept of tree has been broadened. The broader the concept becomes, the more it is generalized.

If concept were considered as a group or collection

of unchangeable responses restricted to definite stimuli, we would be returning to a mechanistic psychology of learning. The meanings in a concept are not restricted to the objects or situations from which they were originally derived. Therefore, they can be applied in any way to any similar object or situation. We may explain this in the following way. No situation is exactly the same as its preceding prototype when it is seen in relation to its whole environment. The opportunity is therefore presented to the individual to modify his reaction to fit the situation. If he has detached meanings and formed a concept previously, he should also be able to remake this concept, which is flexible, and to apply wholes or parts of the meanings necessary in order to deal satisfactorily with the situation facing him.

This power to deal with new situations comprises the essence of the transfer process. If this power is understood to come through concepts, the concepts and their meanings cannot be considered as fixed identities. They must be flexible and modifiable, in order that the individual may meet all situations, however different they may be.

According to Bode and Orata, transfer then is a process of extending and applying meanings to new situations in order to deal with them satisfactorily.

If education follows the theory involving concepts, it becomes a process of concept-formation. Schools attempt then to encourage their students to form new concepts, to gain new meanings, and to enrich the others they already have. They may do this by giving their students new experiences from which to derive meanings. The experiences may be personal or vicarious, although the former are ordinarily better.

Aids to the enriching of meanings and concepts include in general an environment conducive to the development of independent and effective thinking. Proper organization of material, and the provision of opportunities for experimentation, inquiry, interpretation, and the use of the library all contribute to the development of meanings and concepts.

The relation between this explanation of transfer via concepts and meanings and the theory of generalization can be seen readily. Concept seems to be a broader term than generalization and closer to the working materials of human beings - words. Although the concept theory explains transfer in a similar way, it appears to be the more inclusive theory, for its terminology would seem to include the process of generalization, and also "generalizations" or principles, among its component parts.

The unverballed awareness method of generalization. Another suggestion for the explanation of the transfer problem was offered by Gertrude Hendrix in the

December, 1947, number of the Elementary School Journal.²⁶

In attempting to determine whether the manner of learning a "generalization" would affect the amount of transfer, she found that becoming aware of the principle but leaving it unverbilized excelled the other methods with which it was compared.

The experiment was performed three different times - twice with college groups and once with a number of eleventh and twelfth grade boys. Three sets of subjects, equated with each other as closely as possible, were tested at each performance. Each set was trained with a different method.

Method I was the common procedure in which the "generalization" is stated before, after, or along with an explanatory illustration, and then applied to several examples. The principle used in the test and explained for Group I before they were given the opportunity to practice with it was: "The sum of the first n odd numbers is n -square."

Methods II and III were the same at first. Each subject was given the problems of finding the sums of the first two odd numbers, the first three, and so on. The difference occurred at this point. As soon as a mem-

26. Gertrude Hendrix, "A New Clue to Transfer of Training," Elementary School Journal, XLVIII, 4, (December, 1947), pp.197-208.

ber of Group II gave evidence that he was aware of the relation between the sums and the number of odd numbers which he had added, and began to get the following answers rapidly by means of the short cut, without adding the numbers, he was permitted to leave the room. The first sign which showed that he had run onto the rule or "generalization" was usually a start, a smile, or a slight display of tenseness.

As soon as a member of Group III exhibited this type of behavior, he was asked to state the rule which he had discovered. For even the more intelligent of these students verbalizing the "generalization" was a rather slow process and took nearly twice as much time as it had taken to discover the rule on the unverballed level. Incorrect statements were offered, but were corrected by the subjects themselves until the rule had been stated in the right form.

At a later time a test was given to the three groups that included several problems which could be solved rapidly if the person recognized the opportunity to use the "generalization" but which could also be solved if one would go to the trouble of adding a set of numbers.

The results revealed that Group II, employing the unverballed awareness procedure, showed the greatest amount of transfer, while those taught by Method I had

the least. In an exact comparison of scores 73% of the members of Groups II and III were above the median of the subjects in Group I in the measurement of transfer effects. Of those taught by Method II 77% had scores above the median of those taught by Method III.

Hendrix has developed the following hypotheses from the experimental results:

1. For generation of transfer power, the unverb-
alized awareness method of learning a generalization
is better than a method in which an authoritative
statement of the generalization comes first.
2. Verbalizing a generalization immediately after
discovery does not increase transfer power.
3. Verbalizing a generalization immediately after
discovery may actually decrease transfer power.²⁷

On the basis of the experiment and these hypotheses

Hendrix makes these observations:

Many of us have suspected for a long time that learning by conscious generalization yields more dynamic transfer power than Method I. However, the fact that it is the intermediate flash of unverb-
alized awareness that actually accounts for the transfer power is a new and startling proposition in learning theory. Important as symbolic formulation must be for verification and organization of knowledge, it is not the key to transfer. That key is a sub-ver-
bal, internal process - something which must happen to the organism before it has any new knowledge to verbalize. Furthermore, this kind of learning can be promoted in any field by a teacher who is suf-
ficiently aware of the process to plan for it.²⁸

There seem to be two separate, sub-verbal processes involved in this learning. The first, which must always

27. Ibid., p.198.

28. Ibid., p.200.

come first in point of time, is the realization of the "generalization"; the learner sees some different method of solution. The second is the use of that method on another problem; the learner transfers his knowledge or insight. Hendrix feels that these may be the internal evidences of the external processes called induction and deduction.

Learning via these internally-viewed processes poses a question concerning the consistency of the commonly accepted assumptions taken from Dewey's Experience and Education: 1) All learning is experience; 2) All experience is interaction between internal and environmental factors. The first generalization flash which hit the learner was not a result of direct experience, if experience is still understood by the second statement above, for this learning was an interaction between internal and internal factors. The learner had seen no environmental factor in terms of squaring eight, for example, to get the sum of the first eight odd numbers. Experience must not thereby be considered unnecessary for learning, but learning might perhaps be interpreted as occurring sometimes without the direct action of an environmental factor. The total process of transfer, of course, cannot occur without the environmental factor, but the initial phase of the process may, perhaps, take place outside of actual experience.

It would be possible for teachers to teach directly for the development in students of an un verbalized awareness of some "generalization." But this may have its dangerous points, also.

Perhaps, however, the most startling implication of all comes forth when one speculates on the possibility of using this un verbalized-awareness method to teach false generalizations. Imagine the state of a person who knows something false or pernicious on this level; consider especially the case of a person who knows subconsciously two or more generalizations which will compel contradictory behavior in certain circumstances. Such knowledge is tremendously dynamic. It turns on automatically in situations to which it applies, and it tends to be manifested in behavior. How can a person be relieved of such an affliction? Psychotherapy, or some procedure by which the person can be led to verbalize the pernicious generalization, does, indeed, seem to be the only answer. A person who knows two inconsistent sub-verbal generalizations, both of which impel him to act in the same situation, becomes a tortured creature, paralyzed by the incompatibility of the two tendencies to act, and unable to identify or understand either of them. Symbolic formulation of the generalizations that are already there is the only known procedure by which he can detach himself from such knowledge.²⁹

If false "generalizations" learned on the un verbalized level have such power, then also the more favorable ones can be learned similarly and exert great power for self-direction. It may be best that these be not verbalized immediately, either, in order to preserve their dynamic quality.

This raises the problem of the manner in which one's un verbalized knowledge may be formulated symboli-

29. Ibid., pp. 202-03.

cally with a minimum loss of its dynamic power. Hendrix suggests that the time interval between the learning and the verbalization may be the important thing, or that perhaps composing a verbalized description of the experiences preceding the discovery may prove to be the best method.

In connection with school and classroom life the responsibility would then rest upon the teachers to plan the proper type of experiences and to have them happen in the correct sequence so that students might be able to draw the un verbalized "generalization" upon perception of the consequences offered by the experiences.

Further experimentation with the process of generalization is required before any fairly positive statement can be made about the value of the un verbalized-awareness procedure. Such continued investigations, however, along with research into the implications of the different methods, should go a long way toward forming a more accurate explanation of the transfer of training.

The Theory in Lutheran Religious
Education

One may see from the foregoing portion of this chapter that educators **approach** a discussion of the theory of generalization from several points of view. Each approach cannot be considered entirely separate from another; instead each should be viewed in its relation to a broadly-conceived theory of generalization which includes a number of different phases.

Lutheran writers of education do not appear to attach themselves to any one phase of the theory of generalization. Since their views occasionally spread over several of the phases, the present writer thought it best to treat them as they have been presented by the individual men. None of the views presented here must be taken as representative of any one man's whole explanation of the process of transfer. Whatever is recorded here concerns merely those ideas which are representative of the principles implied by the theory under consideration.

Generalization in Lutheran teaching. In teaching the Catechism and Bible history Reu would use modified forms of Herbart's five formal steps.³⁰ Reu's procedure

30. Reu, Catechetics, pp.485.487.530-34.

seems to be chiefly inductive and synthetic in style. The "generalization" or main truth is developed from the story or lesson material and then presented in a simple, clear, and short form. Verbalization of the truth is stressed by Reu, as his advice also to Sunday School teachers indicates. X

Under the teacher's guidance the class must so think through the story that they gain a clear conception of the truth it contains, that they are able to put this truth in words, and sum it up and formulate it in a clear definition. Only when we have helped our pupils to accomplish that, only then have we really helped them master a truth and make it their own. Only then have we taught a truth when we have not merely told about it, or pointed it out in the hazy distance, but when we have put it before our children in clear detail, in sharp outline and in the right perspective.³¹

Noting relationships between the various truths and items of knowledge is implied in that part or step of the instruction named comparison or penetration. Application is the fifth step in Herbart's system and it occupies the same position in Reu's forms. The instructor must not only see that the students' knowledge is generalized, but he must also apply it to definite areas of their lives.

Paul Kretzmann notes four steps in the thinking process: comparison, identification, generalization, and naming. Generalization itself is a conscious process and

31. Reu, How To Teach in the Sunday School, p.97.

involves the grouping of concepts or the parts of concepts under one common name. The principle or truth is to be verbalized either before or after the presentation of the material. Kretzmann treats both the analytic and the synthetic methods of explaining Luther's Small Catechism without committing himself to either one. The analytic method would be compared to Method I in Hendrix's experiment and the synthetic to Method III.³²

Generalization is recognized as a process by Schmieding also. He describes it in the following way:

Another type of reasoning results from the application of a known fact to a more complex series of facts. Suppose the child has learned that it is wrong to take money from a fellow pupil. If through guidance he now learns that it is wrong to take money from Father, Mother, or anyone else, also that it is unlawful to take things such as pencils, marbles, compositions from another, he is engaged in a mental activity known as generalization.³³

Although he seems to have made no direct connection between generalization and concepts, Schmieding still emphasizes the development of concepts and he places that among the higher forms of learning.

32. Cf. Kretzmann, Psychology and the Christian Day-School, pp.45.116; The Teaching of Religion, pp.71.90-91.

33. Schmieding, Understanding the Child, p.90.

Concepts are the organized meaning centers, which make thinking and reasoning possible. Concepts are more than a mere combining of single experiences, they involve regrouping, elimination, comparison, classification, organization. They undergo frequent revisions.³⁴

Other references in Lutheran educational literature to the building of concepts are somewhat rare. One brief notice of it was made by Koehler in 1946.³⁵ The use of the process of generalization and of "generalizations" is more pronounced in the literature.³⁶ Haentszchel suggests that the teacher permit the pupil to do much of the generalizing himself. His two statements quoted here could even possibly hint at the unverbilized-awareness procedure.

. . . a wise teacher will not make all the connections/between cause and effect/ himself and merely point them out to the children, but he will give them every possible opportunity to do that themselves under his guidance. He will let them discover relationships through their own efforts and have them try to reason out causes and effects.³⁷

This quotation from Haentszchel indicates the probability of a misinterpretation and misuse of the theory of generalization in Lutheran circles. Some teachers, it

34. Ibid., p.80.

35. E.W.Koehler, "The Law and Gospel," Lutheran School Journal, LXXXI, 8, (April, 1946), p.347.

36. Cf. F.Weber and Wm. Schmidt, "Suggestions for Teaching a Bible-Lesson," Lutheran School Journal, LXXVI, 3, (November, 1940), pp.103-05; see also section in Gleanings from the Field, "Procedure in Religion Lessons in the Primary Grades," Lutheran School Journal, LXVII, 7, (March, 1932), pp.308-11.

37. Ad. Haentszchel, Learning To Know the Child, p.41.

seems, may have felt that they were using the methods of generalization and so were providing for transfer when they were doing the generalizing in front of the rest of the class without any direct participation by the students. This practice appears to be similar to that used by Hendrix with her first group when the principle was stated and explained before it was applied to the examples. The teacher is expected to break the trail while the students need only follow along behind. But the members of Hendrix's class group who were taught by Method I were still allowed to practice breaking the same trail after they had been shown how.

Perhaps the teaching of religion among some Lutherans has required only the "following along behind" during and after the development of a truth and has expected the student to accept the truth without requiring that he develop that truth by himself by the same process of generalization at the same time or later. According to the theory of generalization, if transfer is to result, the student must do the actual generalizing himself.

Or perhaps the lack of transfer, if there has been a lack, has been due to the fact that the generalization on the part of the student has too often been assumed to have taken place, when in reality no real thinking did take place.

We learn by experience. "Learning by doing" and "learning by experience" are favorite expressions of "progressive educators." Some adherents of this type of education have in past years, it seems, abused the privilege of a certain freedom which it grants. They have made activity the central and sometimes only theme of their instruction, thinking that the mere doing or experiencing will result in learning which will be transferred. When an activity is performed, it is learned to a certain extent, but whether or not it has been learned so that it will transfer is another question. X

Exponents of the theory of generalization would require that the individual generalize his experience, that is, place it into some pattern or link it up with some principle, before he can be expected to transfer what he has learned from it. Under the same theory but with different terminology, Bode and Orata would have the person first derive some meaning from the experience and associate it with other meanings in a concept. Learning of the experience variety seems then to be only a beginning step in the transfer process.

In this connection we might be inclined to ask whether all learning is experience.³⁸ Must everything

38. Cf. supra, p.114.

which is to be learned actually be experienced, or in other words, produce interaction between internal and external factors? If all learning is experience, then experience would be undeniably linked with the transfer process. Something which is not experienced could not be transferred.

In Lutheran religious education, experience, or pupil activity, has been encouraged, not only for the purpose of creating interest and attention, but also for supplying aids to learning. Nuernberg writes that "the fact remains that our teaching of religion can be made more interesting, impressive, meaningful, and lasting when suitable activities are used." [Italics mine.]³⁹ X

Kuehnert also urges the provision of opportunities for experience for pupils.

Expression and child activity is [sic] not out of place in religious instruction. The teacher has ample opportunity to provide for it, and the instruction or guidance of the child will be much more effective if this principle is applied. As children learn to write by actually writing and to draw by drawing, instead of merely being told to form and shape letters and merely being informed about rules of perspective and principles underlying color combinations, so a child may and should be permitted and directed to plan and organize and construct in connection with his work in Bible History and Catechism and memorizing.⁴⁰ X

39. W. Nuernberg, "Activities in Religious Education," Lutheran School Journal, LXXIX, 6, (February, 1944), p. 253.

40. Kuehnert, Directing the Learner, p. 39.

On the other hand, Kuehnert warns against the "claim that religious education and training can take place only through actual personal experience."⁴¹ A.C.Mueller would also reject that same trend in education. However, he recognizes that "doing" or experience involves mental and emotional activity as well as the actual physical performance, but he senses that the emphasis has been placed upon the physical side, or upon the training rather than upon the instruction. His articles are directed against this over-emphasis upon training. The following quotations from two articles should present several of the main points in his argument against the assertion that all learning is physical experience.

It is sheer folly to ask an immature child to learn the most important things in life through experience, when even mature adults come into possession of the most fundamental truths by means other than experience. The wisdom of the ages is enshrined in theology, philosophy, and great literature, and the most fundamental facts about life, government, God, man, and the world are still learned by children on the authority of older and more experienced persons.

We are capable of acquiring knowledge, functional knowledge, otherwise than through experience, because the Creator has endowed us with mentality, or reason.

Again, Progressives refute themselves when they insist that we learn only through experience. Is their

41. Ibid., p.7.

experimentalism the product of experience? No, it is the product of reflective thinking, or reasoning, or of speculation.⁴²

A person may be learning when he follows the logical presentation of his teacher and pigeonholes certain facts, or when through discussion he gains fresh insights into doctrinal problems or practical problems of the Christian's daily life. He is learning, for example, when the teacher excites his emotions and causes him to be inwardly stirred up and incensed over Jezebel's injustice in having Naboth condemned by false witnesses and stoned to death.⁴³

Before making any evaluative statements for or against learning by experience, the present writer should become better acquainted with the definition of experience proposed by Dewey, who, it appears, is bearing at least part of the attack. But we may still attempt several conditional statements.

First, if a meaning can be derived from an experience and a concept from a group of such meanings, experience, at least to any follower of Bode and Orata, is important in the process of learning and in the trans-

42. A.C.Mueller, "Do 'We Learn By Experience'?" Lutheran Education, LXXXIII, 5, (January, 1948), pp.273. 274.276.

The reference to the speculative or reflective thinking of the Progressives brings to mind again the second method used in the experiment performed by Hendrix. Whether Progressivism was born out of speculation or pure reflection, rather than out of Dewey's own experience, may perhaps be debated. Further experimentation, however, which is directed toward the area pointed out by Hendrix, should help to clarify the role which experience plays in learning and in the transfer process.

43. A.C.Mueller, "Relating Religious Instruction to Life," Lutheran School Journal, LXXXII, 6, (February, 1947), p.246.

ference of learning. Kuehnert indicates this importance in his course written for Sunday School teachers.

The young child comes to school with an appreciable stock of skills and concepts and attitudes, largely gained by experience. With the school or Sunday-school a new agency begins to assist in the work of guiding the child's learning which was begun in the home. While the surroundings are different and the guiding becomes more systematic, the learning process does not change. Experience remains an important factor in the child's learning. Therefore the teacher must be conscious of the part experience plays if his guiding and directing is to be successful. *Italics mine.*⁴⁴

Second, if the mental process is considered the essence of transfer and if experience is interpreted as something outside the area of mental activity, experience can be necessary to transfer only 1) in so far as it may help to set the mental machinery into operation; 2) in so far as it provides the ideas with which the mind is to work; and finally 3) in so far as it provides a situation to which that which has been learned can be transferred. The above quotation from Kuehnert and also the following one support the necessity of the first and second areas set forth in this statement.

In the teaching of religion as well as in the teaching of other subjects children will understand better and develop new ideas more readily if the teacher

44. Kuehnert, Directing the Learner, p.25.

uses the child's past experiences and teaches new concepts on the basis of the old, that is, those which the child has previously learned.⁴⁵

These statements set forth the validity of the third area:

Since religious training has value only in so far as it is actually applied to the individual's life, it is vitally important that the pupil's learning be associated with self-activity.⁴⁶

But the principle of learning by doing in its application to religious training involves another highly important aspect which the Christian teacher dare not overlook. We must at all times strive to train our pupils so that their conduct will reflect the faith that is in them. Knowledge obtained and principles learned must be translated into practice. Christian virtues, the result of faith, are to be woven into the very fabric of life and are not to be mere ornaments which are only occasionally displayed.⁴⁷

Third, if experience is defined as an activity involving any mental or emotional, as well as physical, behavior, it must be considered of central importance in the transfer process whenever it fulfills those essential conditions required by an explanation of transfer.

The importance of experience in learning and transfer cannot be denied. Since, however, this whole matter appears to be a phase of the heredity-environment question, the exact extent of the influence of experience will likely remain undetermined.

45. Ibid., p.IV.

46. Ibid.

47. Ibid., p.40.

Summary and Concluding Remarks

There is an abundant amount of evidence available for the support of the theory of generalization. Charles Judd is a chief exponent of the theory.

As it is employed in this explanation of transfer, generalization is a mental process in which the individual groups a number of related experiences into some sort of pattern. Such a pattern, or the principle which has resulted from relating a group of items of knowledge, will help the individual, when he is in one situation, to recognize an element which is similar to one he has seen and learned before.

In formal education this theory implies the need for training in the process of generalization, in the recognition of relationships in all subjects, and in the application of knowledge.

Generalization may also be defined in terms of concepts and meanings. Bode and Orata describe it as the detaching of meanings from their original experiences and grouping them together under a general concept. Hence transfer becomes a process in which the individual applies meanings to new situations in such a way that he can deal with them in a satisfactory manner. The purpose of formal education is then the provision of an environment and such experiences which will

be helpful in the derivation of meanings and in the formation of concepts.

Gertrude Hendrix recently completed an experiment in which she compared the effectiveness, in respect to transfer, of three methods of generalization. Her results show that those subjects who learned a "generalization" by the un verbalized-awareness procedure had greater transfer power than those who were trained by other methods. If this new development is substantiated by further evidence, it should reveal a need for some rather startling changes in instruction.

The theory of generalization with its implications seems to be recognized by most of the prominent Lutheran educators. The failure of the theory to produce any transfer effects when it is put into practice may be due to the fact that the students have really done no generalizing at all, even though the instructor has presented the material according to an approved method.

Learning by experience is encouraged in Lutheran educational literature. However, Lutheran writers inveigh against the tendency to emphasize the outward training to a practical exclusion of mental and emotional training. X

Perhaps the chief issue against the theory of generalization is its apparent omission of affective factors. The explanation serves well for intellectual

learning and its transference, but there appears to be no allowance for affective, or emotional, learning. Since affective factors seem to play such an important part in all forms of education, they should receive an important position in any explanation of the transfer of learning. No evidence has been organized in discussions of the transfer problem to show that other than purely intellectual factors should be considered. There have been several theories of recent origin, however, not included in the investigation of this paper, which do emphasize the affective aspect.⁴⁸

48. Cf. Harold Tuttle, A Social Basis of Education, pp.153-55. Tuttle, "That Vague Word, Conditioning," The Journal of Educational Psychology, (September, 1941), reprint copy, pp.431-37. Edward Thorndike, The Psychology of Wants, Interests and Attitudes, Gordon Allport, Personality, pp.286-85.

CHAPTER V

CONCLUSION

The transfer of training refers to the application of a learned skill, item of information, judgment, or emotional response in any situation which the individual meets. Many theories have been proposed for an explanation of the nature of the transfer process. This paper surveys the representative theories: the traditional doctrine of formal discipline; Edward Thorndike's theory of identical elements; and Charles Judd's theory of generalization.

Formal disciplinarians received their initial and basic support from the faculty psychologists of the pre-twentieth century period who claimed that the powers or faculties of the mind were innate and localized in specific areas of the brain. The disciplinarians argue that these powers may best be developed by exercise in selected forms of material. The subjects in the classical curriculum have been established as best suited for such mental discipline. According to the theory, the individual who is thoroughly trained by the methods of formal discipline should be able to perform the process

of transfer automatically in every situation that would require the use of one of the trained mental faculties.

Experimental evidence which began to appear especially at the start of the twentieth century soon — showed that the position of the formal discipline theory was weak. It was found that mere exercise did not always produce transfer and that the faculties did not own a rigid location in the cerebral cortex.

Proponents of the first opposing transfer theory inferred from their experiments that mental functions are specific rather than general, because only the very specific training which their subjects received would reveal any carry-over effect. Upon the basis of these results the theory of identical elements was formulated. It states that transfer occurs only when two situations contain identical elements; the elements are to require a specific mental function for their learning and for their re-use in the transfer situation.

Thorndike's connectionist or bond psychology explains the psychological basis for the theory. All acts and functions in the behavior of the individual are identified by the definite bonds or pathways formed for them in the nervous system.

Enough evidence has been produced by physiological and other experiments to cause one to discount many of the claims of the connectionist. Other psychologists

point out that mental functions need not be only specific. The reason for the slight amounts of transfer which resulted from the training given by Thorndike and his followers in their experiments is seen to involve the methods of training and procedure employed and not the specificity of the functions. These methods - routine drill and habit formation - are those which are used by the theory of identical elements when it is applied to classroom teaching. In practice the theory results in little transfer when more could be gained, and it also develops products with a mechanically-minded character.

The experimental results which are directed against the theory of identical elements are taken together with others to define the transfer process in an explanation of generalization. Generalization is the mental process of relating experiences in a manner which enables an individual to recognize situation-elements as belonging to a previously formed pattern. According to Bode and Orata generalization involves the detaching of meanings from experiences, combining the meanings, and forming general concepts. For education the theory of generalization in all of its forms points out the necessity of training pupils in the thought-processes which will help them see relationships, formulate concepts, and make applications in the appropriate situations.

A review of the current Lutheran literature dealing with principles, methods, and objectives of religious education reveals no serious attachment to the theories of formal discipline and identical elements. Some teachers and writers in the past did adhere to laws of learning which were related to exercise and repetition (in their original meanings) and to an over-emphasis of facts and deeds. This adherence apparently did result in various degrees of verbalism, legalism, and moralization. Although evidences of these results may still be existent in actual current practice, at least the writers in the recent issues of the periodicals and the authors of the later brochures and books seem to be free of most of these tendencies which conflict with the more acceptable parts of the theories of the transfer of training.

Another recognized result of Lutheran religious teaching is still not explained by the theories thus far surveyed in this paper. This is intellectualism. It refers to the possession of a full comprehension of a body of subject matter and to the lack of the dynamics which will promote the transfer to behavior.

Several theories have been proposed in secular education which seem to be on the right track toward the provision and explanation of the dynamics of learning and its transference. These presentations refer es-

pecially to the development and learning of affective factors such as interests, aversions, emotional responses, portions of attitudes and ideals, and the like. These factors, it seems, hold part of the answer to the problem of the cause of transfer.

References to affective processes are not strange to readers of Lutheran literature. Some of the writers, however, appear to be confused about the role which the affective processes play in learning. Others say that behavior is a result, first of the acquisition of knowledge, and second of an appeal to the emotions, with the two coming in that order. Still others go only so far as to say that the emotions do produce the dynamic power for behavior. In many cases, when arbitrary statements are made, adequate supporting evidence is not supplied.

The real dynamics of learning and behavior, and the relation between intellectual and affective processes at least in their behavioral aspects are two of the problems which require further study and investigation before a fuller comprehension of the process of transfer can be achieved. Other broad matters similarly involved in this connection include the problems of determining the best methods of generalization; defining the place of semantics in the learning process; determining the relation between learning and experience; ascertaining

the educational implications of new suggestions for explanations of the transfer process; and, if possible, securing Biblical evidence affecting the suggested theories or items of the theories.

In general, the transfer of training remains a problem which is worthy of deliberate study by all who are engaged in any form of teaching as well as by all theorists.

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