

Transfer of Training/Transfer of Learning

The problem of transfer of training is one of the most interesting and important problems in the study of education and educational psychology. Learning is dynamic process and what is learnt in one situation must have some transfer value. A professor of mathematics would always say "mathematics and language are the meat and potatoes of education diet." The problem of transfer determines to a large extent the programmes, contents, methods and objectives of education.

(1) NATURE OF TRANSFER OF TRAINING

Meaning and Definition of Transfer of Training :

1. **Crow and Crow** : "The carry over of habits of thinking, feeling or working of knowledge or of skills from one learning area to another is usually referred to as the transfer of training."
2. **Peterson** : "Transfer is generalization, for it is extension of idea to a new field."
3. **Guthrie and Powers** : "Transfer may be defined as a process of extending and applying behaviour."

From the above definitions we can conclude that transfer of training occurs when the results of learning in one situation affect our performance in different situations or when training in one activity affects other forms of activity. In simple words it implies carry over of learning from one situation to another. For example, if learning the riding of a horse is found to be helpful to the learning of riding a bicycle, we can say that there is transfer of training from horse-riding to cycling. If one is not going to help another, there is no transfer or 'carry over' from one area to the other.

Types of Transfer :

1. **Positive Transfer** : When learning of one activity facilitates the learning of another activity, it is known as positive transfer. For example if writing of English facilitates the writing of Hindi, transfer is positive in nature.
2. **Negative Transfer** : When previously learnt activity interferes with the learning of another activity, it is known as negative transfer. Negative transfer is illustrated by the child, who has learnt that the plural of "book" is "books" applies this knowledge in such a way that the plural of "sheep" comes out to be "sheeps". The negative transfer is also called habit interference.

3. **Zero Transfer** : When learning of one activity neither facilitates nor interferes with the learning of a new task, it is said to be zero transfer. There may be zero transfer between language and mathematics. This type of transfer, generally, does not exist.

Theories of Transfer :

1. **Formal Discipline Theory** : It is also known as faculty theory of transfer because it is based on faculty school of psychology. According to this theory mind of the child is composed of various independent faculties like memory, imagination, attention, thinking, reasoning, temperament, will and judgement. This theory believes that a particular faculty works in every situation. For example if a person possesses good reasoning, he can use it in any situation. He will be able to reason anything – a sum of arithmetic, a problem of science or logic. So these faculties of the mind should be trained.

Criticism : Modern psychologists do not accept formal discipline theory because they say :

(1) Improvement in one single activity may not improve the other. It may injure it.

(2) The present day curriculum is not based on any faculty notion of mental faculties but it is based on the value of the subject in social and practical situation. At present various skills and faculties are taught directly but they cannot be taught indirectly by transfer.

2. Theory of Identical Elements (Components) : This theory was put forward by Thorndike. He says that transfer of training depends upon the extent of common elements or components between the two situations. He stated that the study of a particular subject can be helpful in the study of another subject. For example the knowledge of history is useful in the study of geography, because both the subjects are inter-related. They have certain common elements or components.

3. Theory of Generalisation : This theory was given by Judd. According to him degree of transfer is proportional to degree of generalisation. Generalisation means to find out the relevant relationship between the two situations. Judd, believed that experience in one situation could be generalised and applied by the learner in other situation. He demonstrated his experiment in 1908 to explain his theory. He performed his experiment on children and that experiment was to hit the target under water with darts. He divided the class into two groups—one was experimental group and the other was controlled group. The experimental group was given a full theoretical explanation of the law of refraction and the other group was not given any experimental training. It was found that in hitting the target under water experimental group fared positively because it knew the law of refraction. The general conclusion is that the understanding of the theoretical principle of generalising experience contributes greatly to transfer effect.

4. Spearman's Two Factor Theory : According to Spearman learning depends upon two factors— one is "G" (General Factor) and the other is "S" (Specific Factor). "G" factor is used in every activity whereas "S" factor is used only in certain specific activity. So it is said that transfer is greater where "G" is used and transfer is less where "S" is used.

5. Gestalt Theory of Transfer : According to this theory transfer depends upon the whole part relation between the old and the new situations. If the learner understands the total situation transfer will be more and if he does not understand the total situation transfer will be less.

6. Theory of Ideals : The theory was put forward by Bagley. He believed that ideals are deeper than generalizations. Hence ideals are the basis of transfer. Ideals once adopted, are applicable to all situations. Ideals like thirst for knowledge, spirit of enquiry and love for wisdom are transferable from one subject to another.

All the theories are complementary and not contradictory. They are very close to each other and hence they emphasise different aspects of the same truth. All the theories reveal that transfer of training does occur.

Experiments on Transfer of Training :

1. Experiments on sensory-motor transfer : Many experiments on sensory-motor transfer have been conducted. Some of the well known experiments in this direction are :

(i) **Starch's Experiment :** Starch experimented with the mirror drawing of a star. The subject was asked to trace the figure of a star with his left hand while looking at a figure in the mirror. The time taken in doing it was noted. Then he was asked to trace the figure with his right hand. The subject was given practice for ten days. After that he was asked to trace with the left hand. It was observed that now the subject could do it in lesser time than before. It proves that skill has been transferred from hand to hand. The other studies of similar nature are by Evert, Munn, Brey and Cook.

(ii) **Webb's Experiment :** Webb tried to determine whether learning to thread a pathway through a maze with a stylus aided, hindered, or had no effect in learning several other mazes. He also tested the effect of learning several mazes upon the first maze; that is he measured the transfer effect of maze A upon mazes B, C, D, E and F, and also the transfer effect of mazes B, C, D, E and F upon maze A. Both animal and human subjects were used in this experiment. The results revealed that maze A aided in the learning of the other mazes, and the other mazes aided in the mastering of maze A. The degree of positive

transfer varied from 19 percent to 77 percent. The results of the experiment prove that there is positive transfer from one sensory-motor material to another. In this experiment it was also noticed that the individual differences play significant role in transfer effects. The degree of transfer also varied with the direction of learning.

2. Experiments on perceptual materials : E.L. Thorndike and R.S. Woodworth carried out a number of experiments in the area of perception. They tried to find out if there was any transfer effect of training in estimates of areas, length and weights of various shapes and sizes, upon the ability to estimate areas, lengths and weights similar in shape but different in size, different in shape but similar in size ; and different in shape and size. They also conducted several experiments to find out the effect of training in various forms of perception and observation on the perception and observation of slightly different forms. Their general inference was that improvement in any single mental function rarely brings about equal improvement in any other function, however, similar they may be, for the working of every mental function is conditioned by the nature of the material in such particular area.

3. Experiments on memory : Some of the important experiments dealing with memory materials and transfer are as under :

(i) **Experiment of William James :** Experiment of James (1890) throws light on the transfer of training of memory materials. This experiment is described in his book "Principles of Psychology" published in 1890. For eight successive days he learned 158 lines from Victor Hugo's *Satyr* and kept account of the time it took him i.e., 132 minutes. He then trained his memory by practising about 20 minutes per day for 38 days in learning the first book of Milton's *Paradise Lost*. Thus he devoted this period for practise in memorisation. Then he selected 158 lines from the *Satyr* and memorised them. To his surprise it took him 151 minutes, i.e., more than what was needed on the first occasion. He explained this loss due to his being tired. His conclusion was that there was no improvement due to training. It led to the refutation of the theory of formal discipline.

(ii) **Experiment by Winch :** W.H. Winch conducted a controlled experiment by having two equated groups with the same memory ability, one experimental and the other control group. The experimental group was given practice in memorising poetry for two weeks ; the control group had no such practice. It was found that the experimental group did better than the control group.

(iii) **Experiments by W.G. Sleight :** Sleight, an English psychologist, made some of the best experiments in the field of memory and training. He tested the effect of memorising poetry, tables and prose substance upon the ability to memorise dates, non-sense syllables, poetry, prose and letters etc. It was observed that in some instances little or no transfer took place, in other instances, a small amount of positive transfer occurred, whereas in still others, negative transfer was resulted. Two significant conclusions reported by Sleight are :

- (a) There appears to be no general memory improvement as a result of practice.
- (b) Memory activity may not be co-related.

Many other investigations signify that practice does not improve memory. The transfer of memory depends upon the specific activity exercised and its relation to memory activity to which it is transferred.

4. Experiments on reasoning materials : A number of experiments in the transfer of training in reasoning have been made :

(i) **Experiment by Winch :** W.H. Winch used school children to determine the value of training arithmetical reasoning problems in solving other logical problems. He trained the experimental group in arithmetical problems, and found that this group did 30% better in logical reasoning than did the control group which was not given any training in arithmetical problems. Hence it can be concluded that training in arithmetical reasoning can be carried over in a helpful manner in solving other logical problems.

(ii) **Experiment by Barlow :** M.C. Barlow, on the basis of his experiment, claims that skill in reasoning is improved by teaching definite methods of reasoning. He trained one group of seventh and eighth graders in how to analyse verbal problems and how to state general principles. He found that this training resulted in substantial gains on reasoning problems that were quite different in content from those used during practice.

(iii) **Experiment by Ulmer** : In an experimental study with 1239 high school pupils, G. Ulmer tested the value of a course in geometry for training in reflective thinking. He concluded that, if definite methods of reflective thinking were stressed in the learning of geometry there would be a resultant improvement along such lines in other learning situations. If the course in geometry was taught with no such emphasis no general improvement in reflective thinking was resulted.

5. Experiments on ideals : In the field of morals and ideals it has been found that honesty is a very specific response. Qualities like neatness and tidiness in one area may be transferred to other areas. Bagley emphasised neatness and accuracy in arithmetic papers to a third-grade group of children. Nothing was said to the children about being neat in their other papers. However, their papers in spelling and language were scored for neatness and accuracy. It was observed that neatness and accuracy had decreased rather than improved in these papers. In another investigation, Bagley went a step further. He emphasised neatness in all the papers and the children were told the advantages of neatness. The papers were rated for neatness. He found considerable improvement. Hence he concluded that ideals can be transferred.

6. Experiments on problem solving : Some well known experiments in the area are :

(i) **Gray's Experiment** : Gray made a composition of two types of learning by means of a substitution test. He conducted an experiment in code substitution with two equated groups. He gave initial test and then gave training in a new code to the experimental group by a method in which emphasis was placed upon its logical relationship. Then both groups again were given code substitution tests. The experimental group showed an advantage of 20% in its performance over the other group.

(ii) **Judd's experiment** : For this experiment please read page 629.

(iii) **Other experiments** : Experiments conducted by Reuediger Hendrickson and Schroeders, Gates and Katana show that understanding, organising and generalising experiences contribute greatly to transfer effects.

7. Experiments on School Subjects : Various experiments have tested the transfer value of elementary school subjects.

(i) **Experiment by Briggs** : T.H. Briggs analysed the disciplinary value of studying formal grammar. Two groups of seventh grade children were equated in intelligence. The tests were then given to both the groups. Next, the first group studied grammar for three months, while the other group studied language and composition. At this time the tests were again administered. Then first group studied language and composition for three months, and the second group studied grammar. At the end of this three month period, the tests were again given to both groups. It was found that grammar groups improved in only one of the abilities measured, the ability to see likenesses and differences.

(ii) **Experiment by Winch** : W.H. Winch conducted an experiment to prove whether training in arithmetical computation transfers in such a manner as to show an improvement in arithmetical reasoning. He took up two groups of ten-year-old students who were equal in their ability to solve reasoning problems in arithmetic. One group practised arithmetic computation 30 minutes a day for 10 days ; the other group practised drawing. After ten days, both groups were tested for arithmetical reasoning ability. It was found that both groups did equally well. Hence it was concluded that students may study arithmetical computation without any guarantee of improvement taking place in reasoning in arithmetic.

(iii) **Experiment by Thorndike** : E.L. Thorndike made an experiment to determine the transfer value of high-school subjects. He used over 8000 students, gave them preliminary intelligence test, studied them during one year's instructional period in a high school, and again tested their intellectual capacity to find out whether one year's instruction had any transfer effect upon intellectual activity. The students showed a gain of 23 points on the second test. Approximately 50% of the gain was due to the previous experience in taking the first test, and about 50% to the high school course studied for a year. The highest 1% of the students gained $20\frac{1}{2}$ points, while the 1% pupils of the lowest intelligence gained only about $\frac{1}{3}$ points. On the basis of these results it was concluded that the intelligence of students was a larger contributing factor to improvement than were the subjects studied in high school for a year.

(iv) **Experiment by Wesman** : A.G. Wesman found correlation between intelligence test scores and achievement test scores at the beginning and end of a school year. He concluded the presence of transfer.

(v) **Experiment by Rugg** : H.O. Rugg found that a course in descriptive geometry transferred 32% to other geometrical materials, but only 7% to non-geometrical materials.

(vi) **Experiment by Hewins** : N.P. Hewins, a teacher of botany, measured student ability to observe, and then trained them for a period of time in observing botanical materials. The amount of transfer from this training was 33.9% to other botanical materials and 5.4 percent to non-botanical materials.

(vii) **Another experiment of Thorndike** : From 1921 to 1924, E.L. Thorndike made another experiment to determine the transfer value from Latin to English. It was found that high school freshmen who studied Latin for a year gained in a knowledge of English words of Latin origin about $2\frac{1}{2}$ times as much as did freshmen who did not take Latin. He further found that the study of Latin causes an improvement in students' knowledge of the English language about 10% higher than the improvement of those not taken Latin. *W.W. Coxe* founhd that Latin increases the ability to spell words of Latin origin, but the transfer is negative in relation to spelling words of non-Latin origin.

(viii) **Thorndike's experiment on transfer of school subjects** : One of the most important and interesting studies of transfer of academic training was made by Thorndike. He studied the effect of a year's work in such school subjects as Latin, Mathemtics and History as well as shopwork and book-keeping. All the students included in this study were first given a test on selective and relational thinking. At the end of the year, a parallel form of the same test was given. The results in the following table indicate the relative effect upon development in reasoning of a year's study in ten subject matter areas :

<i>Group of Subjects</i>	<i>Relative effect of test gains</i>
1. Algebra, Geometry, Trigonometry	2.99
2. Civics, Economics, Psychology, Sociology	2.89
3. Chemistry, Physics, General Science	2.71
4. Arithmetic, Book-keeping	2.60
5. Physical Training	0.83
6. Latin, French	0.79
7. English, History, Business, Drawing	0.00
8. Stenography, Cooking, Sewing	-0.14
9. Biological Science, Agriculture	-0.43
10. Dramatic Art	-0.48

Thorndike concluded that both the liberal subjects, like Latin, Mathematics, and History as well as professional subjects like Business and Book-keeping have little effect on selective and relational thinking and there is no marked balance in favour of any one.

(2) FACTORS INFLUENCING TRANSFER OF TRAINING

1. **Meaningfulness of contents** : If the contents are meaningful transfer will be more.
2. **Similarity of contents** : Transfer of training is possible when there are some similar contents between the two situations e.g. in civics and political science, history and geography.
3. **Similarity of techniques and principles** : If the techniques and fundamental ideals or principles are similar in the two situations, transfer will be more. For example in football and hockey, most of the techniques are common.
4. **Methods of teaching** : Transfer of training to a great extent depends upon the methods of teaching. So transfer of training occurs if the methods of teaching are life like, interesting and effective.
5. **Meaningful learning** : The more meaningful is the learning the greater are the chances for its transfer, that is transfer depends upon understanding, that is why rote learning is not desirable.
6. **Intelligence** : The amount of transfer is closely related to the intelligence of the learner. Brighter children tend to transfer their learning more effectively than average or dull children.
7. **Deliberation** : Transfer very much depends upon a deliberate effort on the part of the learner to interpret a new situation in the light of the past.
8. **Generalisation** : Generalisation is said to be the crux of transfer of training. The more we generalise our reactions the more are the chances for transfer of training from one situation to another.

(3) HOW TO ACHIEVE MAXIMUM POSITIVE TRANSFER ?

OR

EDUCATIONAL IMPLICATIONS OF TRANSFER OF TRAINING

Following are suggestions for achieving maximum positive transfer :

(1) Suitable Curriculum :

There is an urgent need to bring desirable changes in the present curriculum. It is unpsychological, unprogressive, narrow, rigid and divorced from actual life. Improvement is needed in the curriculum from the point of view of transfer of training :

1. **Integrated curriculum** : Curriculum should be an integrated whole so that there may be positive transfer of training. Hence correlation should be given due weightage while determining the curriculum. Special attention should be paid to the following types of correlation :

- (1) Correlation among different subjects of the school curriculum.
- (2) Correlation of school subjects with physical and social environment.
- (3) Correlation of different branches of the same subject.
- (4) Correlation of different topics within the same branch.

2. **Practical and utilitarian curriculum** : Curriculum should be of some practical use for the students. It should be associated with day to day interests and needs of the learners. It should be directly related to vocational interest, health and safety needs, citizenship of recreational activities of the pupils and social environment.

3. **Guidance in the selection of curriculum** : The students must be guided in the selection of such courses which have maximum transfer value.

(2) Suitable Methods of Teaching (Role of Teacher in Transfer of Training) :

Effective methods of teaching should be used for increasing the possibilities of transfer. The following suggestions are offered in this direction :

1. Emphasis on correlation : Emphasis should be laid on correlation so that previous knowledge may be used in the new task. For example grammar of mother tongue should be related to the grammar of foreign language.

2. Co-ordination between theoretical knowledge and practical experiences : Students should be encouraged to apply their classroom techniques to the practical life situations.

3. Use of illustrations and audio-visual aids : Effective use of models, charts, maps, graphs, diagrams, blackboard and other audio-visual aids should be made while teaching. Proper use of verbal illustrations like analogies and comparisons, stories and anecdotes, similes and word pictures should be made.

4. Emphasis on intelligent methods of learning : Intelligent methods of learning should be encouraged. Rote learning should be discouraged.

5. Use of life like methods : Methods of teaching should be made life-like, psychological, child-centred, interesting and effective. There should not be gap between theory and practice.

6. Use of practice : Provide practice in transfer. Also provide practice in guarding against old expectations or mental set.

7. Attitude of transferability : Attitude of transferability should be fostered among the students.

8. Special attention towards intelligent students : The amount of transfer is closely related to the intelligence of the learner. Brighter children tend to transfer the learning more effectively than average or dull children. The brighter children will be quicker to recognise the element of similarity. Hence the teacher should pay special attention to intelligent students from the point of view of transfer of training.

9. Use of generalisations : To generalise is to summarise which is common to a number of principles, ideas and situations. Generalisations formulated by pupils themselves in their own words, are more useful and appropriate. The teacher should keep in mind that for maximum transfer, the generalisations should be thoroughly mastered and completely understood. The teacher should provide wide variety of opportunities for application. This would enhance meaningfulness, understanding, completeness of knowledge and thoroughness of learning.

10. Laws of association : The teacher should make the best use of laws of association for providing different types of knowledge.

11. Use of concentration : The teacher should concentrate both on the process and product of learning. He should keep and develop logical thinking in constant focus.

12. Deliberate and purposeful efforts : There should be purposeful and deliberate efforts on the part of the teacher to secure definite transfer value. Students should be given a chance to make and use generalizations.

Orata, P.T. remarked, "First, the teacher should know what it is that he wants the children to transfer to other fields ; second she must learn by experience or experiment how to teach for transfer, and third to go ahead and do it."

QUESTIONS

1. What is transfer of training ? Describe theories regarding transfer of training.
2. Explain nature of transfer of training.
3. How will you promote transfer of classroom learning ?
4. Discuss the role of teachers in transfer of training.
5. What is meant by transfer of learning ? Discuss the conditions under which transfer of learning takes place. Explain its significance to the teacher.
6. What steps can a teacher take to facilitate maximum positive transfer ?
7. How can transfer of class-room learning be promoted ?