

---

“शिक्षा मानव को बन्धनों से मुक्त करती है और आज के युग में तो यह लोकतंत्र की भावना का आधार भी है। जन्म तथा अन्य कारणों से उत्पन्न जाति एवं वर्गगत विषमताओं को दूर करते हुए मनुष्य को इन सबसे ऊपर उठाती है।”

— इन्दिरा गांधी

---



---

*“Education is a liberating force, and in our age it is also a democratising force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances.”*

— Indira Gandhi

---



Block

# 2

## **ET: A SYSTEMS APPROACH**

---

### **UNIT 5**

**Systems Approach and Problem Solving** **5**

---

### **UNIT 6**

**Feedback Mechanism** **23**

---

### **UNIT 7**

**Transfer of Training** **40**

---

## EXPERT COMMITTEE

Prof. R.G. Takwale Ex VC, IGNOU	Shri V. Rama Rao EMPC, IGNOU	Dr. Kamallesh Rai NCERT
Prof. B. C. Agarwal TALEEM, Ahmedabad	Prof. M.S. Yadav Senior Consultant SOE, IGNOU	Dr. K. Subrahmanyam NIC
Prof. G.T. Lalla TTTI, Bhopal	Prof. R. Natarajan IIT, Madras	Prof. M.M. Pant SOCIS, IGNOU
Prof. D.R. Goel CASE, M.S. University, Baroda	Prof. S.S. Kulkarni Narayan Ashram, Maharashtra	Prof. S.K. Panda STRIDE, IGNOU
Prof. Chandra Bhushan NCERT	Shri Kiran Karnik CEO, Discovery Communica- tion India	Prof. M. B. Menon SOE, IGNOU
Prof. R.L. Phutela NCERT	Dr. N.K. Sehgal Dept. of Science and Technol- ogy, Delhi	Prof. SVS Chaudhary SOE, IGNOU
Prof. P.K. Bhattacharya NCERT	Dr. Sugata Mitra NIIT	Prof. M.C. Sharma SOE, IGNOU
Prof. S. Mukhopadhyay SCERT, Delhi	Dr. G. Rajgopalan School Net India	Prof. M.L. Koul SOE, IGNOU
Prof. Mohd. Mia PEP DPEP, Delhi	Dr. B. N. Biswal NISI	Prof. Vibha Joshi SOE, IGNOU
Prof. Veena Kumar IIT, Delhi	Dr. T.K. Swatantra Devi Bharathidasan University	Prof. N.K. Dash SOE, IGNOU
Prof. Usha Reddi CEMCA	Dr. Sushmita Mitra Indian Society for Technical Education	Prof. C. B. Shrama SOE, IGNOU
Ms. Jai Chandiram Indira Gandhi National Center for Arts		Ms. Poonam Bhushan SOE, IGNOU
		Dr. M.V. Lakshmi Reddy SOE, IGNOU

## COURSE PREPARATION TEAM

Course Contribution	Content Editing	Language Editing
Ms. Kiran Gupta Lecturer Amity Institute of Education Saket, New Delhi	Prof. O.S. Dewal Former Principal Regional Institute of Education, Ajmer	Dr. Parmod Kumar Lecturer. School of Humanities IGNOU, New Delhi
Prof. S.V.S. Chaudhary Vice-Chairperson National Council for Teacher Education, New Delhi	Design, Formatting and Course Coordination: Prof. N.K. Dash School of Education, IGNOU, New Delhi	
Prof. N.K. Dash School of Education, IGNOU, New Delhi		

**Acknowledgement:** Contribution of Prof. SVS Chaudhary. (SOE, IGNOU), as the earlier coordinator of the PGDET programme and this course is duly acknowledged.

## PRODUCTION

Mr. B. Natrajan Dy. Registrar (Pub.) MPDD, IGNOU	Mr. Jitender Sethi Asstt Registrar (Pub.) MPDD, IGNOU	Mr. Hemant Parida Proof Reader MPDD, IGNOU
--	---	--

November, 2011 (Reprint)

© Indira Gandhi National Open University, 2009

ISBN-978-81-266-3975-5

All rights reserved. No part of this work may be reproduced in any form, by mimeograph or any other means, without permission in writing from the Indira Gandhi National Open University.

Further information on the Indira Gandhi National Open University courses may be obtained from the University's office at Maidan Garhi, New Delhi-110 068.

Printed and Published on behalf of the Indira Gandhi National Open University.  
New Delhi, By Registrar, MPDD.

Laser Typeset by Tessa Media & Computers, C-206, A.F.E.-II, Jamia Nagar, Okhla, New Delhi

Printed at : Young Printing Press, 2626, Gali No.7, Bihari Colony, Shahdara, Delhi – 11 00 32

---

# MES-031 ET – AN OVERVIEW

---

## **Block 1 Introduction to ET**

- Unit 1 Nature of ET
  - Unit 2 Impact of ET
  - Unit 3 Making ET Attractive
  - Unit 4 ET: Evaluation, Research and Implications
- 

## **Block 2 ET: A Systems Approach**

- Unit 5 Systems Approach and Problem Solving
  - Unit 6 Feedback Mechanisms
  - Unit 7 Transfer of Training
- 

## **Block 3 Learning & ET**

- Unit 8 Learning: Concept and Forms
  - Unit 9 Implications of Learning Theory
  - Unit 10 Impact of ET on Learning
  - Unit 11 Trends in Learning Approaches
- 

## **Block 4 Policy Issues for ET**

- Unit 12 A Global Overview on ET Policy
  - Unit 13 Evolving Policy Perspectives in Educational Technology
  - Unit 14 ET Infrastructure/ Initiatives
  - Unit 15 Policy Implementation and Impact Assessment
-

---

## BLOCK 2 ET – A SYSTEMS APPROACH

---

### Introduction to the Block

After having gone through the nature of educational technology and its impact on teaching learning system in Block – 1, we will focus on the application of systems approach in the teaching-learning process, feedback mechanism and transfer of training in this Block.

Unit 5 deals with systems approach and problem solving. A system signifies a connotation of wholeness and comprises a number of components operating together in an interrelated and interdependent manner towards the attainment of certain goals. A system consists of five main components, namely, input, process, output, analysis and feedback and environment. Systems approach means studying the phenomenon as a whole. An instructional process is considered as a system. Systems approach to design and development instruction has four general stages, which we have discussed in the Unit.

Unit 6 is concerned with feedback mechanism in the teaching-learning process. Feedback refers to the process of receiving input from the environment based upon the output of a system. Feedback can be of two types, namely synchronous feedback and asynchronous feedback. The sources of feedback are learners, environment and human teacher. Feedback plays an important role in micro-teaching which aims at simplifying the complexities of the regular teaching-learning process. The major feedback devices are programmed instruction and interaction analysis. In the end, we discuss different channels of feedback.

Unit 7 focuses on transfer of training or learning. The process of one's own learning/training experiences being transferred to a new learning/training situation or more than one learning/training situations is called transfer of learning or transfer of training. There are four major theories of transfer of learning. These are mental discipline theory, theory of identical elements, theory of generalization and theory of transposition. Forms of transfer of learning are lateral and vertical, positive and negative and near transfer and far transfer. There are a few conditions which help transfer of learning. In the end, we discuss the role of teacher in the transfer of learning

---

# UNIT 5 SYSTEMS APPROACH AND PROBLEM SOLVING

---

## Structure

- 5.1 Introduction
- 5.2 Objectives
- 5.3 Concept of a System
  - 5.3.1 Definition
  - 5.3.2 Components of a System
- 5.4 Concept of Systems Approach
- 5.5 Teaching – Learning as a System
  - 5.5.1 Meaning of Teaching, Learning and Instruction
  - 5.5.1 Teaching-Learning as a System
- 5.6 Design and Development of Instructional System
- 5.7 Educational Technology (ET) and Problem Solving Approach
- 5.8 Let Us Sum Up
- 5.9 Unit-End Activity
- 5.10 Suggested Readings and References
- 5.11 Answers to Check Your Progress

---

## 5.1 INTRODUCTION

---

In Block 1, we have discussed in detail, the nature of educational technology, and its impact on teaching and different kinds of learning systems, ways and means to make educational technology popular and attractive and finally evaluation and research implications in educational technology.

In this unit, we will focus on the concept of systems approach, which is a means of looking at a problem in a holistic way, help solve problems and improve the working of existing systems. We shall also discuss the applications of systems approach in teaching and learning in general and problems solving in particular.

The concept of systems approach first emerged during World War II, when it was effectively used by the think tank of the armies for the optimal management of enormous man and machine power deployed in the war. Since then it has been successfully used in various fields of management especially industries, business, policy making by the government and defence forces. Its application in the field of education is relatively a recent phenomenon wherein it is being used as a strategic tool to achieve the best in the process of imparting education including planning, execution and evaluation.

---

## 5.2 OBJECTIVES

---

After going through the unit, you should be able to:

- define systems approach in the context of educational technology;
- discuss the application of systems approach in education in general and in the teaching-learning process in particular; and
- discuss the role of systems approach in problems solving.

---

## 5.3 CONCEPT OF A SYSTEM

---

The term 'system' is used by people from all walks of life, be it a layman or an educated and learned individual. It refers to the wholeness aspect of something. It signifies a connotation of wholeness, interrelationship between parts or elements and self-regulation.

### 5.3.1 Definition

Oxford dictionary defines system as follows:

- Organized or established procedure
- Methodically arranged set of ideas, principles, methods or procedure
- A regularly interacting or independent group of items forming a unified whole.

For example, when we talk about the Post and Telegraph system in a city, we do not refer to the postman, telegraph operator, the machines, method of sorting or delivery of the letters or the building but to the postal and telegraph system as a whole. The same holds true to any system of human body. For example, when we talk about the circulatory system, we do not talk about the heart, arteries, veins or capillaries separately but to the circulatory system as a whole. Similarly, education also is not an isolated unit but a complete system with students, teachers, curriculum, teaching methods, media, classroom environment and evaluation procedures as its sub-parts which function in unison to achieve the specified goals of education. In this way the term system may be understood as a self-maintaining, self-regulating device consisting of interrelated and interacting elements or sub-systems operating as a whole to achieve the predetermined purposes or goals with efficiency and productivity.

Based on the above definitions, characteristics of a system may be summarized as follows:

- System is a general term, which can be applied to many fields like engineering, industries, policymaking and education, etc.
- Aim of a system is to achieve pre-specified goals or objectives with utmost efficiency and economy.
- It consists of a number of elements or parts, which are interdependent and/or interrelated to each other.
- All the parts or elements of system have specified role assigned to them in order to achieve a particular task. However, all the components function in unison to achieve the specified goal.
- Relationship between various components of the system is not fixed and static. It is dynamic i.e. it keeps changing depending upon the change of strategy or goals.
- It has inbuilt checks and controls and therefore is capable of self-maintenance and self-regulation.

### 5.3.2 Components of a System

Let us now study how a system works. You have seen that every system has specific functions to perform or goal(s) to achieve. These can be termed as outputs or outcomes. In case of a school transport system, the function or the goal is to pick up and drop children from and at pre-determined places. In order to achieve this output, the school transport system requires buses/vans, drivers, cleaners, a transport manager, supervisory staff to ensure orderly and safe embarking and disembarking of the students, parking space for the vehicles and a room for the staff to operate and rest; all these can be termed as input. But by just possessing the components listed as input, the output will not be achieved. The school transport in-charge ought to have knowledge of all picking up and dropping points, plan the number of vehicles required, the routes and timings to be followed by various vehicles, contingency plan in case a vehicle breaks down or does not turn up, ensure adequate safety measures, arrangement for refueling of the vehicles etc. All these procedures can be termed as process. She/he will also have to evaluate the functioning periodically and change his/her plans according to the needs of the students or compulsions of the management of the school.

Therefore, as you can see from the above, any system consists of five main components. Let us discuss them taking another example of Income Tax system.

- i) **Input:** The input refers to what is put into the system. This may include resources (human, finances, machinery or hardware, etc). In an income tax system, the input will include the human resources like income tax commissioner and his staff, vehicles, offices, stationery, computing communication and information tools, finances for maintenance of human and other resources.
- ii) **Process:** The process refers to the functioning of the system i.e. whatever is going on in the system. In context of income tax system the process will mean disseminating information about the policies of government regarding payment of income tax by the public, finding out the details of persons who fall with in the purview of income tax, method of computing and collecting the tax, keeping a tag on the defaulters, having a method of redressal of complaints regarding over-assessment etc.
- iii) **Output:** The output is the final result or product of the system. In the example quoted above, it means generation of revenue for the government in a fair, uncomplicated and efficient manner.
- iv) **Analysis and feedback:** The analysis and feedback is done after the output is available. The final outcome is analyzed in the light of pre-determined goals and based on this feedback; action plan for achieving the goals is revised. In our context, we know that the income tax form has been revised and made simpler after receiving feedback on its complexities from the consumers.
- v) **Environment:** Environment refers to the physical, social and political conditions under which individuals and women etc. announced by the government are examples of influence of environment on the income tax system.

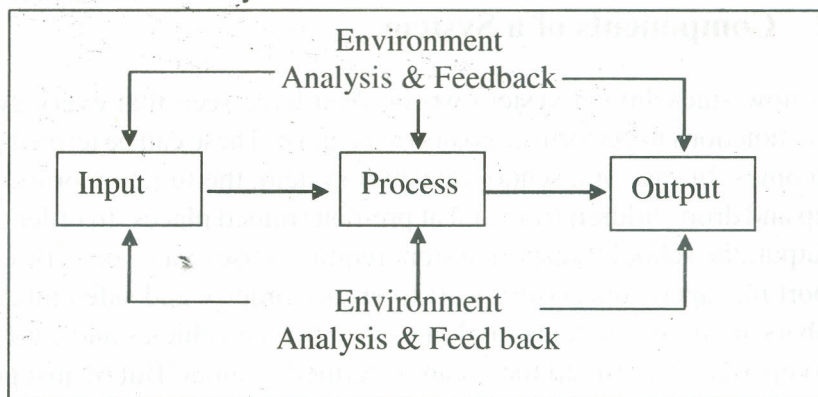


Figure 5.1: Systems components

**Classification of system:** A system can be classified as inanimate objects such as motor car, refrigerator, etc. or animate objects such as human, social organization, etc. They are also classified as closed-or open systems. It is important to understand that a system does not work in isolation. It is continuously influenced by other systems, which form its environment. If the system reacts to this influence, it is called an open system and if it does not, it is termed a closed system. A mechanical motorcar without a human driver is an example of closed system, as it cannot change its direction or speed in response to changing environmental stimulus like traffic congestion, etc. Closed system is, therefore, one which does not accept new information, and which has become detached from interfacing with other related systems.

An open system accepts information from its interfacing systems and is capable of adapting to new circumstances. For example, a refrigerator with a thermostat can maintain its internal temperature by way of switching on/off the compressor. Therefore, it is a relatively open system when compared to a motorcar. All living systems are open, which means they receive large and **variable inputs** and after **processing** produce **output**.

Education system is an example of living and open system. Various constituents of the education system like teachers, students, education policy, curriculum, media, etc., change as per the goals of education and need of the society (environment) and feedback from the students and society.

**System and sub-system:** A system is a relative concept. Each system has a number of sub-systems. A human being is a system, but it can also be studied as a sub-system of a bigger system namely a society. Education is a sub-system of the social system. School system is a sub-system of education system and teaching learning process is a subsystem of the school system.

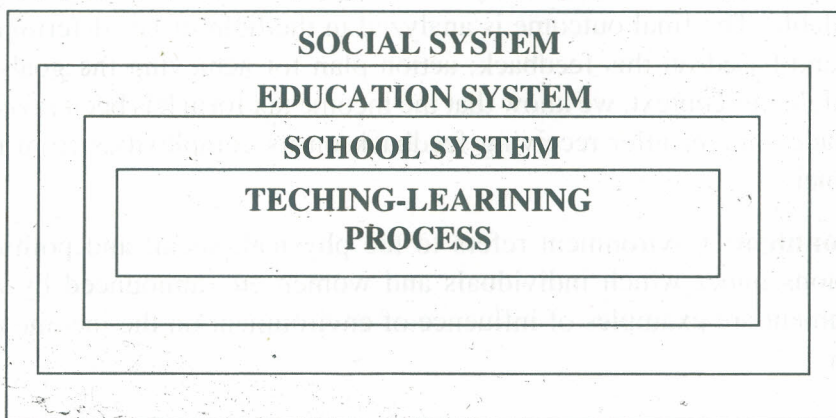


Figure 5.2: School and Social System

In power system, harnessing of water (dams, etc.), generation of electricity, laying of transmission wires, delivery of electricity to individual house/industry, methodology of charging the users for its use, etc. are all sub-systems of the main system.

Thus the term micro or macro, small or big, super or sub-systems are relative. Each sub-system (part) is managed as per principles of systems approach, which will be discussed in subsequent paragraphs.

---

## 5.4 CONCEPT OF SYSTEMS APPROACH

---

At a layman's level, the term 'systems approach' indicates systematic thinking, step by step problem solving and considering many variables of a phenomenon or problem not in isolation of each other but as interacting with each other. In other words, studying the phenomenon or process as a whole and not in bits and pieces. In this approach a problem is taken into account in its totality and attempts are made to solve it in the context of the

- i) Pre-determined objectives
- ii) Functioning of its interrelated parts and the whole system under the given environmental constraints.

It advocates the exercise of a reasonable control over the organization, processes and product of a system meaning thereby that it creates a reasonable balance among inputs, process, output and the environment constraints for achieving the specified objectives. If a system meets the requirements of the systems objectives, it is maintained; if it does not, then it is modified. In short the term systems approach refers to the use of a system in identification, execution and evaluation of goals in any given situation

In general the systems approach includes the following steps:-

- Analysis of the given situation.
- Setting up relevant objectives or goals.
- Devising the most appropriate ways and means to achieve the specified objectives or goals keeping in mind various factors like resources (human, finances, machinery), environment and time frame etc.
- Devising monitoring tools to evaluate the achievement of specified goals and thus the effectiveness of the system.
- Planning alternative solutions in case of failure of the main solution.

Let us elaborate the above steps with an example of improving spellings of English of children in vernacular medium school.

**Step-1: Analysis of the problem:** We have to assess the level of knowledge of English of the students and find out the reasons for their backwardness in this particular area.

**Step-2: Setting up specific objectives:** To enable the students to write correct spellings of commonly used words of English.

**Step-3: Devising means to achieve the specified goals:** The teacher chooses appropriate teaching aids like spelling charts, devises various teaching strategies like giving practice, both oral and written.

**Step-4: Devising monitoring tools:** Like oral tests and dictation to see the improvement made by the students.

**Step-5: Planning alternative solutions:** If there is no improvement in the skill of students in the field of spellings, the teacher will have to think of other ways and means of bringing about the desired improvement. For example, increase the motivational level of the students; give more exposure to the English language (by reading and listening) and change of teaching techniques.

While applying the systems approach for any situation, you should keep the following points in mind:-

- i) The approach has to be conceptual rather than concrete i.e. analyze whether the proposed solutions are relevant to the specific problem or goals.
- ii) Approach has to be goal oriented.
- iii) Approach has to be both holistic and analytical. That means you have to first understand the problem as a whole and then break the problem into smaller parts. For example, if the problem area is the educational process, then you have to understand the whole educational process in general first and then go on to analyze its various parts like teachers, pupils, curriculum, instructional strategies, physical environment and evaluation etc.
- iv) Focus has to be both on the “whole” and the “parts”. Focus on the parts will change as per the change of perception of the whole. As per the example given above if there is a need to make the educational process vocational oriented rather than degree oriented, the teaching strategies, curriculum, type of student intake etc. will change accordingly.
- v) Importance of the dynamic relationship between various aspects of the situation and strategies to their changing nature should always be kept in mind. That means the input, process and output will keep changing as per the need and requirement of the situation.

### **Historical Background**

Let us see as to how and when systems approach crept into the area of education. The simplest form of educational technology (ET) was first seen in 1873 at the international exhibition in Vienna where an American school exhibited some maps, charts, textbooks and some other equipment. However, despite tremendous advances in the field of industrial technology in the western countries during the first half of the century, it was only in the year 1955 that Dr Alvin C. Eurich and Dr Alexander J Stoddard of Ford Foundation gave the first real thrust to the use of technology in education. It was, however, soon realized by the educationists all over the world that technology alone cannot sort out all the problems of education. The concept of system analysis and system development was borrowed from the field of management and was first applied to the field of education in 1960's. This led to the development of large number of designs of improved instruction. Over a period of time the importance of this concept in the field of education has been established beyond doubt all over the world and to-day it is considered as the best approach towards reaching the goal of bringing about revolutionary improvements in the area of educational technology.

## Need of the Systems Approach in Education

Over the last decade or so, there has been tremendous explosion in almost every field of education. May it be the number of teachers, students, knowledge base, teaching aids, availability of various subjects and needs of the students. This complex and vast requirement in the field of education demands comprehensive planning, which should lead to desired results. This type of planning involves identifying the needs of the students and strategies for optimal use of resources in order to meet these needs. Detailed planning also helps in devising tools for evaluation of the success achieved. The systems approach fulfills this requirement in the most effective way and hence its increasing use in the field of education. When applied to the various fields of education such as instruction, research, management of educational institutions, curriculum development and so on, it is an effective problem-solving tool for critical analysis of the educational system in order to make it more effective. The approach can be applied to any aspect of education, for example:

- Defining need of education.
- Setting up of goals of education
- Identifying means of imparting education e.g. formal/informal/school/colleges/universities/correspondence, etc.
- Curriculum planning
- Teaching-learning process

In the teaching learning process, the systems approach takes into consideration all available learning resources, content, learning experiences, methods and media etc, to achieve the given set of learning objectives. It focuses first upon the learner and the performances required of him, only then it makes decisions regarding the course content, learning experiences and the most effective media and instructional strategies. Such a system incorporates within itself the capability of providing continuous self-correction and improvement. Its purpose is to ensure that the components of the organic whole will be available with the proper characteristics at the proper time to contribute to the total system fulfilling its objectives.

Let us take an illustrative example of application of systems approach to education. Mr. Swami has started a coaching institute for preparing students for admission to medical colleges. He wishes to apply the systems approach for his project. This is how he should proceed:

<b>Input:</b>	No. of students expected to join the classes:	50
	No. of teachers required for various subjects	3
	No. of other employees	3
	Salary for the employees	A
	Other expenditure	B
	Income from students (fees)	C

**Process:** Lesson plans, curriculum designing  
Use of audio-visual aids, computer etc  
Handouts of notes

Weekly/fortnightly/Mock tests for assessment of performance

Interactive sessions with the students

Feedback from the students.

**Output:** No. of students who go back happy with the coaching.

No. of students who get into medical colleges.

**Environment:** Location of the building (near the road head, rural/urban area, ambience of the class rooms, neighborhood noise/disturbances etc)

### Analysis and feedback

Excellent performance: continue the existing pattern. Average performance: Identify and rectify weak points. Modify strategy. Poor performance: - complete overhauling of the input, process and environment.

Let us take another example. Suppose the management of a school is not happy with the present functioning and utilization of the school library and wants to make the library a “learning resource center” where students will use books, audio-visual equipment and other resources on their own ultimately developing self-study habits.

They want a system analyst to find out whether their present library needs to be changed and if so how? This is how a system analyst will proceed:

### Identifying the goal

The system analyst will first like to ask questions like what is the problem for which some solution is to be found? What is the desired goal for which a system needs to be designed (or, if already existing, improved or changed)? In this case it will be optimal utilization of the school library and to make the library a “learning resource center” where students will use books, audio-visual equipment and other resources on their own ultimately developing self-study habits.

### Analysis of the problem:

He will then study the sub-systems operating presently. For example, library (including the structure, books and librarian etc), teachers, students, subject matter or curriculum, audio-visual facilities available in the school, administrative set up of the school, comfort level of the place e.g. availability of adequate lighting, fans, coolers, air-conditioners, chairs, tables, etc. He will go on to identify the problems by studying the efficiency and effectiveness of the existing components. For example, he may find that:

- The image of **the library** is that of a dingy uncomfortable place where only teachers or a few students go to borrow books.
- The **librarian** may be a disinterested person whose sole job is to look after the custody of the book.
- **The books** or other material may be old and not properly arranged.
- The **audio-visual aids** may not be accessible to all the teachers or students because of cost factor or they may not be available for every one.
- **The students** may not be motivated enough or aware of the potential advantages of using the library facilities.

- The teachers themselves may not be encouraging the students to use the library on the pretext that they should master their standard textbooks first and not waste time on advanced books as are available in the library.
- **The management** itself may not be inclined to spend enough money on the library or he may find that there is no deficiency of funds.

### Devising a strategy

He will require a large amount of data to devise a strategy to implement his plan of action to achieve his goal. He will have to find out the constraints and resources (factors that will inhibit and factors that will benefit the change). He may like to interview parents and other persons both inside and outside the school to find out their views. He will have to study various documents like school plans and budget. The teachers and students may be asked to provide the list of desired material.

The system analyst will then make a list of various components (personnel, facilities etc), determinants (elements outside the system that determine the nature, form and limits of the system, for example, government circulars regarding school libraries, finances, donations from outside, etc.), constraints and resources (both human and financial), the projected output and requirement (both financial and human resources etc) and the monitoring and control (feedback) process.

Having done the above, he may have to make one or more presentation to the authorities to get his plan of action approved. Based on the interaction with the management, teachers and students, he may have to modify (upgrade or downgrade) his strategy before the plan is finally put to action.

### Assessment of the strategy

To assess his plan effectively, the analyst will not like to concentrate on what has been achieved but on what has not been achieved. This assessment has to be done by everyone involved with the library i.e. the management, teachers, students, parents etc. An honest and unbiased appraisal of the whole process will identify the areas of failure. Fresh remedial measures can then be planned for the same.

#### Check Your Progress

**Notes:** a) Write your answers to the questions in the space given below.

b) Compare your answers with those given at the end of the unit.

1) List the different components of a system.

.....  
.....  
.....

2) Enumerate five important steps in a systems approach.

.....  
.....  
.....

3) What is the need of systems approach in education?

.....

.....

.....

.....

.....

## 5.5 TEACHING – LEARNING AS A SYSTEM

Both teaching and learning aim at one and the same thing that is to bring changes in the behavior of the learner. A good teaching must always be so designed and performed as to result in maximum learning. A learner must be highly benefited through a well-organized system of actions known as teaching for achieving his learning objectives. Therefore, they have to join hands, come near and have a synthesis known as teaching-learning process:

### 5.5.1 Meaning of Teaching, Learning and Instruction

Teaching-learning is one of the most important components of the education system. In the simplest words, **teaching** refers to the occupation or professional activity of a sub-group of society called teachers. It can also be defined as an activity or a group of activities undertaken to help an individual to learn or acquire some knowledge, skills or attitudes. (B.O. Smith, 1960) or bring about change in the behavior of the individual being taught (Gage, 1962, Clarke, 1970). Clarke says teaching means activities that are designed and performed to produce change in the student’s behavior, it will become clear that **teaching consists of all those activities or system of actions that are aimed at producing learning.**

**Learning** is defined as relatively permanent change in the behavior of the student (excluding the influence of growth and maturity). You will study the concept of learning in Block-3. If you carefully examine the definition of teaching and learning you will find that both are interlinked and aimed at achieving same objectives that is change in learners’ behaviour.

**Instruction** is always a part or one of the several modes of teaching. Whereas, instruction itself can never be called as teaching, the term teaching may include or cover instruction. Instruction is mainly concerned with the development of knowledge and understanding in an individual about a thing, system or process. Imparting of knowledge and understanding merely represents one of the many objectives, which we want to achieve through the process of teaching. The conative (motor) and affective (emotions or feelings) domain of one’s behavior is badly neglected in instruction, which develops only the (intellectual) domain of one’s behavior. In the context of teaching and learning as a system, the term instructional system is used loosely to mean the same thing.

### 5.5.2 Teaching-Learning as a System

Teaching learning is one of the fastest evolving and changing aspects of the education system. Rapid proliferation in the subjects to be taught as result of

tremendous increase in the knowledge base in almost every field, redefining of the goals of education, increasing ambitions of the students, advancement in the field to teaching technology and many more social, economic and political factors have made teaching-learning a highly complex process. Teaching technology is a specialized branch of educational technology concerned with the systematization of the process of teaching providing necessary theory and practice for the teachers with the aim of bringing improvement in the task of teaching and learning. The process of teaching-learning involves certain goals, numerous inputs that may vary from time to time, a process initiated by these inputs and finally an output, which besides the process is also influenced by the environment of the whole process.

In systems approach to instruction, the teacher has to plan completely the utilization of selected resource material and the classroom activities (each student working alone, in small groups, working alone with teacher's guidance or in large groups). The teacher should have fair understanding of the subject, knows his/her limitations, knows all about his/her students and their individual differences. The systems approach involves continuous evaluation of learning outcomes and utilization/application of knowledge gained by analysis of results of evaluation to suitably modify the plan of approach to achieve the stated objective.

In brief the systems approach applied to the teaching-learning process involves the following interlinked and interdependent stages:

- Explicitly stated standards of output performances, including sequenced behavioral objectives and post-test.
- Planned input and processes involving structural learning materials and methods suitably geared to the needs of particular group of learners.
- Monitored output, which is used to revise, improve and evaluate the instructional system, providing feedback to the learner and the teacher.
- A degree of inbuilt flexibility to adjust to individual situation.

Let us now examine each component of this teaching-learning or instructional system:

**Objective:** The objective or the desired output of any instructional system is to bring about the desired cognitive, affective and psychomotor transformation of the learners.

**Input:** As discussed before, input means what goes into the system. In the case of instructional system the input consists of the following:

- Teachers or instructors and their characteristics
- Students and their characteristics

Knowledge, capabilities and the level of motivation of the teachers and students act as a powerhouse of the system to initiate the mere presence of the input material i.e. teachers and students, is not enough. Both the qualitative and quantitative components are important in determining the nature and force of the "process".

**Process:** The process means what happens within the system as a result of interaction of various components or factors. We have seen what initiates the process in an instructional system. However, other factors like designing the right curriculum, adopting the right teaching methods, appropriate use of teaching technology, creating the right environment, both physical and emotional play an important role in the ultimate quality and outcome of the process.

**Output:** The net result of the interaction of various inputs and plans of action is the end result or output. In case of the instructional system the output is the desired change in the behavior of the students. In a perfectly functioning system the output should be the same as objective or desired output as planned in the beginning.

**Analysis and feedback:** Any variation from the desired output, however, leads to analysis of the whole situation with a view to taking remedial actions or modifying action plans. Feedback from any of the “parts” of the system e.g. students, teachers or administrators can also be used to modify the strategies of action. In short, based on the end result and the viewpoint of the various members of the system, the reappraisal of the system is done almost continuously. The ultimate aim being to get the best out of whatever is available for the system in a given situation. The review plan could be directed to the teachers (improved training, motivation), students (better motivation), teaching aids/technology, environment (better class rooms, quieter environment, more comforts e.g. fans etc), redesigning of curriculum and so on.

It will be clear from the above discussion that teaching-learning or instruction is a dynamic system with definite inputs, process and output. It is affected by the environment in which it works and is subject to scrutiny by means of analysis of the end result and feedback by the participants of the system.

**Check Your Progress**

**Notes:** a) Write your answers in space given below.

b) Compare your answers with those given at the end of the unit.

4) Define teaching-learning as a system.

.....  
.....  
.....

5) What are the “inputs” in an instructional system?

.....  
.....  
.....

6) What are the various factors that influence the “process” in an instructional system?

.....  
.....  
.....

## 5.6 DESIGN AND DEVELOPMENT OF INSTRUCTIONAL SYSTEM

Let us now see how an instructional system is designed. There are **four general stages** in designing instruction.

### Stage 1: Identification of the initial problem situation (P-1)

This stage consists of three sequential stages:

Identification of the desired objectives/learning outcomes (knowledge, skills, and attitudes). This has to be done while keeping in mind the needs of the given society, quality of the teachers and students, finances and facilities available and time frame for the achievement of the desired objectives. Let this step be called 'X'.

Identification of pupils. This step is important in order to decide the level at which instruction will start; Let us call this step 'Y'.

Identification of the objectives/learning outcomes, which the instructional system is expected to achieve. This will be the difference between the desired objectives and the knowledge already possessed by the students. The gap to be filled up by the instructional system can be represented as 'X'-'Y'.

### Stage 2: Development and operation of the instructional system (IS)

This stage consists of two steps:

- Designing an instructional system capable of achieving the objectives/learning outcomes represented by X-Y. This stage involves developing the overall structure, selecting and sequencing the content, choosing appropriate teaching methods, etc.
- Making appropriate administrative arrangements to put the instructional system into operation i.e. implementation of the system.

### Stage 3: The error elimination process (EE)

The stage, a key stage in Popper's methodology, involves carrying out a critical examination and analysis of Stages 1 and 2.

According to Popper's methodology a new instructional system can be regarded in the same way as a new scientific theory which has been developed in an attempt to resolve a specific problem situation, but which has not yet been subjected to rigorous experimental testing. According to Popper such a theory should be tested not by trying to prove it right, which logically may be an impossible task, but by trying to prove it wrong (looking for ways in which the theory can be shown to be incompatible with the experimental evidence; also called as "Falsificationism").

In case of a new instructional system too, the testing should be carried out not by trying to prove that it is succeeding in achieving its desired purpose, but by looking for ways in which it is not succeeding. Besides the latter option being an easier task than the former, it also helps in identifying the weaker links of the system thus paving the path for taking remedial measures.

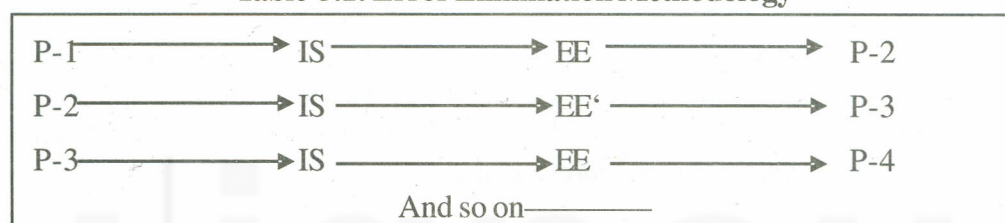
Popper's approach, however, requires a healthy attitude towards criticism. Very often people who develop and operate instructional systems tend to defend their systems against criticism by contrived arguments and unnecessary justifications and rationalization. What is required of them, however, is the courage to accept valid criticism, identify the shortcomings of the system and initiate necessary remedial measures.

#### Stage 4: Identification of the new problem situation (P-2)

Appraisal of Stage 3 should reveal areas in which the instructional system needs to be improved. It should also be able to suggest the nature and methodology of carrying out the remedial measures for the same. The analysis leads to a new problem situation called say P-2 which in turn can form the starting point of another developmental/improvement cycle.

To sum up, Popper's error elimination methodology is open-ended and on-going method, forming a basis of the continuous development of instructional system of all types.

**Table-5.1: Error Elimination Methodology**



In the Table depicted above, P-1 is the initial problem situation the analysis of which led to the formulation of instructional strategy (IS). After analysis and error elimination (EE) process, a second problem situation (P-2) arises. This is tackled in the same way as P-1 and the process goes on till the desired goal is achieved. Let us illustrate this with an example of a history teacher who is not satisfied with the performance of her pupils in this subject. She wishes to devise ways and means of making her students get interested in the subject rather than trying to learn it by rote. This is how she should proceed to develop an instructional strategy for the same.

#### Step 1: Analysis of the problem situation

The teacher wants her students to get interested in the subject of History and perform well in the examination of class X. She makes an assessment of the students and finds most of them to be fairly intelligent and performing well in other subjects. They desire to know the subject better but somehow just can't do it. They find it difficult to remember the name of the king who constructed a particular monument or fought a battle. They also feel that all this information is unnecessary and does not contribute in a significant way in their future career (Y). The teacher now has to devise ways and means to achieve the difference between the desired goal (X) and what her students have now (Y), i.e. X-Y.

#### Step 2: Development of an instructional system

The teacher now analyses various factors like audio-visual aids, library facilities etc. available in the school for students. She finds that except some charts, there is hardly any audio-visual aids available in the school. Some good books on history are available in the library but their quantity is insufficient. However, she intends to bring about the desired change in the students behavior. Now she makes a plan to foster students interest in the study of History.

- Motivate the students to study the subject by telling them the value of knowledge of history. Stress upon them that knowledge of history is important to know the cultural and historical background of various nations, to know the great people who have made sacrifices for our country, for policy makers and governors of the nation, for preparing for competitive exams in which large number of questions are from history and so on.
- Make the subject interesting by telling them interesting anecdotes from relevant portions of the text which may or may not be given in the prescribed text book, taking them to the museums and historical movies and plays, "light and sound shows" organized in various historical monuments, organizing quiz competitions on history etc.
- Increase the number and variety of books on history in the library and encourage students to use this facility.

She presents this plan to the management which agrees to all the points. The teacher then goes ahead with the next step of implementation of the action plan.

### Step 3: Assessment of the plan

At the end of a specified period, say three months, the teacher evaluates her strategy by taking all the points one by one. She concentrates more on what she has not achieved rather than what she has achieved.

### Step 4: Identification of new problem situation (P-2)

Based on the evaluation (of her own assessment and the feedback from the students) she identifies the areas of weakness and revises/redesigns her strategy and goes ahead with its implementation.

#### Check Your Progress

Notes: a) Write your answers in space given below.

b) Compare your answers with those given at the end the unit.

7) Discuss the four stages of development of instructional system.

.....  
.....  
.....  
.....  
.....

8) What is falsificationism? Give an example.

.....  
.....  
.....  
.....

## 5.7 EDUCATIONAL TECHNOLOGY (ET) AND PROBLEM SOLVING APPROACH

From the above discussion you might have seen that use of the systems approach not only helps in better management of a problem but also acts as an effective problem-solving tool. You have already read about ET in details in the first unit, however, this section will mainly deal with the application of systems approach, an effective problem-solving tool to educational technology.

Systems approach uses effective and efficient strategies to solve problems scientifically. The degree to which the application of systems approach matches the pre-specified goals of ET conveys the effectiveness of the systems approach. Efficiency, however, refers to the degree to which there is saving of time and energy in problem solving as compared to other methods. In other words in ET, as compared to other methods of problem solving, appropriate use of systems approach can be used to solve problems in the most effective way, in a shorter time and at a lesser cost.

You will recall from what we have learnt in section 5.4 that in general the systems approach includes the following steps:-

- Analysis of the given situation.
- Setting up relevant objectives or goals.
- Devising the most appropriate ways and means to achieve the specified objectives or goals.
- Devising monitoring tools to evaluate the achievement of specified goals and thus the effectiveness of the system.
- Planning alternative solutions in case of failure of the main solution.

These steps can be easily adopted in the effective management of ET. Let us take an example of introducing computer-aided education (CAE) in a school of a village.

**Analysis of given situation:** The first step is to identify the need for CAE in a particular school. Why is it required? Is the present system not meeting the needs of the society, students or the parents? What benefits will accrue after the introduction of CAE? Once it is felt that introduction of the CAE will help the students of that school in improving their academic performance, level of awareness of the latest technology and to compete with their counterparts in the city, the need for CAE in that school is established.

**Setting up goals or objectives:** Once the need is established, next step is to spell out the objectives of starting CAE clearly. What and how much are we expecting? Is it the increase in interest in studies or improved performance in the exams or increased awareness of the computer technology or just increased confidence level among the students? Spelling out the goals will depend upon the needs and aspiration of the society and the students.

**Devising the ways and means to achieve the specified goals:** Third and a very important step is to analyze various factors like human and financial resources, availability of logistic support in the form of repair and maintenance of computers,

adequate number of teachers who are trained in this technology, deciding the number of computers to be purchased, frequency and level at which this mode of teaching will start, appropriate modification of the school curriculum, introducing motivational measures etc. The strategy of action will have to be based on all these factors.

**Devising monitoring tools:** Having implemented the plan of action, it is prudent to monitor and make periodical assessment of the strategy. Is the strategy working? What are the goals it has achieved and what are the fronts on which it has failed? Assessment and feedback from the teachers, students, management, parents etc will lead to identification of failure areas.

**Devising alternate plans:** The strategy of action will be revised keeping all these points in mind e.g. more computers may be required, some teachers may have to be sent to specialized centers for training, the batches of students may have to be increased or decreased in size, software may need to be modified to suit the local language and so on.

It will be clear from the above that use of systems approach in ET is not only the most effective but also the most flexible and realistic problem-solving tool.

---

## 5.8 LET US SUM UP

---

In this unit you have studied the concept of systems approach, its components, classification and development of a system, system analysis, education as a system concept, history, need and application of systems approach. Subsequently, you have studied the concept of teaching-learning as a system and a plan to construct a model of instructional system. Finally, the use of the systems approach as a problem-solving tool in ET has been covered. This exposure will help you in applying the concept of system approach to teaching-learning in day-to-day practice leading to improved performance in your profession as a teacher.

---

## 5.9 UNIT-END ACTIVITY

---

Suppose you are appointed a teacher in a school of a small village. A dilapidated school building has just the basic facilities for teaching. Using the systems approach, devise a model for imparting students the best possible education.

---

## 5.10 SUGGESTED READINGS AND REFERENCES

---

- Elington, H, Percival, F. and Race, Phil. (2003). *Handbook of Educational Technology*. New Delhi: Kogan Page India Private Limited.
- Kulkarni, S.S. (1986). *Introduction to Educational Technology*, Bombay: Oxford and IBH publishing Co.
- Sampath, K. Paneerselvan, A. Santhanam, S. (1983) *Introduction to Educational Technology*, Sterling publishers, New Delhi
- Sharma, Motilal. (1985). *Systems Approach, Its Applications in Education*, Bombay: Himalaya Publishing House.

---

## 5.11 ANSWERS TO CHECK YOUR PROGRESS

---

- 1) Input, process, output, feedback.
- 2) Analysis of a given situation, setting up goals, devising the ways and means to achieve the goals, evaluation strategies, planning alternate solutions.
- 3) For effective and optimal management of the complex field of education with available resources.
- 4) See 5.5.2
- 5) Teachers, students and their characteristics.
- 6) Teachers, students, curriculum, teaching methods and technology and environment.
- 7) Identification of the initial problem situation, development and operation of IS, error elimination process and identification of the new problem situation. Also see Secion 5.6
- 8) Judging a theory of a new instructional system by proving it wrong rather than proving it to be right in order to highlight its shortcomings.



---

## UNIT 6 FEEDBACK MECHANISM

---

### Structure

- 6.1 Introduction
- 6.2 Objectives
- 6.3 Feedback
  - 6.3.1 The Concept
  - 6.3.2 Types of Feedback
- 6.4 Feedback and Microteaching
- 6.5 Feedback and Reinforcement
- 6.6 Feedback Devices
  - 6.6.1 Programmed Instruction (PI) as a Feedback Device
  - 6.6.2 Interaction Analysis as a Feedback Device
- 6.7 Channels of Feedback
- 6.8 Let Us Sum Up
- 6.9 Points for Discussion
- 6.10 Suggested Readings and References
- 6.11 Answers to Check Your Progress

---

### 6.1 INTRODUCTION

---

Feedback is an important element in all types of communication, including the teaching-learning process. It constitutes part of the systems approach to teaching and learning. You will agree that feedback is required in both the classroom as well as open distance education situations to know whether the students are learning as per the objectives. Without meaningful feedback, we shall not be able to know whether the teaching strategy followed by us is adequate, whether the course objectives have been accomplished or whether the students are learning as per the teaching-learning strategy. In Unit 5 you have studied the concept of the systems approach to the teaching-learning process. You have also studied the role of the systems approach in solving problems and increasing the productivity of learning. Feedback is an integral part of the systems approach. In this Unit we shall discuss the feedback mechanism as integral part of the effective teaching-learning system. We shall first explain the concept and importance of feedback. We shall also highlight the importance of feedback in microteaching and programmed instruction. We discuss, in brief, types, sources of feedback and channels of communication for providing and receiving feedback. You will also study the role of providing immediate and /or delayed feedback to your students and facilitating their learning.

---

### 6.2 OBJECTIVES

---

The main objective of this Unit is to discuss the role of educational technology in facilitating feedback to and from the learners so that their active participation in the teaching-learning process is ensured. After going through this Unit, you should be able to:

- describe the concept and importance of feedback
- discuss the role of feedback in facilitating learning and teaching
- discuss the nature and importance of feedback in microteaching and programmed instruction
- explain various types and sources of feedback
- discuss various channels for providing and receiving feedback to and from the learners.

## 6.3 FEEDBACK

The term 'feedback' may not be new for most of you. This term is being used in all walks of life, including the teaching-learning process. We shall discuss the concept of feedback from teaching-learning point of view in this section.

### 6.3.1 The Concept

Let us begin our discussion with understanding the concept of feedback, which is an important element of effective communication to achieve pre-determined objectives and to ensure whether the teaching-learning process is effective enough. Feedback does imply evaluation of learning/training objectives and teaching approaches applied to achieve them. This objective consequently introduces changes, which occur in the form of a chain in order to direct the whole system to arrive at and maintain the objectives (you have already studied about the systems approach to teaching and learning in Unit 5, Block 2 of this course. Feedback is an important concept in a system view. It refers to the process of receiving input from the environment based upon the output (consequences) of a system. The quality of outputs directs the learner about the future action. The consequences may either be external or internal. Consequences of feedback have relation with learning. In other words, feedback is an inseparable part of learning (Golec, 2004). The consequences or outputs control learners' behaviour. You should refer back to the content of that Unit in the context of feedback.). The consequences or outputs will control learners' behaviour or learning outcomes. The control on performing a correcting function, therefore, is known as feedback. The basic concept of control concerns with self-regulation of goal-seeking behaviour (purposive behaviour) by an individual. Thus, you can say that feedback is information which is given back by the receiver to its source. It provides information to both the parties of communication (for example, teachers and the learners in the teaching-learning process). For example, a teacher can get to know as to how well the learners are learning concepts taught by him/her and the learners can clarify misunderstandings and receive information about their performance (Wolcott, 1994). Thus feedback is used by the learners to improve themselves and by the teachers to help learners improve (Mahar, 2005). The concept of feedback can be diagrammatically shown as follows:

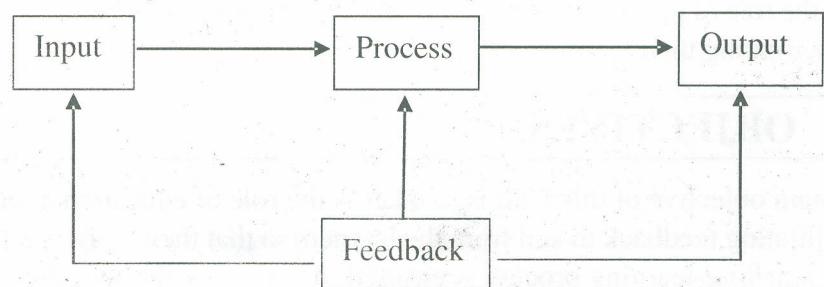


Fig. 6.1: Feedback: A Systems View

Feedback is a device/means for directing the systems (for example, the teaching learning systems) towards achieving the pre-determined learning objectives and then maintaining the same. Feedback can be defined as, 'the return to the input of a part of the output' (Golec, 2004). Feedback helps teachers adapt and adjust teaching strategies to accommodate the needs of the learners. Thus, feedback guides both the teachers and the learners for optimum gains from the teaching-learning process. Without well-thought arrangement for feedback mechanism, the objectives may not be achieved effectively and efficiently. In other words, feedback is a developmental approach to help teachers (both as a source and/or receiver) apply more appropriate teaching methods/strategies, and learners (both as a source and/or receiver) applying more appropriate strategies to achieve learning objectives. Feedback provides information about the areas in which the learners have performed well or succeeded, their strengths as well as the areas that require further improvement/development to overcome their weaknesses.

The learners get opportunities to comment and reflect on the usefulness of the feedback offered to them and are able to use feedback / information in subsequent learning. We, therefore, should be clear in our approaches / strategies that feedback should be useful to the learners; it must consist of more than just informing right or wrong answer. Feedback should be analytical and suggestive, and should be provided at a time when learners are in need and interested in. We, as teachers / trainers, should ensure that the learners are able to reflect on the feedback they receive, make adjustment and try again in a new situation. Thus feedback is a central element of the entire education process. It has been shown in Figure 6.2.

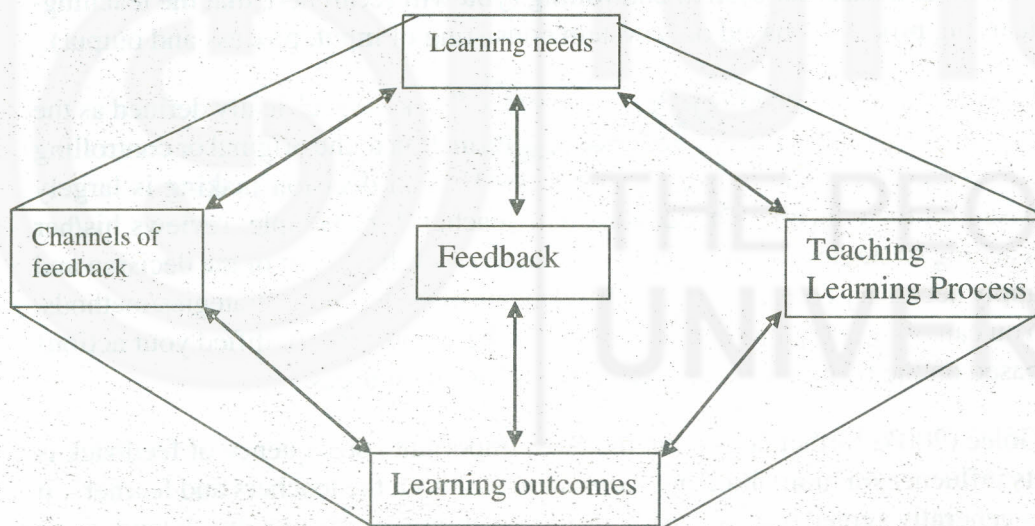


Fig. 6.2: Feedback Mechanism

We can understand the concept of feedback by analyzing the theories of learning also. For example, behaviourists insist on feedback in the form of positive and negative reinforcers for learning with the purpose of encouraging desired behaviour and discouraging undesirable behaviour. The cognivists ensure whether knowledge was received and checked for schemata revision. They provide feedback to know whether the learners are getting information / knowledge. The cognivists as well as constructivists check, through feedback, what knowledge was organized and constructed. They want to understand as to what kind of knowledge construction is happening within the learner, even though there is no emphasis on right or wrong. These examples show that feedback is an essential part of learning theories.

A critical feature of the communication process is feedback. We usually think of feedback with examination but there are other techniques, which tell the teachers as to how the learners are receiving instruction (Heinich, Molenda, Russell and Smaldino, 1996). Facial expressions, body language, discussion responses, homework, assignments, etc. are other forms of feedback. Feedback helps us ascertain whether the communication is through, and that too in the right direction and right perspective.

Golec (2004) analyzed the concept of feedback mechanism in two perspectives. They are:

- Systemic view of feedback
- Decision making view of feedback

Let us elaborate each perspective from the systemic point of view of a system or interdependent group of items forming a unified whole. Feedback mechanism has very important role to play. Through feeding back a part of an output again into the system, we obtain a perfect regulatory mechanism. In other words we, both as teachers and learners, are able to control the teaching-learning process for optimum gains in terms of knowledge, skills and behaviour. This regulation is based on two basic kinds of feedback, namely positive and negative feedback. We call a feedback positive if the resulting action goes in the same direction or occurs more frequently, as the condition that triggers it. On the other hand, a feedback mechanism is called negative if the resulting action opposes the condition that triggers it. The two mechanisms of positive and negative feedback constitute a basis for system controlling (you will recall here that the teaching-learning process is based on a system consisting of input, process and output).

From the decision making point of view 'feedback is specifically defined as the transmission of evaluative or corrective information to the original or controlling source about an action, event, or process. Human decision making is largely based on the concept of feedback'. The teacher, for example, reviews his/her teaching strategies used by him/her by analysis of the output of the decision and apply necessary corrections or improvements in the teaching strategies/methods. You can offer many more such examples where you have modified your actions based on the feedback you gathered from various sources.

Golec (2004) further states that the most important consequence of feedback is its influence on motivation and consistency of both the teachers and learners. It is generally agreed that a decision maker receiving positive feedback tends to be motivated to continue with previous chosen course of action only slightly modifying it. If provided with a negative feedback the teacher/learner has a tendency to feel demotivated and search for alternatives of solving the problem. For example, you may first try (could be through trial and errors) some teaching learning strategy and based on experience you may change or improve your decision. You may agree here that teaching learners is an effective way to learn and improve the process.

### **Importance of Feedback**

Theories of teaching and learning have a propensity to emphasize the importance of feedback. Feedback provides learners with knowledge of results that indicate whether they have learnt intended concepts correctly, or it (feedback) can take

the form of a response from another person indicating as to how well the learner has learnt. Feedback can be simple, merely providing correct answer to straightforward questions; or it can be much more complex, suggesting a variety of responses, and the ways to evaluate among them (Bates, 1995)

The advantages of feedback may also be argued on the basis of its cognitive effects. Feedback works best when we share the results or outcomes of an educational activity with learners. The learners know that through feedback we are trying to improve their capability to learn more. Information about performance confirms whether learners have understood the concepts, corrected their errors, clarified their misconceptions and indicated the relative adequacy of the learning strategies with which the learning tasks have been mastered. Feedback gives them strength, increases their confidence in learning and consolidates their learning in the form of their knowledge. Thus the learners are able to focus their efforts and attention to achieve learning objectives.

Draper (1999) differentiated three distinct though related expressions: feedback, interaction, and discussion. Feedback is extra information an entity gets (only) as a result of its acting. Interaction concerns effects (often but not always information) an entity gets from interacting with (acting on and being acted upon by) another entity. Feedback is considered an important component of interaction which concerns about how interacting with another person changes one's ideas for the better.

Besides teachers and learners, feedback is important for educational planners and policy makers with a view to getting information for revision and modification of plans from time to time and for monitoring the implementation of curriculum, projects, plans and policies. The execution of plans, projects and policies at time fails because of lack of adequate feedback mechanism. Feedback helps the education system in developing learning support services for learners, monitoring their progress, developing in-service programmes for teachers and re-visiting/reviewing instructional goal, set to be accomplished. Hence feedback to and from the learners plays an important role in enhancing active learning.

Feedback is a tool to initiate pedagogical dialogue between the teachers and learners. It creates a chance for the teachers and the learners to express their interest and builds a personal quality to the teaching-learning process. Hence feedback is a key to the continual improvement process used by effective teachers. We the teachers design tests to give feedback to learners. These tests provide different types of feedback to the learners, such as recall of facts, ability to critically think or make decision, etc.

Meaningful feedback should guide both the teachers and the learners. It should be integral part of teaching and learning, and hence focus around learning outcomes. The feedback should guide the learners to become independent and to achieve course/unit objectives.

The feedback may also reflect on the gap between the desired and expected performance of the learner. We, the teachers, apply assessment tools to give feedback to the learners. These tools provide different types of feedback to the learners, such as recall of facts, ability to critically think, or make appropriate decision, etc. At the initial stage we provide information about the success or failure, for example, by awarding a grade or mark based on the strength and

weaknesses of the answers. In the next stage we can inform the learner about his/her outcomes i.e. the difference between the desired and the expected outcomes. For example, by comparing the answer of self-check question with the one given at the end of the lesson, we can tell him/her whether the answer given by him/her is correct. After giving information about the right or wrong answer, we can diagnose the weakness of the answer and strengthen the merits of the answer. At a higher stage, we can inform the learners as to why the answer is right or why the answer is wrong. In other words, we can inform the learners about the strengths and weaknesses of the answer/response given by them. Thus, we provide meaningful and constructive feedback to the learners by explaining the strengths and weaknesses of their answers.

Feedback is of critical importance in open distance learning system in which the learners pursue their study at a distance from both the institution and the teacher. Constructive feedback by the teachers goes a long way in not only motivating them but also facilitating them to successfully complete their course. Being geographically removed from the teacher and with minimum personal contact opportunities, feedback is provided to them through various channels.

Feedback is of critical importance in open distance learning system in which, as you know, the learners pursue their study at a distance from both the institution and teachers. Constructive feedback, therefore, goes a long way in not only motivating them but also facilitating them to successfully complete their course. Being geographically removed from teachers and with minimum personal contact opportunities, distance learners depend on various channels of communication for seeking feedback on their performance. The above conceptualization of feedback highlights its importance in the teaching-learning process.

**Check Your Progress**

**Notes:** a) Write your answers to the questions given below.

b) Compare your answers with the one given at the end of the unit.

1) Explain the basic objective of feedback in the instructional process.

.....  
.....  
.....  
.....  
.....

2) How does feedback help a teacher in the decision-making process?

.....  
.....  
.....

**6.3.2 Types of Feedback**

Feedback can be of different types to help the learner improve his/her performance or solve problems. But those can be studied under two types/classifications

## Synchronous and Asynchronous Feedback

Feedback can also be provided in both the synchronous and asynchronous modes. Let us first elaborate the concept of synchronous and asynchronous feedback and then discuss the role of synchronous feedback in facilitating learning.

In a synchronous feedback/interaction, two or more people communicate synchronously while they have to be in the same place (physically or virtually) at the same time. Synchronous feedback takes place in real time and feedback is provided immediately. Electronic chat is a good example of synchronous feedback in which we sit at our respective computers at the mutually agreed upon time and initiate pedagogical dialogue. We respond/answer the query raised or question asked by the learner. Synchronous feedback can be fast or slow depending upon the situation. Example of fast feedback is transfer of video and voice, and of slow communication is text (typing) based chat. Tan and Biswas (2006) reported that learners who receive immediate feedback (the teacher intervened as soon as the learners made errors and forced them to correct the errors before they could move on) learnt the computer based lessons faster than the learners who have to ask the teacher for feedback. However, the latter group made lesser errors in post-test. In a study conducted by Corbett and Anderson (2001) demonstrated that immediate error feedback helped with immediate learning, but there were indications that providing learners with more control (on-demand-feedback or guided feedback) led to better retention and deeper understanding.

Asynchronous feedback does not happen in real-time. In other words, we can communicate asynchronously without fixing a common time. E-mail and electronic bulletin boards are examples of asynchronous communication. For example, if we can send you a message at noon and you will get that message without having to be logged in at the exact time we sent and read it at your convenience. You can read the message any time after it is sent and send a response back anytime you want. Thus in asynchronous communication the delayed feedback is provided or received. Tutors' comments on the strength and weaknesses of your assignment responses are asynchronous feedback.

There are the obvious advantages of each type of communication mode with respect to teaching and learning. Let us look at synchronous feedback first. In situations where physical constraints (i.e. location) prevent face-to-face contact, there is a need for synchronous communication tools such as teleconferencing, interactive radio, etc. We all know by research or intuition that some students simply learn better when they can see a teacher's face and converse in real time with a peer or teacher. Goldberg (2001) did comprehensive research on synchronous and asynchronous communication. Goldberg's research shows that learners perform best when they have access to lecturers in addition to a web-based course, as opposed to the web-based course alone. According to Goldberg synchronous communication tools bring nothing new to education. They simply take an existing teaching method (lecturers, seminars, workgroups, etc.) and make them more available by removing location barriers. This improves education by making it more widely available and allows learners from a wider variety of backgrounds influenced by location to learn together.

Goldberg argues that asynchronous communication is simply synchronous communication's poorer, slower brother, to be used when we lack the ability or infrastructure to achieve synchronous communication. Asynchronous

communication is not simply slower synchronous communication, it has its own advantages and disadvantages. It appeals to a different but overlapping set of learners than does synchronous.

### **Synchronous and Appropriate Feedback**

Learning is enhanced by immediate feedback. Some of studies have shown that immediate feedback is more effective than delayed feedback in the teaching-learning process. Bangert-Drowns, Kulik, and Morgan (1991) provided comprehensive analysis, reviewing 53 studies that compared some forms of immediate (synchronous) feedback to delayed (asynchronous) feedback in test-like events. The studies covered a variety of instructional applications from classroom quizzes to programmed materials and computer-assisted learning (CAL). Their general conclusion was that in typical classroom settings immediate feedback is more effective. They also found small to moderate gains for the use of immediate feedback over delayed feedback in CAL materials; however, the number of Computer assisted learning (CAL) studies in their analysis was small.

Draper (1999) gave more emphasis on determining the criticality of an error or weakness and then providing immediate synchronous or delayed asynchronous feedback based on the error type. His hypothesis (which was not tested) is that the effectiveness of the delayed feedback over immediate feedback in computer-assisted learning depends upon the type of knowledge, type of feedback, type of error (critical or non-critical) and present learner skill level (low or high) with delayed feedback being more effective under conditions of procedural knowledge, elaborative feedback, non-critical error and low skill level.

### **Sources of Feedback**

Feedback can be provided or received through various means, e.g., face-to-face interaction, radio, television, teleconferencing, fax, e-mail etc. and devices such as verbal, written, question, etc. According to Draper (1999) information supplied by feedback may come from various possible sources. In his view there are three main categories of possible sources:

- Learners
- Environment
- Human teacher

Let us elaborate each source of feedback for our clarity and understanding. Learners generate a lot of feedback internally, by internal judgments of their success. Their internal criteria for understanding and adequate argument and explanation do it. For instance, we often know we have typed the wrong letters before we see the result. At the conceptual level, most of the learners learn a lot from writing a paper or essay without any feedback from anyone else at all. That is because they have internalized many of the relevant standards and can judge the quality of their own output quite well. In fact this internalized standard is one of the main aims of learning and teaching. A learner may have a better internalization of some of the types of information above than others. You might have revised many assignment responses/answers knowing that the quality of the answers is not up to the mark. This decision is based on your internal judgment, not based on any feedback from outside sources. We, therefore, generate/ get feedback from within.

The environment in itself is a category of feedback sources, which is very diverse. At one end it includes seeing directly whether you missed the target and by how much, and at the other a sophisticated machine may give you a lot of diagnosis, such as error messages and debugger displays in programming environments, etc.

We are often used to provide feedback of all types; indeed that is one of their main functions. The reason for distinguishing a human teacher from the otherwise heterogeneous category of learning environment is simply because of the practical importance of the question of whether computers, dispensing with the need for human teachers to perform this function, could give all feedback. It is easy in principle, to automate some types of feedback, but explaining of what is wrong about the learner's answer is probably difficult or impossible to automate because it depends on links by the learner between the content to be learnt and some other knowledge: and that is too open-ended a set to predict easily. However, it is possible and probably desirable to automate the most common cases of misconceptions.

---

## 6.4 FEEDBACK AND MICROTEACHING

---

Microteaching is a laboratory situation training procedure aimed at simplifying the complexities of the regular teaching–learning process. The learner is engaged in a scaled down and focused situation, scaled down in terms class size and lesson length and focused on certain teaching tasks such as practice and mastering of specific skills such as lecturing, questioning, probing, leading a discussion, managing classroom, etc. The main elements of microteaching are as under:

- Teaching learning laboratory
- Safe practice ground
- Micro setting and teaching skills
- Modeling component
- Feedback component

Feedback is one of the important components of microteaching. The learners take advantage of this innovative technique of acquiring skills and competencies required by an effective teacher. Various sources of feedback are used to communicate to the learners about strengths and weaknesses of their teaching behaviour.

The review of literature indicates that considerable interest was shown by researchers to study the effects of feedback in the microteaching training process. A number of studies consistently supported the advantages of providing constructive feedback to learners. The research related to feedback in microteaching provides evidence for the following conclusions:

- The immediate and constructive feedback improves teaching behaviour.
- Unless accompanied by appropriate highlighting, focusing or cueing, feedback will not change behaviour significantly.
- When accompanied by powerful modeling procedures (acquiring skills by initiation) the effects of feedback tend to be less significant.

The development of microteaching coincided with the development of videotape recorder, which is a powerful tool in improving teaching behaviour of teacher trainees by providing constructive video feedback to them. Video programmes will provide empirical visual feedback on their teaching behaviour. They should use video recording extensively in microteaching as adjuncts to critiques by supervisor and peers, and as a basis for the feedback to trainees. Besides face-to-face feedback from the teacher educators/supervisors, the learners can use video recording of their microteaching as a source of self-feedback and use it to know their strengths and weaknesses, and improve their teaching behaviour accordingly. Video recording is a powerful source of feedback in microteaching as a tool of acquiring teaching skills.

**Check Your Progress**

**Notes:** a) Write your answers to the questions given below.

b) Compare your answers with the one given at the end of the unit.

3) Differentiate between synchronous and asynchronous feedback.

.....  
 .....  
 .....

4) What is microteaching? Explain the role of feedback in micro-teaching.

.....  
 .....  
 .....

**6.5 FEEDBACK AND REINFORCEMENT**

Feedback and reinforcement are two of the most pivotal components/elements of effective learning. The terms 'reinforcement' and 'feedback' are used interchangeably but these are different from one another. Reinforcement increases the probability of desired response and the function of feedback is to bring a change in behaviour. The term 'reinforcement' is the psychological concept but the term; feedback is concerned with physical sciences. The function of a machine is based on feedback. The momentum is provided in machine by pushing steam or smoke back or steering motorboat. Reinforcement play crucial role in all the learning situations.

As you have studied, feedback equips learners with consequential information about their responses whereas reinforcement affects the tendency to make specific response(s) over again. Feedback can be positive, negative or neutral; reinforcement is either positive (increases the responses) or negative (decreases the responses). Feedback is always almost considered external while reinforcement can be both the extrinsic and/or intrinsic. Further feedback is cognitive in nature and generally used in training situations while reinforcement is affective and used specially in teaching situations.

Feedback is defined as the knowledge about the results or outputs while reinforcement is meant for strengthening desirable behaviour. Further,

reinforcement is the process of increasing the frequency of occurrence of low frequency behaviour, or maintaining the frequency of occurrence of high frequency behaviour. The purpose of discussing the distinction between feedback and reinforcement is to highlight their role in teaching and learning. You, as a teacher and learner, can use these devices to make the teaching-learning process more meaningful and effective.

Two general methods / approaches of reinforcement may be applied to achieve learning objectives. The first and more common approach involves pairing participation in, or level of performance on desired behaviour with presentation of a (usually) pleased or satisfying event. For example, a child might be offered a small bit of food for his/her desired verbal response (for example, saying, "cat," when shown her picture). In this case, receiving the food is said to be contingent upon verbalizing the desired response. If presentation of the food has the desired effect, that is, if it leads to an increase in the frequency of occurrence of the desired behaviour then that act is called positive reinforcement. The consequential event responsible for increasing target frequency – the bit of food itself – is called a positive reinforcer. The second general method of reinforcement involves pairing participation in, or level of performance and desired behaviours with removal of (usually) unpleasant or aversive events, or removal of the threat of such events. For example, an anxious youth might be fearful of receiving low marks in an examination, perhaps because of anticipated parental disapproval. If studying for the examination is maintained at an appropriate level in order to avoid this expected aversive consequence, the cessation of the threat is called negative reinforcement, and the threat itself is a negative reinforcer.

Here, you should understand two points regarding reinforcement. First, reinforcement is defined solely in the context of its effects on the desired behaviour. Any consequence that leads to an increase in low frequency behaviour or maintenance of high-frequency behaviour carries the label of reinforcement, no matter how irrelevant or insubstantial that consequence may appear to a teacher or learner. Second, the terms 'positive' and 'negative' do not imply relative worth or desirability. They are not synonymous with 'good' and 'bad'. Rather, these terms are used between desired behaviour and its consequence. Positive reinforcement simply means that something is given to the learner when desired behaviour occurs. In contrast, negative reinforcement means only that something is taken away from the learner upon occurrence of the desired behaviour. In both cases, the goal is to maintain or to increase the frequency of a desired behaviour. In other words through reinforcement we facilitate the learning process.

The programmed instruction / learning situation includes more than one kind of reinforcement, and comprises at least two kinds of learners' behaviour that are being consistently reinforced. Each correct response is reinforced, thereby producing the desired relationship between the content of the steps/frames and the responses made to the content. In addition, the behaviour called paying attention or attending to learning objects, is reinforced each time a correct response is made. As a result the learner tends to continue to pay attention and work carefully on each frame. Thus, programmed instruction makes use of the operation of reinforcement. In programmed learning reinforcement of various kinds are available to the learner. For example, when a learner makes a response, s/he is provided feedback in the next frame. This feedback is the reinforcement. The reinforcement is simply to encourage him/her to proceed to make a response.

---

## 6.6 FEEDBACK DEVICES

---

There are various devices to provide and receive feedback to and from learners. We shall discuss here two important devices. They are: programmed instruction and interaction analysis devices.

### 6.6.1 Programmed Instruction (PI) as a Feedback Device

We hope that you are aware of programmed instruction. The procedure of development of programmed instruction (PI) provides deep insight and understanding about the elements, structure, and sequencing and transaction of content. The preparation of programmed instruction materials makes the trainees aware of content analysis/structure and the entire process provides feedback on the effectiveness of the material. Feedback is an integral part of programmed instruction. Training in programmed instruction develops the following skills in learners:

- The learners acquire skill of analysis and organization of content in the most logical sequence depending on the need and mental ability of the learners.
- They are able to break and present the content into small (but manageable) frames / steps or frames.
- They are able to provide reinforcement to learn by confirming their responses that is they get feedback on the responses or answer.
- They are able to develop appropriate learning environment for achieving the desired learning objectives.
- They are able to consider the individual differences and create an encouraging learning situation so that they can learn according to their own pace.
- They are able to identify the objectives precisely and state them in terms of learning outcomes.

### 6.6.2 Interaction Analysis as a Feedback Device

The teacher trainees are trained both in theory and practice of interaction analysis for use. It acts as a feedback device. Feedback is considered an important component of interaction. Feedback provides learners with knowledge of results that indicate whether they have learnt correctly, or it can take the form of a response from another person indicating how well the learner has learnt (Bates, 1995). During teaching practice, the performance of teacher trainees is observed by using the interaction analysis technique. The record sheet of classroom observation is given to the teacher trainees so that they can decode their own teaching behaviour by preparing the matrix table. The decoding process provides feedback on their teaching behaviour. The awareness of teaching behaviour performance will provide feedback to the teacher trainees who will further improve their teaching behaviour by analyzing their teaching performance. The decoding process may be followed by discussing feedback with their peers and supervisors. The trainees can make use of feedback given by peers or supervisors by decoding process. The audio and videotape can be used for recording teaching behaviour and can be displayed by the teacher trainees to observe their teaching behaviour. The knowledge of their performance will provide feedback to them to improve and modify their behaviour.

**Check Your Progress**

**Notes:** a) Write your answers to the questions given below.

b) Compare your answers with the one given at the end of the unit.

5) Explain how feedback is different from reinforcement.

.....

.....

.....

.....

.....

.....

6) Why is feedback used in Programmed Learning Materials (PLM) ?

.....

.....

.....

.....

.....

.....

## 6.7 CHANNELS OF FEEDBACK

Due to technological developments in the recent past various channels of feedback are available to both the teachers and learners. Depending on accessibility and pedagogical effectiveness appropriate channels of feedback can be identified and used. We shall discuss, in brief, major channels of feedback for you to use them in your teaching/learning system.

- **Verbal/non-verbal interaction in a face-to-face situation:** This is a common channel of providing and receiving feedback in a classroom situation. The learners get opportunity to interact with their teachers and resolve their problems. Through verbal interaction both the teacher and the learner get feedback on whether learning objectives are being achieved. Besides, they come to know strengths and weaknesses in their teaching and learning strategies respectively. Verbal feedback is very popular in conventional classroom-based learning. This type of feedback is synchronous in nature. The teachers in verbal feedback should use the language (including its difficulty level) which is easily understood by the learners.
- **Assessment of assignment responses/project work homework:** In many courses, the learners are expected to work on assignment questions/ projects and submit their responses to the teacher for evaluation both in the classroom situation and open distance learning system. The teacher assesses the work and gives feedback on the strengths and weaknesses of the responses. The

learners in this case get non-verbal and delayed feedback on their performance.

- **Learning at a distance:** In open distance learning system postal system is used to respond queries raised by the learners who pursue their study off-campus.
- **Interactive radio and television:** Two-way audio and video communication is becoming popular these days. The learners listen to or view the presentation made by the teacher and discuss problems related to the topic. Interactive radio and television provide in-time feedback to the learners.
- **Teleconference:** Teleconferencing is also becoming a popular channel of communication in ODL system. Through teleconferencing we can connect more than two learning centres and interact electronically with learners. These learning centers may be spread in different part of the country. Depending on the nature of the content, learners and infrastructure various modes of teleconferencing: audio, video and computer can be used for interaction with the learners. This is a synchronous mode of feedback in which the learners get an opportunity to get feedback from the experts instantly.
- **Fax:** Fax is yet another popular channel of feedback. The learners can fax their queries / problems in writing to the teacher who in turn, can send response back to the learners. Fax is effective when the query/problem needs long explanation.
- **E-mail:** With availability and accessibility to Internet facility e-mail is a vibrant mode of communication. There is no distance barrier in this mode of communication. The learners located in any part of the world can interact with their teachers and resolve their queries. Use of internet for pedagogic interaction has become very popular among learners these days. Internet has brought a paradigm change in the way we communicate.
- **Pass-out rate:** Information about the pass-out rate in an institution provides institutional feedback about the impact of teaching on the learners. High pass-out rate confirms the effectiveness of teaching behaviour of the teacher. The marks or grades provide information about the performance of learners.
- **Continuous and term-end examination:** As we know, continuous evaluation and term-end examinations provide feedback to both the teachers and the learners about their performance. It highlights the effectiveness of teaching and learning strategies.

Effective feedback should have the following features.

- It should be constructive so that learners feel encouraged and get appropriate information about their behaviour.
- It should be timely, so that they can use it for subsequent learning tasks.
- It should be prompt so that students can recall what they have learnt.
- It should focus on achievement, not efforts. The work should be assessed, not the learner.

- It should be specific to learning outcomes so that assessment is clearly linked to learning.
- It should be consequential so that it engages learners on what they are required to do on subsequent tasks.
- It should foster independence to lead the learners of assessing their own learning/performance/work.

### Check Your Progress

**Notes:** a) Write your answers to the question given below.

b) Compare your answers with the one given at the end of the unit.

- 7) List the various instructional devices through which feedback is provided to the learners.

.....

.....

.....

.....

.....

## 6.8 LET US SUM UP

Feedback as a component of communication is a significant mechanism used in teaching and training situations. It is needed by teachers to adapt and adjust teaching to accommodate learning needs and learners to adapt and adjust their learning strategies. Feedback has different sources and types, which can be used in the light of the context, content and process of teaching and training. In feedback the learners are able to reflect on their success in learning of content. It is, however, important that correct and constructive feedback should be given to the learners.

In this Unit, you have studied the concept and importance of feedback. We discussed feedback in relation to reinforcement and microteaching. We also discussed programmed instruction and interaction analysis as feedback devices. Synchronous and asynchronous channels of feedback have also been discussed in brief. Various channels of feedback such as verbal/non-verbal interaction, postal correspondence, teleconference, interactive radio and television, e-mail, pass-out rate and examinations, etc. are discussed in the Unit. At the end of the Unit, we have listed some features of constructive feedback.

## 6.9 POINTS FOR DISCUSSION

'Some scholars believe that feedback does not function as reinforcement.' What do you say? Discuss your response with the help of convincing argument, examples and illustrations.

- 1) There is a controversy between 'immediate' and 'delayed' feedback. Discuss the situations where 'immediate' and 'delayed' feedback should be given. Justify the use of 'immediate' and 'delayed' feedback.

- 2) 'Feedback gives support to the learners to self-assess themselves on the content being taught/learned. They must learn to internalize feedback (input) and take appropriate judgment with regard to their study.' Discuss the statement.

---

## 6.10 SUGGESTED READINGS AND REFERENCES

---

- Bangert-Drowns, R.L, Kulik, C.C., Kulik, J.A. & Morgan, M (19991). The Instructional Effect of Feedback in Test-like Events, *Review of Educational Research*, 61 (2) 213-238.
- Bates, Tony, (1995). *Technology, Open Learning and Distance Education*, London: Routledge
- Draper, Stephen W. (1999). Feedback, <http://www.psy.gla.ac.uk/~steve/feedback.html>.
- Goldberg, Murray (2001). *Synchronous vs. Asynchronous: Some Thoughts*, [www.otlnewsletter.com](http://www.otlnewsletter.com).
- Golec, Piotr: *Feedback – Key Concept in Economics and Management*, <http://www.economicwebinstitute.org/glossary/feedback.htm>
- Heinich, R.; Molenda, M.; Russell, J. & Smaldino, S. (1996). *Instructional Media & Technologies for Learning*, New Jersey: Prentice-Hall Inc.
- Mahar, S.E. (2005). The Centrality of Feedback in Teaching Business Communication and Improving Performance, in *Proceedings of the 2005 Association of Business Communication Annual Convention*, Associates of Business Com, USA
- Merrill, D.C., Reiser, B.J. Ranney, M. & Trafton, J.G (1992). Effective Tutoring Techniques: A Comparison of Human Tutors and Intelligent Tutoring Systems, *The Journal of Learning Sciences*, 2(3), 277-305.
- Singh, L.C. (2005). *Microteaching: Theory, Research and Practice*, Agra: National Psychological Corporation.
- Wolcott, L.L. (1994). Audio Tools for Distance Education, in book: *Distance Education: Strategies and Tools*, Barry Willis (Ed.), New Jersey: Educational Technology Publications.

---

## 6.11 ANSWERS TO CHECK YOUR PROGRESS

---

- 1) The basic purpose of feedback is to help both teachers and learners achieve pre-determined instructional objectives effectively and efficiently by adapting and adjusting teaching-learning strategies.
- 2) Feedback helps a teacher to make appropriate decisions and review his/her earlier decisions regarding various components of the instructional system. For example, if the teacher fails to explain a particular concept to student with the help of a particular method, he/she may shift to some other method.
- 3) Synchronous feedback takes place in real time and feedback is provided immediately. Electronic chat on the Internet is a good example of synchronous feedback in which we sit at our respective computers at the

mutually agreed upon time and initiate pedagogical dialogue. Asynchronous feedback does not happen in real-time. We can communicate without fixing a common time. E-mail and electronic bulletin boards are examples of asynchronous communication.

- 4) Microteaching is a scaled down approach in terms of class size and lesson length to master specific teaching skills such as explaining, reinforcement, introduction to the lesson (set induction), closing the lesson (closure), etc in a teacher education programme. Feedback is used in microteaching as a tool to communicate to the student teachers about their teaching behaviour.
- 5)
  - i) Feedback is provided to bring a change in behaviour, whereas reinforcement increases the probability of desired response.
  - ii) Feedback is concerned with physical science; reinforcement is a psychological concept.
  - iii) Feedback equips learners with consequential information about their responses whereas reinforcement affects the tendency to make specific response (s) again and again.
  - iv) Feedback can be positive, negative or neutral; whereas reinforcement is either positive or negative.
  - v) Feedback is always considered external whereas reinforcement can be both extrinsic and/or intrinsic.
  - vi) Feedback is cognitive in nature and reinforcement is affective in nature.
- 6) Feedback is used in programmed learning materials (PLM) to help the learners confirm their responses to the questions and progress in the learning task.
- 7)
  - i) Verbal/non-verbal interaction
  - ii) Assignment responses
  - iii) Project work/home work
  - iv) Continuous assessment
  - v) Term-end examinations.

---

## UNIT 7 TRANSFER OF TRAINING

---

### Structure

- 7.1 Introduction
- 7.2 Objectives
- 7.3 Transfer of Learning/Training the Concept
- 7.4 Theories of Transfer of Learning
  - 7.4.1 Mental Discipline Theory
  - 7.4.2 Theory of Identical Elements
  - 7.4.3 Theory of Generalization
  - 7.4.4 Theory of Transposition
- 7.5 Forms of Transfer of Learning
  - 7.5.1 Lateral and Vertical Transfer
  - 7.5.2 Positive and Negative Transfer
  - 7.5.3 Near Transfer and Far Transfer
- 7.6 Conditions of Transfer
- 7.7 Role of a Teacher in Transfer of Learning
- 7.8 Let Us Sum Up
- 7.9 Unit End Activity
- 7.10 Suggested Readings and References
- 7.11 Answers to Check Your Progress

---

### 7.1 INTRODUCTION

---

All human beings learn something or other every now and then. Learning takes place in both structured and unstructured environment. While learning experiences are provided to modify the behaviour of the learner consciously in structured environment like schools, colleges or universities, many learning experiences are acquired by the learner in unstructured environments like home, neighbourhood market places, etc. In both the environments, the main objective of human learning is acquisition of knowledge or modification of existing behaviour or knowledge. But human learning goes beyond merely acquisition of knowledge. Human beings make use of existing learning experiences to learn new learning experiences or to solve various problems they face in their lives. For example, Rajesh knows how to drive a scooter. Now, he joins a car driving school to learn driving a car. The trainer at the driving school examines Rajesh's knowledge of accelerator, gear, clutch, break, etc. Rajesh knows the functions of these mechanisms while driving a scooter. Now, he makes use of the earlier knowledge of driving a scooter to learn driving a car. In this case, Rajesh is able to transfer his learning/ training of driving a scooter to learning/ training of driving a car. The process of one's own learning/training experiences being transferred to a new learning/ training situation or more than one learning/training situations is called transfer of learning or transfer of training.

In this unit, we shall discuss the concept, types, theories and various applications of transfer of learning. Since the concept, types and theories of transfer of training are based on the concept, types and theories of transfer of learning, we will focus on transfer of learning through out the unit. We shall discuss the role of teachers in helping the learners to transfer learning and solve the problem. We shall also discuss the factors, which can facilitate the skill of transfer of learning among the learners.

---

## 7.2 OBJECTIVES

---

After going through this unit, you should be able to:

- define the concept of transfer of learning/transfer of training;
- describe transfer of learning at the memory levels;
- discuss theories of transfer of learning;
- describe various forms of transfer of learning;
- discuss the conditions of transfer; and
- state the role of a teacher in transfer of learning.

---

## 7.3 TRANSFER OF LEARNING/TRAINING : THE CONCEPT

---

Human learning has always been the focus of psychologists, educationists and practitioners. Although learning has been defined by educational psychologists from different perspectives, it is generally defined as a relatively permanent change in the behaviour of a human being which results from his interaction with the environment. English and English (1958) define learning more formally as a 'highly general term for the relatively enduring change, in response to a task demand, that is induced directly by experience, or the process or processes whereby such change is brought out'.

Learning as the change of behaviour always occurs in a human being. The change of behaviour may be overt or covert. We come to know that learning in an individual has occurred when he/she displays or demonstrate that learning. For example, a primary school child is able to produce number tables up to 20 or the child corrects all the questions in a grammar test. In these situations, learning is inferred from the child's ability to demonstrate knowledge and skills. But demonstration of knowledge and skills, which occurs at the end of learning tasks, may or may not happen if the learner is faced with a new learning situation. For example, a student may solve the mathematical problems at the end of the chapter but may find difficulty in solving similar problems when they occur mixed with others at the end of the course. This implies that learning in the student has occurred but he is not able to transfer the existing learning experience to new similar situations. Hence, transfer of learning is equally important as learning a new task.

Perkins (1992) defines, "Transfer of learning occurs when learning in one context or with one set of materials impacts on performance in other context or with other related materials". Donclark (2000) points out, "Transfer of learning is a phenomenon of learning more quickly and developing a deeper understanding

of the task if we bring some knowledge or skills from previous learning. Transfer of training occurs when previous learning experiences influence the learning of future learning tasks.

From these definitions, it is clear that previous learning experiences play a great role in transfer of learning. William James was the first educational psychologist who evinced a lot of interest in this concept. In 1890, he found that practice in memorizing Milton's 'Paradise lost' did not produce any improvement in memorization of French poetry. This finding aroused a lot of interest in other educational psychologists who also started investigating the impact of previous learning on learning a new task or how learning of a previous task is being transferred to learning a new task.

Let us discuss as to how transfer of learning occurs at the memory or cognitive level.

**Transfer of learning at memory level**

According to educational psychologists, any kind of information we receive through our interaction with the environment passes through three memory stores. The progress of information through these stores is often referred to as Information Processing Model (Donclark, 2000).

(Source: <http://www.nwlink.com/~donclark/hrd/learning/memor/html>)

When an individual interacts with the environment, information from the environment reaches his sensory memory store. The sensory memory retains an exact copy of what is seen or heard (visual and auditory). But the information remains in it only for a few seconds. Hence, ability of sensory memory to retain information is momentary. Only those information which are selected by human attention move to short-term memory or STM. This means, a limited amount of information is transferred into short-term memory. From short-term memory to long-term memory (LTM) the transfer process involves the encoding or consolidation of information. Moreover, the meaningfulness of the content of information also decides whether the information can be transferred to LTM or not. If the information or the learning experience is not meaningful, there is likelihood that the information may be forgotten. Rehearsal of the learning experience may also help it to be retained in STM for longer time. LTM provides the framework to link old knowledge to new knowledge. It has the capacity to store the information for longer period in comparison to sensory memory and short-term memory. To conclude, we may say that the learning experiences, which exist in LTM help the learner, transfer these experiences to learn/acquire new learning experiences.

**Check Your Progress**

**Notes:** a) Write your answer in the space given below.

b) Compare your answers with those given at the end of the unit.

1) What is transfer of learning or transfer of training?

.....  
.....  
.....

- 2) Why do learning experiences existing in LTM help the learner learn new learning experiences?

.....

.....

.....

.....

.....

.....

## 7.4 THEORIES OF TRANSFER OF LEARNING

The interest in the concept of the transfer of learning formally started in the nineteenth century. Since then, some theories of transfer of learning (as quoted in Thurnburg, 1984) have emerged during the past two centuries. Let us discuss these theories.

### 7.4.1 Mental Discipline Theory

There were two forms of mental discipline theories. One form of the mental discipline of theory emphasized that mind could be best trained by studying the classical language and the second form of mental discipline stressed that the mind was like muscle and could be strengthened with continuous and vigorous exercise. According to mental discipline theory, subjects like Mathematics, Latin, Greek and Sanskrit should be taught to students so that these subjects help in strengthening various faculties of mind.

### 7.4.2 Theory of Identical Elements

The mental discipline theory was challenged by William James in 1890. The writings of William James (1890) and the research of Thorndike and Woodsworth (1901) cast the first serious doubts on mental discipline theory.(as quoted in Thurnburg,1984) In 1901, E.L. Thorndike conducted an another experiment and concluded that there was no significant gain in intelligence by students who studied Latin or French than by students who studied physical science.

The theory of identical elements was propounded by E.L, Thorndike. He believed that learning in one kind of activity transfers to another as long as certain features in both tasks are identical. In other words, information which has been learnt in one situation and the information which has to be learned in a new situation must be identical. For example, training in car driving can be transferred to training in truck driving. Similarly,  $4 + 4 = 8$  will facilitate learning  $6 + 4 = 10$ . Learning of Sanskrit may be transferred to learning of Hindi. Training on the typewriter may be transferred to word processing on computer.

Although Thorndike's theory has implications for classroom learning or training situations, it suffers from some limitations. It is very difficult to find a high degree of similarity between two learning situations in actual classroom practice. Some critics felt that human learning experiences were more meaningful if they

were transferred to learn more complex learning experiences. Hence, identical nature of two learning situations is an inadequate explanation of transfer of learning. The deficiencies that were with Thorndike's theory gave rise to a new theory of transfer of learning.

### 7.4.3 Theory of Generalization

The theory of identical elements was questioned. It was advocated that transfer is based on understanding Charles Judd in 1908 advocated that transfer is based on an understanding of general principles rather than upon a recognition of identical elements. This means that understanding the general principles underlying the learning task is more important than recognizing their identical nature. Let us examine the following examples to understand the theory of generalization:

- learning  $2 \times 2 = 4$  facilitates learning  $5 \times 4 = 20$
- learning  $8 \div 4 = 2$  facilitates learning  $10 \div 2 = 5$
- learning  $6 \times 4 \div 2 = 12$  facilitates  $6 \times 5 \div 2 = 15$

In the first example, the general principle "multiply" transfers to the new learning task and in the second example, the principle "divide" transfers to the new learning task, whereas in the third example, both the principles transfer to the new learning task.

Judd conducted an experiment to justify his theory. He selected two groups of boys who were asked to throw a dart at an underwater target. The experimental group was taught the principle of refraction, but the control group was not. In the initial trial both groups performed comparably. There was no impact of learning the principle of refraction by the experimental group successfully hit the target and the control group could not. Judd concluded that knowledge of the principle successfully transferred in the experimental group's second trial. Judd's finding was supported by Hendrickson and Schroeder in 1941 in a replicated study.

### 7.4.4 Theory of Transposition

The theory of transposition was advocated by Gestalt psychologists in the 1930s. A Gestalt means a whole. This means that the learning task is to be perceived in a holistic perspective rather than in a part perspective. The whole is more important than part. Hence, learning is transferable from one situation to another if the learner understands the learning situation in totality or in its appropriate means-end relationship. In Judd's experiment, if the individual is to hit the deeply underwater target with a dart, he/she must perceive the situation in terms of the relationships among the previously acquired principles of refraction, water depth, darts and targets. Hence, this theory is an improvement over Judd's theory of transfer in the sense that the learner has taken into other considerations other than the principles associated with the learning task. Learning, according to this theory, is to form a gestalt pattern or configuration, which is meaningful.

After having understood the theories of transfer of learning, we now discuss the various forms of transfer in the next section.

**Check Your Progress**

**Notes:** a) Write your answer in the space given below.

b) Compare your answers with those given at the end of the unit.

3) Differentiate between theory of identical elements and theory of generalization.

.....

.....

.....

.....

.....

4) What is the philosophy behind the theory of transposition?

.....

.....

.....

.....

.....

**7.5 FORMS OF TRANSFER OF LEARNING**

Closed to the theories of transfer of learning, some educational psychologists and researchers later on talked about various forms of transfer of learning. Let us discuss these types.

**7.5.1 Lateral and Vertical Transfer**

Gagne (1965) discusses lateral transfer and vertical transfer. Thornburg (1984) defines lateral transfer as the generalizing of knowledge across a diverse set of situations at roughly the same level of complexity. In other words, it is a general ability we acquire and internalize by using knowledge in a variety of situations. There is no transfer of one learning situation to another in lateral transfer. Rather the learning in one situation can be generalized to a number of learning situations. Let us examine the example:

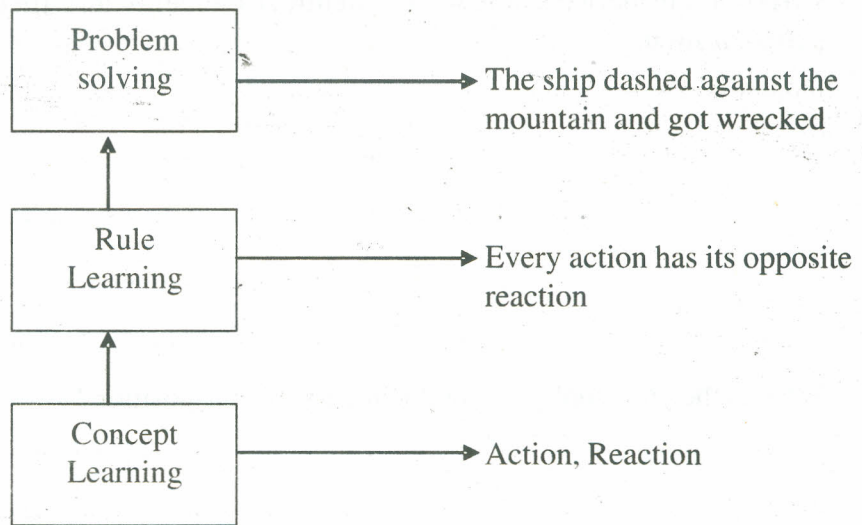
A child has learnt the principle of subtraction and knows that  $10 - 5 = 5$ . He/she can use this knowledge to solve problems related to blocks, or beads or even day-to-day life problems. If a child is asked by his mother to tell him about the number of pencils left with him after distributing 15 out of 20 pencils to his friends on Birthday party, he is able to say that five pencils are left.

Lateral transfer is important when understanding and skills acquired by learners are required to be utilized in learning situations outside the learning environments.

On the contrary, according to Thornburg (1984), vertical transfer is the acquisition of new responses contingent on the learning of prerequisite, subordinate capabilities. This transfer generally occurs when learning events occur in a

hierarchy and is based on Gagne's Hierarchy of Learning. This means we cannot learn at a particular level on the hierarchy unless we have the prerequisite knowledge or skills, which serve the bases for future learning task.

Let us examine the following example.



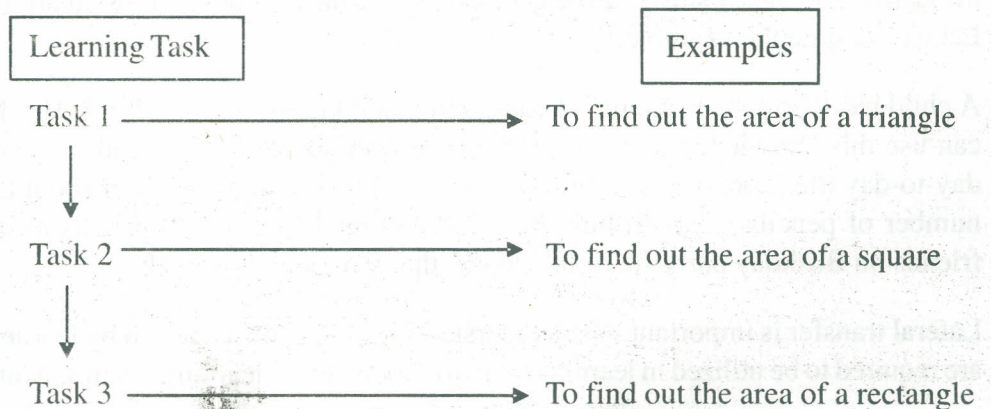
In the example, in order to learn the rule, "Every action has its opposite reaction", the learner must have learnt the concept of action, and reaction. Once he/she learns the rule, he/she will be in a position to explain the problematic situation using the rule.

Some researchers point out some time actions of vertical transfer. First, prerequisite skills do not get always transferred automatically. Second, learners may acquire more learning in order to learn a higher-level learning. However, these limitations do not negate vertical transfer.

### 7.5.2 Positive and Negative Transfer

Positive transfer of learning takes place when a future learning task-task B is facilitated by the existing learning task –task A. This means that learning events should be sequenced; the future learning task is built upon the previous learning task. Moreover, the similarity between the learning tasks also increases the likelihood of positive transfer of learning.

Let us examine the following example:



In the above example, the learner's ability to find out the area of a rectangle depends on his knowledge to find out the area of a square and triangle. The

knowledge acquired in task-1 helps the learner to acquire the knowledge in task -2 and the knowledge acquired in task-2 helps him to acquire knowledge in task-3.

On the other hand, negative transfer of learning occurs when the previous learning inhibits or obstructs in the learning of future task. This phenomenon is also called proactive inhibition. In this type of transfer, though the learning situations or stimuli are similar in nature, the learning task in the second situation demand totally unrelated responses. Generally, it happens that the learner tries to repeat the same responses to the task-2 as they were with the task-1. As a result, learning does not take place and negative transfer occurs. Let us examine the following example:

Harish is a first class cricket bowler. He knows how to swing a cricket ball. He joins a golf training course to learn golf. During his training, he uses the knowledge of swinging cricket ball to learn swinging in the golf. But, he cannot succeed in learning swinging technique for golf. In this case, Harish's earlier knowledge of swinging the cricket ball inhibits the swinging technique for golf. Thus, negative transfer occurs in Harish's learning of golf.

### 7.5.3 Near Transfer and Far Transfer

Transfer of learning can also be classified into near transfer and far transfer. According to Perkins (1992), near transfer refers to transfer between very similar contexts, whereas far transfer refers to transfer between contexts that, on appearance, seem remote and alien to one another. Let us examine the following examples:

**Example-A** A motor mechanic is asked to repair the engine of a new model of car. Since he/she is well versed with the engines of the earlier cars, he/she can transfer that knowledge to the repair of the engine of the new car.

**Example – B** A chess player has joined the military as the commander. He/she knows how to take control of the center. This knowledge he/she can make use of while doing military operation.

In example – A, near transfer takes place while in example B - far transfer of learning takes place.

---

## 7.6 CONDITIONS OF TRANSFER

---

There are certain condition, which facilitate transfer of learning from one situation to another. Perking (1992) has identified the following conditions of transfer.

**Thorough and diverse practice:** when an existing learning experience is practiced thoroughly in diverse learning situations, the learning experience can easily be transferred to a new learning situation.

**Explicit abstraction:** Sometimes learner's ability to abstract critical attributes of a learning situation helps him/her to transfer leaning from one situation to another. In an experiment, Gick and Holyoak (1983) presented subjects with a problem story that allowed a particular solution. From subjects that solved the problem, they elicited what the subjects took to be the underlying principle.

Then they presented the subjects with another analogous problem that invested a similar approach. Those subjects with the fullest and soundest summary of the principle for the first puzzle were most successful with the second. Therefore, explicit abstractions of principles from a situation help in transfer of learning.

**Active self-monitoring:** Self-monitoring or reflection on one's thinking processes seems to facilitate transfer of learning. Whereas abstraction emphasizes the structure of the situation, self-monitoring stresses on one's own thinking process.

**Arousing mindfulness:** Mindfulness refers to a generalized state of alertness to the activities one is engaged in and to one's surroundings, in contrast with a passive reactive mode in which cognitions, behaviours, and other responses unfold automatically and mindlessly (Langer, 1989). Mindfulness promotes explicit abstraction and active self-monitoring, which are helpful for transfer.

**Using a metaphor or analogy:** Transfer of learning is facilitated when existing learning material acts as an analogy or metaphor for the new learning material. For example, the way mind processes information can be compared with the computer processes information. However, while using analogies, one should need detailed elaboration.

**Check Your Progress**

**Notes:** a) Write your answers in the space given below.

b) Compare your answers with those given at the end of the unit.

5) Differentiate between lateral and vertical transfer with examples.

.....  
.....  
.....  
.....

6) List the conditions for transfer of learning.

.....  
.....  
.....  
.....

---

## 7.7 ROLE OF A TEACHER IN TRANSFER OF LEARNING

---

Although transfer of learning takes place in different human beings in different degrees, deliberate attempts by teachers or trainers can help students transfer learning experiences. The following activities a teacher or a trainer can organise to facilitate transfer.

- i) **Ensure the similarity between the present learning experience and the future learning tasks:** The teacher can help the learners find out the similarities between the present learning experience and the future learning tasks. Therefore, he/she should provide identical instructional method and learning material. Even organization of learning experiences should be similar or identical in both the instructional situations – old and new.
- ii) **Provide sufficient practice with the present learning task:** Whenever the teacher organizes a learning task, he/she should provide student ample practice with the learning task so that positive transfer takes place to future learning tasks. Lack of adequate practice may hamper transfer of learning. For example, while introducing algebraic formula of  $(a+b)^2 = a^2 + b^2 + 2ab$ , the teacher should give students many examples of the application of formula and ensure that the students practice with the formula.
- iii) **Provide a lot of examples and illustrations:** When teaching concepts, principles, laws, etc. the teacher should provide a lot of examples, illustrations, and explanations so that students understand them effectively and transfer their learning to new situations. Similarly, when teaching the skill, the teacher should demonstrate the skill he/she is teaching the students. For example, the trainer in a driving school should demonstrate the skill of applying the brake, clutch and accelerator to the trainee.
- iv) **Ensure the understanding of general-principles by learners:** In structured learning situations like classrooms, the teacher must ensure that general principles associated with a learning task are understood by the learners. Such an understanding on the part of the learners help them apply these principles while learning a similar kind of learning task. The transfer of learning, therefore, depends as how well general principles are understood.
- v) **Emphasize the learning of sequential task:** Many learning tasks comprise a series of sub-skills, which are sequential in nature. The learning of one specific skill depends on the mastery of the pre-requisite or previous specific skills. Generally, the lower order or less difficult skills are learnt prior to higher order or more difficult skills. Hence, transfer of learning to a new task depends on the acquisition of learning on the previous tasks. For example, learning of four digit addition depends on three digit, two digit and one digit additions.

**Check Your Progress**

**Notes:** a) Write your answer in the space given below.

b) Compare your answers with those given at the end of the unit.

7) Discuss briefly the role of teacher or a trainer in transfer of learning.

.....

.....

.....

.....

.....

---

## 7.8 LET US SUM UP

---

The main objective of human learning in both structured and unstructured environment is to acquire new information or modify human behaviour. But, such learning cannot become operational or functional so long as it is used to learn the future learning tasks or solve various problems of life. Hence, transfer of learning is as important as learning task. It occurs when learning of one task impacts on learning of a new task. Transfer of learning operates at sensory, short term memory and long term memory level. Various theoreticians have come out with different theories of transfer of learning based on experimentation and findings. These theories are mental discipline theory, theory of identical elements, theory of generalization and theory of transposition. Transfer of learning can be lateral or vertical, positive or negative, near or far. Transfer takes place on certain learning conditions.

A teacher or a trainer has a great role in facilitating transfer of learning among his/her students or trainees. Apart from the teachers or trainers, supervisors, learners themselves and co-workers have also to play their roles before, during and after learning activities in order to facilitate transfer of learning.

---

## 7.9 UNIT END ACTIVITY

---

Select a few new learning tasks in the subject area you are teaching. Organize teaching/ training activities to facilitate optimum transfer of learning among your students/ trainers. Write a short report on your observation in the entire exercise.

---

## 7.10 SUGGESTED READINGS AND REFERENCES

---

Chauhan, S.S. (1978). *Advanced Educational Psychology*, Delhi: Vani Educational Books

Donclark (2000). *Transfer of Learning*, <http://www.nwlink.com/~donclark/hrd/learning/transfer.html>

English, H.B. and English, A.C. (1958). *A Comprehensive Dictionary of Psychological and Psychoanalytical Terms*. New York: McKay. in Thornburg, Hershel D. (1984) *Introduction to Educational Psychology*, New York: West Publishing Company

Gagne, R.M.(1965). *Conditions of Learning*. New York: Holt, Rinehart and Winston in Thornburg, Hershel D. (1984) *Introduction to Educational Psychology*, New York: West Publishing Company

Gick, M.L., Holyoak, K.J. (1983) Schema Induction and Analogical Transfer, *Psychology*, 15:1-38, referred in Perkins, D.N. (1992) *Transfer of Learning* <http://learnweb.harvard.edu/alps/thenking/docs/trancyn.htm>

Hendrikson, G and Schroeder, W. (1941). Transfer of Training in Learning to hit a Submerged target. *Journal of Educational Psychology*, 32, 206-213 in Thornburg, Hershel D. (1984) *Introduction to Educational Psychology*, New York: West Publishing Company

Judd, C. H. (1908). The Relation of Special Training and General Intelligence. *Educational Review*, 36, 42-48, Qouted in Thornburg, Hershel D. (1984) *Introduction to Educational Psychology*, New York: West Publishing Company

Langer, E.J. (1989) *Mindfulness*, Addison-Westley, Reading, Massachusetts, referred in Perkins, David, N. (1992) *Transfer of Learning*, <http://learnweb.harvard.edu/alps/thinking/docs/traencyn.htm>

Perkins, David. N (1992) Transfer of Learning, *International Encyclopedia of Education*, Second Edition, Oxford: Pergamon Press. <http://learnweb.harvard.edu/alps/thinking/docs/traencyn.htm>

Thornburg, Hershel D. (1984) *Introduction to Educational Psychology*, New York: West Publishing Company

---

## 7.11 ANSWERS TO CHECK YOUR PROGRESS

---

- 1) Transfer of learning/transfer of training refers to the process in which a learn makes a use of existing learning or training experiences to learn a new learning/ training experiences
- 2). Learning experiences existing in long term memory help the learner to learn new learning experiences because these learning experiences are permanent and meaningful in nature in comparison to learning experiences existing in short term memory.
- 3) According to the theory of identical elements, certain features in the existing previous learning task and the new learning tasks are identical which help in transfer of learning. On the contrary, the theory of generalization advocates an understanding of general principles that underline a learning task, which is important in transfer of learning.
- 4) The basic philosophy behind the theory of transposition is the gestalt or holistic perspective of a learning task. It is more important for transfer of learning than in a part perspective.
- 5) Lateral transfer takes place when learning is generalized across a diverse set of situations at roughly the same level of complexity. For example, a child learns  $2 + 2 = 4$ , this knowledge helps as he/she can use to solve problems like buying or counting anything. On the other hand, vertical transfer is the acquisition of new responses which depend on the learning of pre-requisite capabilities. For examples, learning of a law of demand in Economics is dependent on the learners' pre-requisite knowledge about the concepts of demand and supply.
- 6)
  - i) Thorough and diverse practice
  - ii) Explicit abstraction
  - iii) Active self-monitoring
  - iv) Arousing mindfulness
  - v) Using a metaphor or analogy

7) The role of a teacher in transfer of learning are:

- i) To ensure similarity between the present learning experiences and future learning tasks.
- ii) To provide sufficient practice with the present learning task.
- iii) To provide a lot of examples and illustrations.
- iv) To ensure the understanding of general principles by learners
- v) To emphasize the learning of sequential tasks.

THE ANSWERS TO CHECK YOUR PROGRESS



THE PEOPLE'S UNIVERSITY

MPDD-IGNOU/P.O. 5 T/November , 2011 (Reprint)



ignou  
THE PEOPLE'S  
UNIVERSITY

ISBN-978-81-266-3975-5