

FOUNDATIONS OF LEARNING

Behaviouristic School of Thought

Cognitivist School of Thought

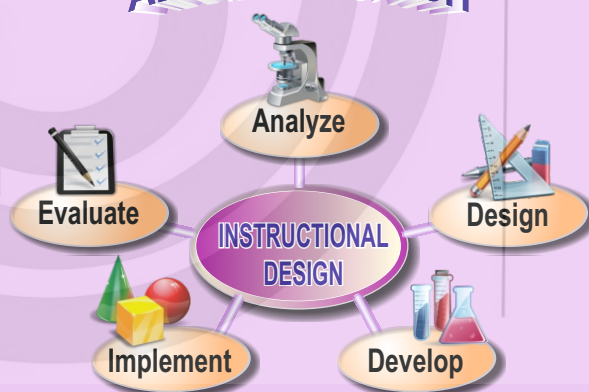
Constructivist School of Thought

INSTRUCTIONAL DESIGN THEORIES AND MODELS

Elaboration Theory

The 4C-Instructional Design Model

ADDIE APPROACH



UNIT DESIGN

Structure

Introduction and Objectives

Subject Matter/Content

Section-1

Section-2

Section-n

In-Text
Questions

In-Text
Questions

Activities

Self Check
Exercises

Self Check
Exercises

In-Text
Questions

Activities

Activities

Self Check
Exercises

Characteristics of Learners and Learning Styles

Instructional Design and Multi-media

Instructional Design and E-Learning

Summary

Answers to Check Your Progress

Assignments

VOLUME 1

Block 1

FOUNDATIONS OF LEARNING

13

Block 2

INSTRUCTIONAL DESIGN: THEORIES AND MODELS

73

MDE-412: Instructional Design

(New Course in place of ES-312: Design and Development of Self Learning Print Materials)

EXPERT COMMITTEE

Prof. A. Sukumaran Nair (*Chairman*)
Former Vice Chancellor
Mahatma Gandhi University
Kottayam

Prof. O.S. Dewal
Founding Director
National Open School, New Delhi

Prof. K. Sudha Rao
National University of Educational
Planning and Administration
New Delhi

Prof. Chandra Bhushan (Retd.)
CIET, National Council for Educational
Research and Training, New Delhi

Prof. Santosh Panda (Convenor)
Director
Staff Training and Research Institute of
Distance Education,
IGNOU

Prof. K. Murugan
Director, School of Humanities
Tamil Nadu State Open University
Chennai

Prof. S.V.S. Chaudhary
School of Education
IGNOU

All STRIDE Faculty

SPECIAL ACKNOWLEDGEMENT

Prof. Nageshwar Rao
Vice-Chancellor, IGNOU

Prof. Rampelli Satyanarayana
Director, STRIDE, IGNOU

COURSE TEAM

Content Contributors

Prof. Basanti Pradhan (Unit 1)
STRIDE, IGNOU

Prof. Manjula Rao (Units 2, 3 & 4)
Regional Institute of Education (RIE)
Mysore, Karnataka

Dr. Sanjaya Mishra (Units 5 & 10)
Commonwealth of Learning, Vancouver

Prof. M. David Merrill (Unit 6)
Professor Emeritus
Utah State University, Utah

Dr. Rajani Joshi Chaudhary (Unit 7)
Sri. L.B.S. Rashtriya Sanskrit Vidyapeetha,
New Delhi

Dr. Ramesh C. Sharma (Units 8 & 9)
Ambedkar University, Delhi

Content Editing

Prof. Vasudha Kamat
Former Vice-Chancellor
SNDT Women's University, Mumbai

Prof. Basanti Pradhan, STRIDE, IGNOU

Dr. Anita Priyadarshini, STRIDE, IGNOU

Format Editing

Dr. Anita Priyadarshini, STRIDE, IGNOU

Language Editing

Dr. Moumita Das, NCIDE, IGNOU (Block 1)

Dr. Sujata Santosh, NCIDE, IGNOU (Block 2)

Course Coordinators

Prof. Basanti Pradhan, STRIDE, IGNOU

Dr. Anita Priyadarshini, STRIDE, IGNOU

Programme Coordinator

Dr. Anita Priyadarshini, STRIDE, IGNOU

PRINT PRODUCTION

Ms. Promila Soni
Assistant Registrar
MPDD, IGNOU, New Delhi

July, 2021

© Indira Gandhi National Open University, 2021

ISBN-81

All right 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 about the Indira Gandhi National Open University courses may be obtained from the University's office at Maidan Garhi, New Delhi-110068.

Published by **The Registrar**, MPDD, IGNOU, New Delhi on behalf of the Indira Gandhi National Open University, New Delhi.

Cover design by Mr. Arif Hasan Naqvi, EMPC, IGNOU.

Laser Typeset at: Tessa Media & Computers, C-206, Shaheen Bagh, Jamia Nagar, New Delhi.

Printed at:

MDE-412: Instructional Design

Course Outline

Block 1 Foundations of Learning

Unit 1	Learning and Instruction
Unit 2	Behaviouristic School of Thought
Unit 3	Cognitivist School of Thought
Unit 4	Constructivist School of Thought

Block 2 Instructional Design: Theories and Models

Unit 5	Instructional Design: An Overview
Unit 6	Component Display Theory (CDT)
Unit 7	Elaboration Theory
Unit 8	Cognitive Load Theory (CLT) and Cognitive Flexibility Theory (CFT)
Unit 9	Theory of Multiple Intelligences
Unit 10	The 4C/ID (The Four Component/Instructional Design) Model

Block 3 Instructional Design Processes

Unit 11	The ADDIE Approach (Analyze, Design, Develop, Implement and Evaluate)
Unit 12	Learners' Characteristics and Learning Styles
Unit 13	Designing Learning
Unit 14	Development of Learning Resources
Unit 15	Evaluation of Learning

Block 4 Instructional Design in Practice

Unit 16	Instructional Design in Classroom
Unit 17	Instructional Design in Training
Unit 18	Instructional Design in Distance Education
Unit 19	Instructional Design in Multimedia
Unit 20	Instructional Design in e-Learning

Block 5 Developing Portfolios

Unit 21	Portfolios: A Review
Unit 22	Design and Development of ePortfolios



ignou
THE PEOPLE'S
UNIVERSITY

INTRODUCTION TO THE COURSE

Dear Learner!

We welcome you to the Course MDE- 412: Instructional Design.

Rapid advances in Information and Communication Technology (ICT) have led to a tremendous increase in the number of courses and programmes offered through Open and Distance Learning (ODL) for diversified group of students. This has resulted in a great need for designing and developing courses and programmes in a dynamic way, which are offered to distance learners based on the philosophy of open learning. In recent years, many ODL institutions have started offering programmes through computer-based instruction with other media, such as online, print, audio, video, and multimedia. Consequently, the need for designing instructional materials in varied formats for meeting the demands of the distance learners is growing. It is to meet this need that the Course MDE-412 'Instructional Design' has been prepared by STRIDE of IGNOU as an M.A. (Distance Education) course.

The mechanisms to design courses and programmes in ODL institutions are continuously evolving and are as dynamic as the philosophy of open learning and are changing with the development of ICT. Many innovations that had happened in the process of course/ programme development and delivery have now been incorporated, and now we have a systematic approach to the process of designing courses and programmes in ODL.

This course is developed to offer you a knowledge base for designing instruction starting from print media to multimedia and e-learning for effective distance teaching. In this course we offer a structure and rationale to underpin all aspects of designing instruction by maintaining a balance between a sound theory and model as well as practical implications. The influences of ICT trends and drivers over the last few decades, as well as current imperatives and initiatives have been presented in this course. In other words, this course aims at identifying the steps in the instructional design process and implementing them to create learning materials and environment.

The purpose of this course 'Instructional Design' is to help you to meet the demanding task of designing instruction in distance education for facilitating learning in distance learners.

This course begins with Block 1 named '*Foundations of Learning*'. This Block consisting of four units provides a basic idea of what learning is and how we learn. This Block focuses on the specific terms – instruction, learning, and the theories of learning mainly Behaviouristic School of Thought, Cognitivist School of Thought, and Constructivist School of Thought. In this block we look at the theories of learning in their broadest sense in order to give a framework for a more detailed discussion pertaining to designing instruction for students that follows in consequent Blocks.

In Block 2 we focus on '*Instructional Design: Theories and Models*', and introduce you to a number of theories and models of instructional design that can be considered for designing courses and programmes. There are two important threads that emerge from this block: the use of theories and models of instructional design and the need for including them in the design process where we consider that design is a process of reflection in action. The six units presented in this Block represent a combination of the published work on instructional design theories and models. Although there are a variety of models, but this Block focuses only a few relevant models for designing instruction.

Block 3 named '*Instructional Design Processes*' provides a detailed discussion on various processes of designing instruction. In this block, the ADDIE approach is explained, which is an acronym for analyze, design, develop, implement, and evaluate. ADDIE is considered as an illustration of the important steps involved in instructional design and development process. As you design ODL study materials keep in mind the models you have studied in Block 2, ADDIE can help you plan the instructional events after assessing the needs of distance learners. Block 3 also provides you guidance on writing learning outcomes, designing learning resources and evaluation of learning.

Block 4 describes '*Instructional Design Practice*'. This block explains how designing instruction is carried out in classrooms, distance teaching, training, multimedia and e-learning. A comprehensive structure for lesson planning, course design, unit design, use of ADDIE in multimedia and e-learning strategies, etc., are presented for providing knowledge and insight that you will use while designing instruction at various levels.

Block 5 is on *Developing Portfolios*, which provides basic information pertaining to what is a portfolio, components of portfolios, purpose of using portfolios, and how to develop an e-portfolio pertaining to instructional design.

The course coordinators express gratitude to their colleagues at STRIDE. Prof. Rampelli Satyanarayana, Director (STRIDE) deserves sincere thanks for his support and cooperation. Prof. Santosh Panda, Prof. Manjulika Srivastava, Prof. C.R.K. Murthy, Prof. Madhu Parhar, and Dr. Tata Ramakrishna deserve special thanks for their encouragement and inspiration.

The course coordinators are thankful to Dr. Anita Priyadarshini, Dr. Amiteshwar Ratra, Dr. Ali Asgar and Dr. Pulla Lakshmi for peer commenting during the formative stage of this course and Dr. G. Mythili for suggestions and incorporation of content in Block 5 pertaining to Development of Portfolios.

The course coordinators extend a deep sense of gratitude to the content editor, language editors, unit writers, and all the authors and writers of different books, journals and publications, websites, which were the rich source for preparing this course. The course coordinators are grateful to Prof. B.N. Koul, former Pro Vice-Chancellor, IGNOU for providing the concept of the unit design on the cover page of this course.

We hope you will find this course, underpinned by a sound theory, as a practical guide that helps you to design units/courses/programmes for students.

A schematic representation of the design of units is given below to facilitate your access to the subject-matter presented here.

In the study guide*, we have divided the units into sections for easy reading and better comprehension. Each section is indicated distinctly by bold capitals and each sub-section by relatively smaller but bold upper and lower typeface. The significant divisions within sub-sections are in still smaller but bold upper and lower typeface so as to make it easier for you to locate this within sub-sections. For the purpose of uniformity, we have employed the same scheme of 'partitioning' in every unit throughout the course.

We have provided self-check exercises under the caption 'Check Your Progress' or 'Self-Check Exercises' at a few places in each of these units, which invariably end with possible answers or hints to the questions in these exercises. These exercises are not meant to be submitted to us for corrections or evaluation. Instead, the exercises are to function as study tools to help you keep on the right track as you read the units.

*Study Guide

Unit X*

X.1 Introduction

X.2 Objectives/Learning Outcomes

X.3 Section 1 (Main Theme)

x.3.1 Sub-section 1 of Section 1

x.3.2 Sub-section 2 of Section 1

.....

.....

.....

Check Your Progress

X.4 Section 2 (Main Theme)

x.4.1 Sub-section 1 of Section 2

x.4.2 Sub-section 2 of Section 2

.....

.....

.....

Check Your Progress

Wherever check your progress exercises or their possible answers appear, they are in boxes to stand out from the rest of the text.

Check Your Progress:
Possible Answers

X.n Let Us Sum Up

*‘X’ stands for the serial number of the unit concerned.

What perhaps you would like to do is to go through the units and as you read, jot down important points in the space provided in the margin. Broad margins in the booklet are provided for you to write your notes. Make your notes as you work through the Units. This will help you prepare for the examination as also in assimilating the content. Besides, you will be able to save on time. Do use these margins. This will help you keep track of and assimilate what you have been reading in the Units, answer the Self-Check Exercises and the assignment questions, and easily identify the items(s) to be clarified.

Good luck!

Basanti Pradhan & Anita Priyadarshini



Block

1

FOUNDATIONS OF LEARNING

UNIT 1	
Learning and Instruction	13
UNIT 2	
Behaviouristic School of Thought	27
UNIT 3	
Cognitivist School of Thought	44
UNIT 4	
Constructivist School of Thought	59



BLOCK 1 FOUNDATIONS OF LEARNING

Introduction to the Block

Dear Learner,

Welcome to Block 1 of Course MDE-412: Instructional Design i.e., Foundations of learning.

The purpose of this Block is to help you to think about how distance learners learn. We start this Block with a discussion on concepts of learning and theories of learning (Behaviouristic, Cognitivist and Constructivist) that seek to explore ‘how distant learners learn’ and ‘what facilitates distance learning’. The implications of these learning theories for designing instructional materials have been discussed in Units 2, 3 and 4. This Block includes the concept of learning and instruction, perspectives of learning and theories of learning, i.e., behaviourism, cognitivism and constructivism, which provide a platform for supporting the different types of learning and designing instruction.

A question may come to your mind and that is “what is learning?” Let us find out.

What is learning?

Your answer to this question depends on your perspective as a distance learner. For some learners, learning is the process of acquiring facts or procedures that are to be applied, whereas for others, learning is an increase in their knowledge, skills and attitudes. There are many sources that tell you about what is learning, which may help you to broaden your conception of learning.

In this Block, we have discussed the perceptions of what the behaviourists, cognitive psychologists, humanistic psychologists and constructivists say about learning. For a behaviourist, learning is the modification of behaviour brought about by experience. For cognitive psychologists, learning is the study of how information is sensed, stored, elaborated and retrieved. Humanistic psychologists insist on personal growth and development as the indicator of learning, while constructivists argue that learning is primarily concerned with how you construct knowledge, and develop different conceptions and construction of reality. Each view leads to a different conception of learning. Each view has different implication for designing and developing course/programme, construction of learning tasks, and methods of assessment.

You learn while going through the self-learning materials and media components, by reading, memorizing, thinking, writing, note taking, watching, observing, participating, and listening to and talking with your counsellor and peer learners during face-to-face or online counselling sessions. You learn by doing activities/self-check assessment questions/check your progress questions presented in the Self-Learning Material and writing your assignment-responses i.e., Tutor Marked Assignments (TMAs). Finally you complete this programme after appearing in the term-end examination. However, does the above description of your experiences as a distance learner explain how you learn and why you learn? For answers to these questions you have to go through the various perspectives and theories of learning. These theories are presented for you for developing a better understanding on a continuum with behaviourism theories at the beginning of the Block and constructivism theories at the end. As you proceed reading the Units of this Block you would understand that these theories of learning are the foundations of designing instruction.

In this Block we have discussed the perceptions of what the behaviourists, cognitive psychologists, humanistic psychologists and constructivists say about learning. For a behaviourist, learning is the modification of behaviour brought about by experience. For cognitive psychologists, learning is the study of how information is sensed, stored, elaborated and retrieved. Humanistic psychologists insist on personal growth and development as the indicator of learning, while constructivists argue that learning is primarily concerned with how you construct knowledge, and develop different conceptions and construction of reality. Each view leads to a different conception of learning. Each view has different implications for designing and developing course/programme, construction of learning tasks, and methods of assessment.

This Block has four units. Unit 1 deals with the contents and concepts of what we consider as the basics for designing instruction. Thereafter we move towards understanding what is learning, what is instruction and the perspectives of learning. In Unit 2 we focus on the Behaviouristic theories that has implications for designing instruction. Unit 3 addresses the question ‘what is cognitivism’ and explores its implications for designing instruction. In Unit 4 we turn your attention to constructivism and its implications for designing instruction. These learning theories are the foundations of instructional design and serve as basis for designing effective distance educational courses/programmes.

We hope that the information presented in this Block will provide you the foundational platform of knowledge that will serve as a base for you to design the courses/programmes in the ODL system.

Good luck!

Basanti Pradhan & Anita Priyadarshini

UNIT 1 LEARNING AND INSTRUCTION

Structure

- 1.1 Introduction
- 1.2 Learning Outcomes
- 1.3 What is Learning?
 - 1.3.1 Learning and Change in Behaviour
 - 1.3.2 Basic Conditions of Learning
 - 1.3.3 Approaches to Learning
- 1.4 Perspectives of Learning
- 1.5 What is Instruction?
- 1.6 Relationship Between Learning and Instruction
- 1.7 Let Us Sum Up
- 1.8 Check Your Progress: Possible Answers

1.1 INTRODUCTION

Welcome to Unit 1 – Learning and Instruction of Block 1 pertaining to Course MDE-412: Instructional Design.

For a successful implementation of any educational programme, knowledge about the theories of learning and instruction form a base for designing programmes in open and distance learning. Sometimes it may happen that certain skills are adequately learnt and practised by us without our being aware of the theoretical basis of those skills. But if we know the theories also, the practice of our skills may be improved for better outputs. For example, you may operate a computer, without being a mechanic for repairing hardware or installation of software, but if you know the mechanisms of operating a computer also you may improve your efficiency as a computer operator.

In the field of open and distance education, your knowledge of various theories of learning will be much more useful when you practice and improve your learning skills. Designing instructional materials, learning strategies, assessment methods – all these are based on certain theories of learning. The contributions of different approaches and conditions of learning belonging to different schools of thought and of individual theorist with different theoretical affiliations and their implications for designing instruction do meet the varied demand of the open and distance education system. This has been the primary consideration for discussing the concept of learning, instruction and relationship between instruction and learning. We have discussed these issues in this opening unit 1 with reference to behaviourism, cognitivism and constructivism theories of learning to provide you the foundational platform of knowledge pertaining to the theories of learning and instruction and their implications for designing instruction for self-learning materials. However, you will have a better and more specific understanding of the implications of these theories for open and distance learning in Units 2, 3 and 4 of this Block.

1.2 LEARNING OUTCOMES

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

- explain the concept of learning;
- discuss the conditions of learning;
- differentiate between surface and deep approaches to learning;
- describe different perspectives of learning; and
- explain the concept of instruction and its relationship with learning.

1.3 WHAT IS LEARNING?

Learning is a lifelong process. It affects all aspects of the human behaviour. Learning also influences your habits, preferences and interests, as well as the beliefs you follow in your day to day life. The meanings and use of symbols, and languages are learnt. For example, a symbol of a pen or pencil helps you to think and interpret in different ways. You may say that the symbols, such as a pen or pencil in self-learning materials represent instruction to write an answer for a question or to complete a self-test question. Therefore, you learnt the meaning of symbols and the language for responding to a symbol or a picture. Some other examples of learning include the learning of motor skills, such as operating a computer or driving a vehicle and carrying out a practical activity in a laboratory. There are different types of activities, which are influenced by learning. In this section, along with the meaning of learning, we will discuss the basic conditions of learning.

What follows is an elaboration of the concept of learning.

1.3.1 Learning and Change in Behaviour

What is learning? As described by the American educational psychologist Richard E. Mayer (1982), “Learning is the relatively permanent change in a person’s knowledge or behaviour due to experience”. This definition has three components: (1) the duration of the change is long-term rather than short-term; (2) the focus of the change is the content and structure of knowledge in the memory or behaviour of the learner; (3) the cause of the change is the learner’s experience in the environment rather than fatigue, motivation, drugs, physical condition, or physiological intervention.

Educational psychologists define learning as an active, constructive process that is heavily influenced by an individual’s existing knowledge and beliefs and is situated in particular contexts. This definition has two important implications for learning in the digital age. The first is about the individual and the second is about the role of context. An individual’s role in the learning process includes the knowledge they bring, their beliefs and their level of motivation. The context provides the learning environment and the learning experience. (Starkey, 2012)

Such a concept of learning assumes that certain conditions in the environment bring about fundamental changes in our behaviour and, that these changes persist for a long time. Learning is not directly observable but can be inferred from performance. We can infer that a person has learnt something when she/he does an activity, which she/he could not do before. For example, you may know something, and yet may not have learnt it. You may ‘know’ how a computer works, but may not be able to operate it. Thus, the distinction between learning or the acquisition of knowledge (i.e., capability) and performance (i.e., exhibiting this capability in some form of action) is an important

one. In this context, when we speak of a relatively permanent change in behaviour, we refer to a change in performance.

From the above discussion, we can summarize that not all changes in behaviour can be related to learning. Some behavioural changes are due to biological development or maturation. In maturation, the growth tendencies are independent of specific learning conditions, and depend entirely on biological growth. For example, the swimming of tadpoles and the flying of birds simply occur at the moment of their anatomical maturation. A child walks once its legs are strong enough to support its weight.

1.3.2 Basic Conditions of Learning

External conditions responsible for learning are very important in various types of learning. A brief description of the basic conditions of learning is given below:

- i) **Contiguity:** One of the basic conditions of learning is contiguity – the almost simultaneous occurrence of the stimuli and of the response to them. For example, suppose you heard the doorbell (stimulus) and ran up to open the door (response). Students make connections between a particular stimulus and the response to it. For example, while watching online video programmes, the online learning environments allow students to make connections between the stimulus i.e., online video programmes and response is participating in the activity.
- ii) **Practice:** Practice is the repetition of a response in the presence of the stimulus. We usually need to practice or repeat S-R (Stimulus-Response) associations to retain them for a relatively longer period of time. For new stimuli and new responses, more practice is required. In all types of learning under S-R situations (e.g., classical conditioning, operant conditioning, skills learning) practice is of crucial importance. But it is of minor importance in learning concepts or principles and in problem solving, if the other conditions of learning, such as reinforcement, are provided appropriately.
- iii) **Reinforcement:** Reinforcement is a major condition required for learning to take place. We can use reinforcement in different ways to produce different effects, i.e., the effect of different types of learning on the students. In the process of reinforcement, a learner is presented with a particular stimulus (i.e., reinforce) before and after it elicits desired responses. In a given situation, the learner will tend to repeat the response for which reinforcement is given and to discontinue the response for which it is not. We can distinguish reinforcement from other stimuli because it has a particular effect on behaviour.
- iv) **Feedback:** Feedback is providing the knowledge that the responses are correct or that they require amendment. Feedback also functions as reinforcement in strengthening the responses to be learnt. The term feedback refers to any information that permits learners to judge the quality of their performance. There are various ways in which feedback may be provided. They are immediate or delayed or end-of-session feedback. The importance of supplying feedback has led to several technological innovations, including programmed instruction and computer assisted instruction. Learning efficiency often increases when the student receives feedback about quality of his/her work. The distance teacher/instructional designer needs to make systematic plans to provide feedback before moving on to new learning materials.
- v) **Generalization and discrimination:** Both generalization and discrimination are perhaps better defined as phenomena rather than as conditions of learning. We call them learning conditions because they are so closely associated with the basic

conditions of contiguity, practice and reinforcement, which are essential to all learning. A complex learning behaviour can be described in terms of stimulus, generalization and discrimination.

In many situations, we observe that child, when confronted with a new stimulus, makes a response previously learnt to respond to a similar type of stimulus. We call this behaviour generalization (or stimulus generalization). When a child is taught to call a particular colour red, it also learns to call other similar hues red.

Under conditions where discrimination takes place effectively, the individual makes different responses to two or more stimuli. For example, a student can learn to select the colour red and not pink. The extent to which it learns to pick up red and ignore pink is the extent to which it has learned to discriminate.

1.3.3 Approaches to Learning

We have explained the term learning as a relatively permanent change in human behaviour and it is the result of reinforced practice through the process by which stimulus and response bonds are established. There is a quantitative increase in knowledge, acquiring, memorizing and reproducing the facts, making sense of abstract concepts, interpreting, and understanding reality in a different way due to learning.

In this sub-section we will focus on different *approaches* to learning and we will explain whether there is an internal relationship between the approaches that students adapt to their learning, and the outcome of that learning. A course developer should be aware of the approaches to learning while designing and developing self-learning materials. It helps her/him to identify whether materials require memorization or understanding or are intended to develop skill and then to work with the materials appropriately. These approaches to learning are described as deep and surface.

According to A.C. Entwistle and N.J. Entwistle (1997) the “student who adopted ‘deep approach’ was able to understand the academic article; critically analyzing the content; examine the logical argument, relating own experience to previous knowledge and experience organizing principles to integrate ideas, relating evidence to conclusion. The surface approach learners who adopted ‘Surface approach’ were having the desire to reproduce parts of the content, accepting ideas and information passively, concentrating only on assessment requirements, memorising facts and procedures routinely and failing to recognize guiding principles or pattern”.

You may refer to the box for examples:

Deep Approach

- ‘I generally put a lot of effort into trying to understand things which initially seem difficult.’
- ‘I often find myself questioning things I read in books.’
- ‘I usually set out to understand thoroughly the meaning of what I am asked to read.’

Surface Approach

- ‘I find I have to concentrate on memorizing a good deal of what I have to learn.’
- ‘The best way for me to understand what technical terms mean is to remember the text book definitions.’
- ‘Often I find I have read things without having a chance to really understand them.’

A learner who adopts a *deep approach*

- is interested in the academic task and derives enjoyment from carrying it out,
- searches for the meaning inherent in the task (for example, if a prose passage is read, the intention of the author is sought),
- personalizes the task, making it meaningful to his/her experience and to the real world,
- integrates aspects or parts of the task into a whole (for example, related evidence to conclusion), sees relationships between this whole and previous knowledge, and
- tries to understand the theories of the task; forms hypotheses. In other words if learners want to grow in understanding they will adopt a deep level strategy.

A learner who adopts a *surface approach*

- observes the task as a demand to be met or a necessary imposition if some other goal is to be reached (a qualification for instance),
- sees the different aspects or parts of the task as unrelated to other tasks,
- considers the time required to complete the task without searching for the meaning inherent in the task, and
- relies on memorization and tries to reproduce the surface aspects of the task. In other words, if a learner wants to display symptoms of having learned something, she/he will adopt a surface level approach.

The above discussion emphasizes the importance of understanding the approaches to learning while designing materials, because the distance learners have a general desire to adopt deep learning approach, but their circumstances often lead to them resorting to the surface learning approach. These circumstances are usually external, such as work commitments, family responsibilities, limitations of study space and isolation from the institution.

Check Your Progress 1

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

- 1) Discuss the basic conditions of learning.

.....

.....

.....

.....

.....

- 2) Differentiate between surface and deep approaches to learning.

.....

.....

.....

.....

1.4 PERSPECTIVES OF LEARNING

In the previous section, you have learnt that learning is a relatively permanent change in behaviour, and it is the result of reinforced practice. Such a concept of learning emphasizes that certain conditions in the environment bring about changes in our behaviour. These conditions are also discussed in sub-section 1.3.2. They are contiguity, practice, reinforcement, feedback, and generalizations.

In this section the concept of learning has been discussed based on the view points or perspectives of different schools of thought. These are behaviouristic perspective, cognitive perspective, constructive perspective, and connectivist perspective.

Behaviouristic Perspective

In behaviouristic school of thought emphasis is placed on behaviour. This school has described learning as a relatively permanent change in behaviour due to experience.

The basic emphasis of Behaviourism is on stimulus – response learning. Learning is a product of stimulus – response bond or association. In other words, learning takes place due to presentation of a series of discrete stimuli and the resulting responses. A learner's response is linked to a particular stimulus. As the result, a learner is not able to perceive the learning task in a holistic perspective. This had the psychologists to develop a learning theory as an alternative to stimulus-response learning. (In Unit 2 of this Block, we have discussed in detail about this school of thought and learning theories of Ivan P. Pavlov, J.B. Watson, E.L. Thorndike and B.F. Skinner.)

This learning theory laid the foundation for cognitivist approach in learning. In the next paragraph you will learn about the cognitive perspective of learning.

Cognitive Perspective

According to the cognitivists, learning is the changing or reorganization of cognitive structures, which involves an acquisition of knowledge and the transformation of new knowledge. In other words, we can say that learning is a change in one's knowledge, skills, attitudes, and values brought about through experience, and this change may or may not be expressed in overt behaviour. Cognitive psychologists such as Jerome Seymour Bruner, Jean Piaget and David P. Ausubel worked on cognitive learning. In Block 1, Unit 3, we have discussed in detail about views of these cognitive psychologists. The cognitive approach focuses on 'how information is processed'.

Constructivism Perspective

Constructivism refers to a process where the learner is actively constructing both the knowledge acquired and the strategies used to acquire it. The learner constructs a new version of reality from his or her own unique experiences, and it is this construction that she/he then uses to deal with any new experiences in the field.

Constructivism emphasizes the active role of the learner on building understanding and making sense of information.

Constructivism is discussed in detail in Unit 4 of this Block. The basic characteristic of constructivism is identifying the principles of learning and understanding concepts such as scaffolding, zone of proximal development, cognitive apprentice and situated learning.

Social Constructivism Perspective

In recent years, teaching and learning have moved from a conventional transmission to an approach, which emphasizes that learners play an active role in their own learning.

Social constructivism focuses on the belief that social interaction combined with cognitive activity shapes individual development and learning forms the basis of scaffolding. Scaffolding is a form of facilitation that facilitates learning. Scaffolding can be a pre-planned activity being applied when needed. It aims to transfer responsibility for learning from the facilitator to the learner. You will read more about scaffolding in Unit 4 of this Block.

Connectivist Perspective

George Siemens (2005), a Canadian educationist, developed connectivism as a learning theory for the digital era. Connectivism aims to provide a theory that considers how people, organisations and technology can collaboratively construct knowledge. He describes connectivism as:

“Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or database) and, is focused on connecting specialised information sets, and the connections that enable us to learn more or more important than our current state of knowing.”

From the above discussion we can summarize the concept of learning from different perspectives as follows:

- **Behaviourism** – Learning is the relatively permanent change in a person’s knowledge or behaviour due to experience.
- **Cognitivism** – Effective learning occurs when students acquire a general understanding of a subject; that is when they understand the structure of a subject, they see it as a related whole.
- **Constructivism** – According to this theory, learning is considered as knowledge construction. In other words, learning occurs when a learner selects, organizes and integrates information and thereby constructs knowledge.
- **Social constructivism** – Learning is a social process of knowledge construction.
- **Connectivism** – Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or database), is focused on connecting specialized information sets, and the connections that enable us to learn more or more important than our current state or knowing.

Check Your Progress 2

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of this Unit.

- 1) Explain the difference between behaviourist and cognitivist perspectives with reference to learning with examples.

.....

.....

.....

.....

- 2) Discuss the importance of connectivist perspective of learning.

.....

.....

.....

.....

1.5 WHAT IS INSTRUCTION?

Giving instructions is a human activity. The purpose of instruction is to help other people learn. The effects of instruction on learning are often useful and easy to observe. When an instruction is designed to accomplish a particular goal of learning and is based on specific content, it facilitates learning. Instruction may include events that may have a direct effect on the learning of human being. It may be generated by a printed page by a picture or a television programme, or by a combination of any of the above. So, the purpose of designed instruction is to activate and support the learning of the individual. Instruction is the deliberate arrangement of learning condition to promote the attainment of some intended goal. You may also refer to Unit 5, Block 2 of this course for a detailed discussion pertaining to instruction.

Instruction is a human understanding the purpose of which is to help people learn. Although learning may happen without any instruction, the effects of instruction on learning are often beneficial and easy to observe.

Instruction is a set of events that affect learners in such a way that learning is facilitated. You may think of these events as being external to you. For example, events presented in study materials (printed pages), for the discussion with an academic counsellor. You may recognize that the events that make up instruction may be partly internal when they constitute the learner activity called 'self instruction'. An academic counsellor can play an essential role in the arrangement of any of these events or the learners may be able to manage the instructional events themselves. Instruction is a goal directed teaching process, which is more or less pre-planned.

From the above discussion, we may summarize that instruction is a planned activity for effective learning. Instruction is designed in a systematic way. In the distance education system we follow the plan of a Unit design, which is part of a Block or a Course/ Programme.

Approaches to Instruction

According to educational psychologists 'A humanistic approach to instruction recognizes the individual learner (i.e., student or trainee) in terms of his or her own capabilities, individual differences, present ability levels, and personal development'. These matters do receive attention in the instructional design process. The main elements of the process include examination of learner characteristics and identification of readiness levels for learning. Furthermore, systematic planning is applied to designing various forms of individualized or self-paced instruction to address an individual learner's needs.

Three schools of thought (learning theories) have provided guidance for instructional practice: behaviourism, cognitivism and constructivism. Table 1.1 presents the basic approaches to instruction and designing online instructional materials with reference to these three schools of thoughts.

These three schools of thought have been used and explored to provide guidance for instructional practice. Mishra (2002) had analyzed these learning theories in the context of online learning to identify the instructional approaches to be used.

Table 1.1: Approaches to Instruction: Based on Three Schools of Thoughts

Learning Theory	Overall assumption	Instructional approaches	Online approaches
Behaviourism	- Behaviour is a function of its consequences and learning is achieved through frequent response and immediate reinforcement of appropriate behaviour. - Essentially, behaviour and performance are either seen as synchronous or performance is seen as the useful outcome of learning.	- Instruction is designed to promote individual pacing and progress. - Instruction is designed using a task analysis, which breaks down the behaviour into a sequence of observable actions. - Assessment practices measure objectives in which behaviour is operationally defined and measured according to some performance indicators.	- Lessons with explicit objectives in behavioural terms are placed in the webpages. - Use of self assessment questions are added as interactive activities in the learning materials. - Step-by-step description of learning materials in small chunks is presented.
Cognitivism	- New information is built on existing structures. - Relevant processing activities are stimulated and specific strategies are taught to assume that the learner efficiently acquires the information or solves the problem.	- Instruction is designed to promote processing activity akin to that of an expert. - Assessment practices rely on observable behaviour but infer specific mental operations based on the design of the test.	- Use of note-taking and annotation is made. - Instructions for learning to learn are provided. - Peer-assessment of learning is carried out. - Information is sought through search engines.
Constructivism	- Learning is understood as interpretative and emergent, and under the control of the learner. Cognition is situated and must be understood in terms of the setting purposes, tools, and tasks in which the knowledge is to be learned. - Knowledge is to a large extent a negotiated meaning as ascribed to reality and should be achieved via collaborative group work.	- The goal structure needs to be negotiated through teacher-learner interaction. - Learners are at the centre of the design activity. Some form of constructivism stress cooperative learning. - Assessment practices are designed around real-life problems and promote self evaluation and reflection and to maximize learner responsibility.	- Use of discussion forums and chat (both synchronous and asynchronous techniques is made. - Use of e-mail by learners. - Group projects - Streaming media use - Provision for social activities on the internet are made.

Source: Villalba and Romiszoski (2001).
(Ref. Course MDE-418/518, Block-02, Unit-9)

There are principles of instruction that support effective learning. These were propounded by the educationist M. David Merrill, who named these as the *The first principles of instruction*.

Principles of Instruction

These principles are:

- 1) **Task Related or Problem Centered:** Learning is promoted when learners acquire concepts and principles in the context of real-world tasks.
- 2) **Activation:** Learning is promoted when learners activate relevant previous knowledge.
- 3) **Demonstration:** Learning is promoted when learners observe a demonstration of the skills to be learnt.
- 4) **Application:** Learning is promoted when learners apply their newly acquired knowledge and skill.
- 5) **Integration:** Learning is promoted when learners integrate their new skills into their everyday life.

Fig. 1.2 presents the concept of First Principles of Instruction by Merrill.

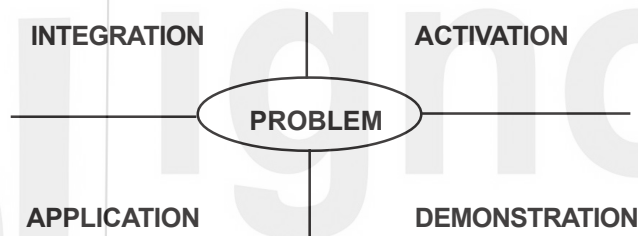


Fig. 1.2: Merrill's First Principles of Instruction

Check Your Progress 3

- Note:** i) Write your answer in the space given below.
ii) Check your answer with the answer given at the end of this Unit.

Discuss the Merrill's First Principles of Instruction with examples.

.....

.....

.....

.....

.....

.....

1.6 RELATIONSHIP BETWEEN LEARNING AND INSTRUCTION

In the above sections we have discussed about the concept of learning and instruction and the different perspectives of learning. Learning is the acquiring of specific information from the environment. Instruction is about how to teach or facilitate learning. Let us now discuss the relationship between instruction and learning with reference to the different perspectives of learning.

According to P.K. Biswas (2007), the three theories of learning and their corresponding approaches for designing instruction form a relationship between instruction and learning. These relationships are described below:

Behavioural theory and the approach to design instruction

The theory of behaviourism concentrates on the study of overt behaviour that can be observed and measured. Some of the theorists in the development of the behaviourist theory were Ivan P. Pavlov, John. B. Watson, Edward L. Thorndike, and B.F. Skinner.

Principles of learning based on Behavioural theory

- Learning takes place when a correct response is seen due to the presentation of a specific stimulus.
- Learning can be determined by observing an organism/human being over a period of time.
- Emphasis is placed on observable and measurable behaviour.
- It is concerned with immediate, recognisable changes in behaviour.
- The reinforcing consequence increases the likelihood of the recurrence of a particular type of behaviour.

Principle of instruction based on Behavioural theory

- Instruction is to elicit the desired response from the student who is presented with an effectively structured material.
- Instruction utilizes consequences and reinforcement of learned behaviour.
- Instructional goal is framed in specific, behavioural, and observable terms.
- Students must know how to execute the proper response or behaviour and the conditions under which the response or behaviour is made.
- Instruct the focus of presentation and interaction. He/ She designs the learning environment.
- Instructor builds an academic relationship with each student.

Learning outcomes expected

The statement which describes learning outcome starts with a description of the conditions under which the behaviour will take place. This includes:

- a description of the actions the student will be able to carry out to indicate his/her understanding with the help of action verbs;
- a criterion or measure of success that defines what would be an acceptable level of performance.

Students' role needed for achieving the learning outcome

- The students have to absorb instructional presentations and material.
- Their main activities include reading, review and analysis of the materials, attending individual tests and activities; submitting individual work directly to the instructor for evaluation.

Cognitive theory and the approach to design instruction

The theory of cognitivism is based on the process behind the behaviour. Changes in behaviour observed are used as indicators as to what is happening inside the human mind. Some key researchers and thinkers in the development of cognitivism are Jean Piaget, Jerome S. Bruner, and David P. Ausubel.

Principles of learning based on Cognitive theory

- Learning is a change of knowledge state.
- The focus of learning is on how the students remember, retrieve and store information in their memory.
- Learning involves deep processing (organizing, exploring, analyzing and synthesizing contents).

Principles of instruction based on Cognitive theory

- The focus of instruction is to create learning or change by encouraging the learner to use appropriate learning strategies.
- The instructor suggests problem-solving and structured-search activities, especially with group learning strategies.
- The instructor is responsible for assisting the student in organizing information in an optimal way so that it can be readily assimilated.

Learning outcomes expected

- The outcome states how the learner would be able to think or solve problems differently when they complete the study.
- The learning outcome focuses more on what the student does to process, store and retrieve information.

Students' role needed for achieving the learning outcome

- They have to explore the learning environment.
- They should focus on interactive problem solving.
- They should give emphasis on discussion, application of principles to case studies and projects.

Constructivist theory and the approach to design instruction

The theory of constructivism is based on the assumption that people construct their own perspective of the world, through individual experiences and schema (an internally existing knowledge structure). Theorists such as Jean Piaget and Lev Vygotsky have contributed to the field of constructivism.

Principles of learning based on Constructivist theory

- Students impose meaning on the world and “construct” their own understanding based on experiences and interactions.
- Learning is a process in which experience forms the basis for understanding the concepts.
- There are several ways (multiple perspectives) of structuring the world and its entities.
- Knowledge is embedded in the context in which it is used (meaningful realistic settings).
- Learning involves collaboration and cooperation.

Principles of instruction based on Constructivist theory

- Instruction is a process of supporting knowledge construction rather than communicating knowledge.
- Instruction should engage students in the actual use of the tools in real world situations.
- Instruction should encourage reflective thinking, higher order learning skills.
- Instructor is a facilitator and mentors peer interaction.

Learning outcome expected

- The outcome states how the learner can create his own unique education because learning is based on prior knowledge.
- The outcome is defined more in terms of a new common perspective rather than particular task or action that individual will be able to carry out.
- The outcome is framed in experiential terms, the kinds of problems addressed, the kinds of control students exercise over the learning environment, the activities in which they engage and the ways in which students reflect on the results of their activity together.

Student's role needed for achieving the learning outcome

- To explore the learning environment in consultation with others and construct meaning from learning experiences.
- To apply knowledge in personally meaningful context.
- To give emphasis on discussion and collaboration.
- To prepare report on authentic experiences, activities and projects.

From the above discussion pertaining to the relationship between instruction and learning, you can recall that learning is concerned with acquisition of specific information from the environment, whereas instruction is concerned with how to guide and facilitate learning. According to R.M. Gagne different functions of instruction are: guiding the students, gaining and maintaining attention, arranging for remembering and stimulating recall, assessing outcomes of learning and providing feedback to the students (Ref. Section 5.4, Block-2). These functions are performed by various media (printed text or electronic media) and by the learner himself or herself. Therefore, a carefully designed combination of media may be required to achieve the kind of instruction that is most effective. For example, within a given topic, attention might be maintained by the introduction of pictures, whereas guiding learning might be accomplished by printed visual (pen or hand for activity). Instructions, frequent questions are included in the printed text for self-assessment and feedback is in the form of answers provided at the end of a unit/text.

In the above discussion you have also learnt how each of these theories has implications for the design of instructional activities. You can design instructional materials for courses and programmes in ODL using the principles of instruction and implications of theories of learning based on behaviourism, cognitivism and constructivism (Ref. Units 2, 3 and 4 of this Block) suitable for students with appropriate content and the context. Therefore, designing instruction is concerned with understanding, improving and applying the approaches of instruction. What is instructional design? It is the process of deciding what approaches of instruction are required for bringing about desired changes in student knowledge and skills for specific course content and a specific student population. According to Charles M. Reigeluth the result or the product of instructional design as a professional activity is an architect's blueprint for what the instruction should be like. This 'blueprint' is a prescription as to what methods of instruction should be used for that course content and those students. We have discussed in detail about instructional design in Unit-5, Block-2 and about instructional design processes in Block-3 of this course.

1.7 LET US SUM UP

In this unit we have discussed the two important concepts. These are learning and instruction. Learning is the modification of behaviour brought about by experience. The concept of learning explains that learning is an increase in knowledge. Instruction is a pre-planned activity which facilitates learning. This unit suggests the ways in which distance learners learn and the factors, which facilitate learning. This unit also presents you with the conditions of learning, perspectives of learning and the different approaches to learning. The Unit describes the relationship between instruction and learning in three different scenarios of behaviourism, cognitive and constructive approaches.

1.8 CHECK YOUR PROGRESS: POSSIBLE ANSWERS

Check Your Progress 1

- 1) Basic conditions of learning:
 - a) Contiguity
 - b) Practice
 - c) Re-enforcement
 - d) Feedback
 - e) Generalization and discrimination
- 2) Surface approach to learning – This implies memorization, with different aspects of a task being unrelated to other tasks (also see sub-section 1.3.3).
 Deep approach to learning – This implies interest in the task and personalizing the task integrating it with the whole task and wanting to develop relationship with the whole and previous knowledge.

Check Your Progress 2

- 1) Behaviourism implies that learning is relatively permanent change in a person's knowledge on behaviour due to experience whereas cognitivism implies that learning occurs where the learner acquires an understanding of a subject as they see it as a whole.
- 2) Connectivist perspective of learning focused on connecting specialized information sets, where connections help us to learn more so that learning takes place.

Check Your Progress 3

Merrill's First Principles of Instructions:

- 1) Tasks centred
- 2) Activation
- 3) Demonstration
- 4) Application
- 5) Integration

Check Your Progress 4

- 1) Gaining of attention;
- 2) Recall of previously acquired knowledge;
- 3) Guiding the learners;
- 4) Providing feedback;
- 5) Establishing conditions for remembering and transfer of learning; and
- 6) Assessment of outcomes of learning.

UNIT 2 BEHAVIOURISTIC SCHOOL OF THOUGHT

Structure

- 2.1 Introduction
- 2.2 Learning Outcomes
- 2.3 What is Behaviourism?
- 2.4 Learning through Stimulus-Response (S-R)
 - 2.4.1 Pavlov and Classical Conditioning
 - 2.4.2 Watson's Learning Theory
 - 2.4.3 Guthrie's Theory of Association by Contiguity
 - 2.4.4 Thorndike and Connectionism
 - 2.4.5 Skinner and Operant Conditioning
 - 2.4.6 Gagne's Learning Theory
 - 2.4.7 Social Learning Theories
- 2.5 Application of Behaviourism in Instructional Design
- 2.6 Let Us Sum Up
- 2.7 Check Your Progress: Hints to Answers

2.1 INTRODUCTION

In the previous Unit of this Block, we have discussed about how learners learn? To find out the answers to this question you have to read the different perspectives of learning discussed in the previous Unit of the Block. By now, you are clear about the concept of learning, relationship between instruction and learning.

The various theories of learning attempt to explain the mechanism of behaviour involved in the learning process. Various psychologists have formulated different theories of learning, which have evolved over a period of time. These learning theories fall under different categories such as Behaviourism, Constructivism and Cognitivism. Theories of learning presented in the Units of this Block are considered as foundations for designing instruction.

The origins of Behaviourism can be traced back to the early 20th Century. At that time it was thought that human activity or learning could be predicted and explained by studying the behaviour of animals. The essentials of the work involved animals responding to stimuli, that is Stimulus-Response. The learning model became more refined with the study of the effect of conditioning.

This Unit discusses the learning theories of five main Behaviourists, namely, Ivan Pavlov, J.B. Watson, E.R. Guthrie, Edward Lee Thorndike, R.M. Gagne, B.F. Skinner, and Albert Bandura. The purpose of this Unit is to introduce you to some behaviouristic theories so that you can understand how these theories had an influence over our understanding of human learning. This Unit has certain activities for you to do that ensure your understanding of the content presented here, as well as to help you reflect upon your experiences related to distance education.

2.2 LEARNING OUTCOMES

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

- differentiate between different schools of behaviouristic learning theories;
 - explain the main features of behaviourist theories;
 - explain the main features of social learning theory;
 - list the behavioural objectives for an area of instruction; and
 - describe the application of behaviouristic principles.
-

2.3 WHAT IS BEHAVIOURISM?

Behaviourism is concerned with observable and measurable behaviour. For behavioural psychologists, learning is the modification of behaviour brought about by experience. Behavioural psychologists observed the way animals learned and believed that this provided insight into how humans learn. They tried to find rules to explain and predict how learning would occur in every learning situation. They explained learning in terms of changes in the subject's behaviour. The prominent Psychologists who developed the behaviourist approaches to learning were Ivan Pavlov (1849-1936), Edward Thorndike (1874-1949), John Broadus Watson (1878-1958) and Burrhus Frederic Skinner (1904-1990). These behavioural psychologists focused on conducting controlled laboratory experiments and objectively recording observations. These methods provided the basis for psychology to become a respectable science that used scientific methods of research and experimentation. The focus was directed on the observable forms of behaviour, which included not only on the bodily movement as seen by an observer watching a subject, but also on the internal physical processes related to overt behaviour. Ultimately, this model of learning developed into a theory of learning called Behaviourism.

In the following sections, the contributions of the behaviourists to the school of learning are discussed with suitable illustrations. The behaviouristic learning theories can be broadly classified into the followings two categories.

- i) **Stimulus-Response (S-R) theories without reinforcement:** These include Pavlov's Classical Conditioning Theory of Learning, and Watson's and Guthrie's Learning Theories.
 - ii) **Stimulus-Response theories with reinforcement:** These include Thorndike's, Hull's and Skinner's learning theories.
-

2.4 LEARNING THROUGH STIMULUS-RESPONSE (S-R)

In behaviourism learning is viewed as the ability to perform new behaviours, which are established as goals. There is an effort to create conditions, which will enable the learner to demonstrate these behaviours, and to continue performing them over a period of time. One creates these changes in behaviour by manipulating the environmental conditions, usually in a consistent manner. Attention is given to these environmental changes both before and after a response from the learner.

2.4.1 Pavlov and Classical Conditioning

Simple observations of animals led to several different theories of learning. Ivan Pavlov (1849-1936), a Russian physiologist and psychologist, using simple experimental

techniques, demonstrated how to teach an animal to give natural responses to neutral stimuli. A neutral stimulus is a stimulus that produces no automatic response other than catching attention. The method of associating or pairing a potent stimulus with a neutral stimulus is called classical conditioning. Pavlov demonstrated the simple relationship between stimulus and response in instructing (conditioning) an organism to modify its behaviour. Pavlov used certain technical terms to explain the process of conditioning. These are:

- CS - Conditioned stimulus,
- US - Unconditioned stimulus,
- UR - Unconditional response, and
- CR - Conditional response.

I) How does learning occur according to classical conditioning?

Pavlov carried out an experiment on a dog in his laboratory. Pavlov conditioned a dog to salivate by linking a neutral stimulus namely the sound of a bell to an unconditioned stimulus i.e. food. Therefore, the response salivation to the ringing of the bell is called conditioned response (CR). So, by the process of conditioning an association is formed between conditioned stimulus (CS) and conditioned response (CR).

A new stimulus is presented in association with the original stimulus. After a time when the original stimulus is withdrawn, it is found that new stimulus now elicits the original response. The response has been conditioned to the new stimulus.

For example, given the sight of food, a hungry dog will naturally salivate. In this case food is the stimulus, and salivating is the response. Normally, a 'neutral' stimulus, like the sound of a bell ringing, will have no such effect on the animal. However, if, on a number of occasions the bell is rung just before food is presented to an animal, the sound alone will eventually make the dog produce saliva, or, in the language of behaviourism, to 'evoke the salivation response'. In other words, any stimulus that readily leads to response can be paired with a neutral stimulus in order to bring about the type of learning described. It is important to note that the learner is typically unaware of this growing association. The conditioned stimulus should precede the unconditioned stimulus. Conditioning depends on the intensity of the stimulus.

This process can be illustrated as below:

US (Food)	————→	UR (Saliva)
CS (Bell)+US(Food)		UR (Saliva)
CS (Bell)		CR (Saliva)

II) Principles of Conditioning

To explain his theory, Pavlov has stated the **principles of conditioning**, which are as follows:

• *Principle of Reinforcement*

The term reinforcement refers to the following of the conditioned stimulus by the unconditioned stimulus. i.e. food following the bell. Without reinforcing the bell with food, no conditioning could be developed. Food was reinforcement. This is applicable to a student's learning where the learning becomes effective when the students are rewarded immediately. Quite often unconditioned stimulus reduces a drive or tension. So, the term reinforcement also refers to a reduction in drives or tensions.

- ***Principle of Sequence and Time Intervals***

There is an optimal time between the presentation of the conditioned stimuli and the unconditioned stimuli. If there is any variation, i.e., an increase or a decrease in the optimal time, then there is no conditioning and a bond or a association cannot be formed.

- ***Principle of Stimulus Generalization***

If we are conditioned to one thing, say a bell, then we would be conditioned to all sorts of bells. In earlier stages of learning by conditioning, the animal responds to a number of stimuli, which accompany the exact conditioned stimulus. The response is the greatest to the conditioned stimulus and goes on decreasing to the other stimuli, which are less similar to the original one.

- ***Principle of Differentiation***

When two stimuli are sufficiently distinguishable, the organism can be continued to respond to one of them. This is done by regularly reinforcing one stimulus and not reinforcing the other.

- ***Principle of Extinction***

If the sound of the bell is not followed by food, it implies that there is no reinforcement. A stage is reached when the dog stops to secrete saliva. This stage is called extinction.

- ***Principle of Spontaneous Recovery***

This explains that there is no complete extinction on account of the time interval, but there is inhibition of the Conditional response (CR), when the dog is brought out of the experimental set up and again put in the set up. After a lapse of certain amount of time, the dog responds to conditioned stimulus (CS), which is called spontaneous recovery.

- ***Principle of Inhibition***

Pavlov mentions two types of inhibition:

- I) *External Inhibition:* Once the dog was conditioned, it was found not to give a Conditional response, in the presence of some stranger.
- II) *Internal Inhibition:* Pavlov observed that if a complete extinction of Conditional response is obtained by not providing food to the dog and it is then given a period of 24 hours rest, the Conditional response will show spontaneous recovery when the dog is tested again. The spontaneous recovery proves that the conditional response while in extinction did not represent dying of the reflexes or any real weakening of the already learnt stimulus-response connections. It was blocked by some internal inhibitory process.

- ***Principle of Higher Order Conditioning***

When conditioning is done to a new stimulus on the basis of a previous conditioned stimulus, it is designated as a higher order conditioning. By this process conditioning can be done by associating one stimulus with another.

- ***Principle of Secondary Reinforcement***

Conditional Response is established to some stimulus other than the primary one (food-elicited salivation). By repeated presentation, it was found that sight of food led to salivation or a partial response. This is called secondary reinforcement.

- **Principle of Age and Conditioning**

The process of conditioning is valuable at all ages, especially in early childhood. From these observations several learning theories grew, which include classical and operant conditioning. We have discussed them in the subsequent sections.

The application of Classical Conditioning theory for designing instructional materials for the distance learners are as follows:

- Assessment of the entry behaviours of the distance learners before designing instructional materials.
- Statement of learning objectives, which decide what to present and how to assess a student's learning.
- Analyse what is involved in the learning tasks of distance learners.
- Develop a sequence of learning tasks that move from simple to complex.
- Design assessment strategies to measure a student's learning in relation to the stated objectives.
- Use guidance, feedback and rewards to reinforce the key points of learning and the process of learning.

2.4.2 Watson's Learning Theory

John B. Watson (1878-1958) was a behavioural psychologist, who expanded Pavlov's work. He suggested that human activities could be explained as learnt habits. The work by Watson and Pavlov is called classical conditioning and can be summarized as 'S-R' (Stimulus-Response theory). Watson drew heavily upon Pavlov's work and became convinced that learning was a process of building conditioned reflexes through the substitution of one stimulus for another. Watson put forward the law of frequency or exercise. To him when stimulus and response occur at the same time in close contiguity, the connection is strengthened without reinforcement or reward. Fig. 2.1 shows how the various types of stimuli produce an automatic response.

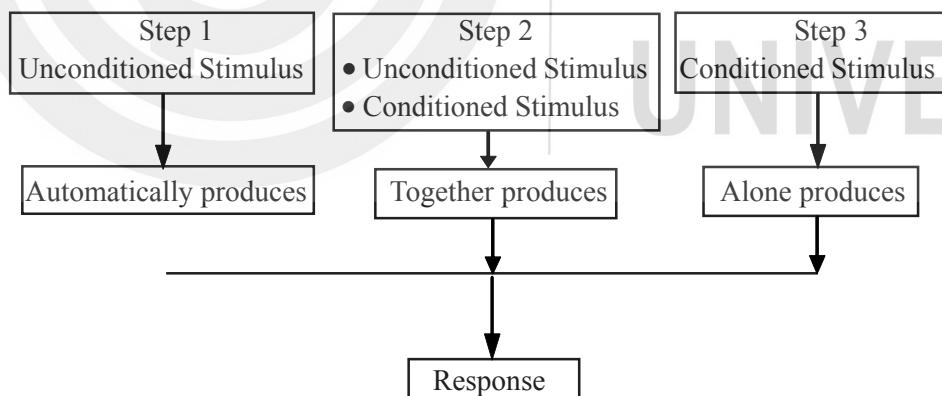


Fig. 2.1: Stimulus-response theory

2.4.3 Guthrie's Theory of Association by Contiguity

Edwin R. Guthrie (1886-1959) developed this theory of learning similar to that of Watson. Guthrie suggested that animals learn to associate stimuli and responses merely through their contiguity. Learning, in other words, depended on a response occurring close in time to particular stimuli. Reward was not necessary. The essence of his theory is as follows:

- Impact of Reward:** The function of reward according to Guthrie is not to strengthen the Stimulus-Response connection, but rather simply to change the stimulus (S) situation. When an individual is rewarded, the stimulus is changed, thereby preserving the previous Stimulus-Response connection.

- ii) **The Function of Punishment:** The function of punishment is to elicit other responses, any one of which may become associated with the preceding stimuli.
- iii) **The Importance of Practice:** Learning of Stimulus-Response connections occurs in one trial only. The fact that the learnt behaviour changes with practice is due to individuals attending to different aspects of the stimulus environment on each trial, and/or to associating different components of a complicated response with the stimuli on each trial.

Check Your Progress 1

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of this Unit.

1) Define the following terms in your own words with examples:

- a) Unconditioned stimulus
- b) Neutral stimulus
- c) Unconditioned response
- d) Conditioned stimulus
- e) Conditioned response

.....

.....

.....

.....

.....

.....

.....

.....

2) Explain the process of stimulus and response theory in classical conditioning. Discuss how this is applied in distance learning.

.....

.....

.....

.....

.....

3) What are the similarities and differences that you find between the theories of Watson, Pavlov and Guthrie?

.....

.....

.....

.....

2.4.4 Thorndike and Connectionism

About the time Pavlov was observing dogs in his laboratory, an American psychologist named Edward L. Thorndike was in his laboratory observing cats. Thorndike (1874-1949) made a very significant contribution to behavioural theory in exploring the effect of consequences of behaviour on subsequent behaviour. He was the first psychologist who is credited with recognizing the importance of reinforcement in learning. Thorndike conducted a series of experiments on the length of time it took a cat to escape from a cage. In one of his earliest experiments, he placed a hungry cat in a cage with a door that would open if the cat properly manipulated a release mechanism. A dish of food was placed outside the cage to motivate the cat to attempt to get out of the cage. Through the trial and error process, the cat eventually learnt to open the cage door quickly whenever it was hungry by pulling the string. Thorndike noted that the cat had been conditioned to associate pulling a string to escape from the cage. Earlier experiments conducted on animals had convinced Thorndike that reinforcement was of central importance for learning. He demonstrated that the consequences of a response can strengthen the connection between the stimulus and response. The reward for learning, not the simple occurrence of stimulus and response, was seen as determining how rapidly learning took place. He formalized his research as the law of effect. This law states that if a stimulus was followed by a positive response, then the stimulus-response connection would be strengthened. For example, a response is strengthened if it is followed by pleasure, and weakened if followed by displeasure (or pain). This principle has become a keystone of behavioural theory and is known as reinforcement. Based on the above, Thorndike propounded the following laws of learning:

- i) **The Law of Readiness:** This law states that, “when any conduction unit is ready to conduct, for it to do so is satisfying. When any conduction unit is not in readiness to conduct, for it to do so is annoying.”
- ii) **The Law of Effect:** This law states that, “if a stimulus is followed by a positive response, then the stimulus-response connection would be strengthened and the desired behaviour is more likely to occur.”
- iii) **The Law of Exercise:** It states that “any response to a situation will, other things being equal, be more strongly connected with the situation in proportion to the number of times it has been connected with that situation and to the average vigour and duration of the connection”.

Educational Application of Thorndike’s Theory of Connectionism

- For applying the first law to the educational situations, the distance education specialist/instructional designer should make sure whether the students are ready to receive the knowledge mentally. For this, the created materials are to be based on a learning environment where the students can spontaneously participate. The teachers should arouse the link between the experiences of students of everyday life with the knowledge to be taught.
- The law of effect can be realized in distance learning materials by providing the experiences to the students, which are satisfying and meaningful in the form of examples. They should organize following the principle of ‘simple to complex’. According to the law, learning takes place when it results in satisfaction and the learner derives pleasure out of it. In the situation when the learner meets a failure or gets dissatisfaction, the progress in learning is blocked. Therefore, the satisfaction, or dissatisfaction, pleasure or displeasure obtained as a result of some learning ensures the degree of effectiveness of that learning.

- For applying the third law, more opportunities should be provided to the students to use and repeat the experiences they undergo while studying the materials. The drill strengthens the bonds of Stimulus-Response and review of the unit maintains connections and reinforces learning.

Thorndike's work established the base for almost all subsequent theorizing about learning in America. While early behaviourist theorists such as Watson and Thorndike hoped that their explanations of learning would be useful in understanding the human learning process generally, their models fell short of explaining the complex nature of learned human behaviour.

2.4.5 Skinner and Operant Conditioning

B.F. Skinner (1904-1990) is the psychologist who has done the most work to develop and apply the ideas originally proposed by Thorndike. Skinner continued and expanded Thorndike's work and is credited with developing the theory we now call Operant Conditioning. In his first experiment, Skinner enclosed a rat in a small box, which contained a food tray and a lever. When a hungry rat is first placed in the box, it emits a wide variety of responses or Operant (e.g., getting up on its hind legs, sniffing around, and trying to climb the walls). Eventually, more or less by accident, it presses the lever. Later it presses it again and again. This shows how often (the frequency) the rat presses the lever. This is the rat's baseline behaviour. In this example, pressing the lever is the unconditioned stimulus. Whenever the lever is pressed, the animal is reinforced immediately by the application of a reward such as food. By progressively reinforcing the operant that come closer to the goal behaviour, a process called shaping, the animal is gradually taught to perform quite complex behaviour. Hence, in the initial stages of conditioning an animal to press a lever or peck a button, the animal's response is reinforced each time it turns in the direction of the lever or button. This is called continued reinforcement. Subsequently, reinforcers are only administered when the animal adds to the response (e.g., by moving closer to the lever or button). Over a number of trials, the animal progressively acquires the desired behaviour (e.g., pressing a lever). At this point, reinforcement is moved to an intermittent schedule, and secondary reinforce (such as lights and buzzers) may be introduced to facilitate behaviour. When primary reinforce is no longer effective (even a rat becomes satiated with food pellets), intermittent reinforcement may be presented in a fixed ratio, that is, after a specified period of time when a response occurs; or at a variable interval, at any time subsequent to a correct response. In general, continuous reinforcement is necessary to establish responses. Once the response is established, an intermittent schedule enhances the retention of behaviour. If a response is not intermittently reinforced, it will gradually fade. Similar results of training may be achieved by using negative reinforcement. For example, the floor of the Skinner box may be mildly electrified. On the performance of the appropriate operant, the current is turned off. A bright rat would quickly learn to sit on the lever. In general, positive reinforcement is found to be more effective than negative reinforcement and avoids side effects.

Operant conditioning has been demonstrated in the behaviour of many other animals, such as a pigeon pecking a key, a dog raising its paw, a horse nodding its head, etc. In principle, any operant behaviour can be made more frequent by being reinforced soon after it occurs.

In human beings, the same model applies. An infinite variety of human behaviour can be made more or less frequent or probable by the use or non-use of reinforcement, contingent or some response. The response can be anything – such as an action, a statement, or even inaction. As we have seen in the preceding sections, a key to the success of operant conditioning lies in the application of reinforcement and punishment.

For a distance learner, reinforcement may be in the form of timely receiving study materials, positive grades in assignments, and the successful completion of a course. Often this type of reinforcement is called extrinsic reinforcement.

The following activity is designed to help you think and write about the ideas associated with classical and operant conditioning.

Check Your Progress 2		
Note: i) Write your answer in the space given below. ii) Check your answer with the answer given at the end of this Unit. Compare and contrast the ideas of classical and operant conditioning by completing the following table.		
Think about	How are Operant Conditioning and Classical Conditioning alike?	
Concept of learning		
Role of reinforcement		
Principle of association		
How are they different with regard to	Operant Conditioning	Classical Conditioning
Person's control of initial behaviour		
Factors influencing learning		
Type of reinforcement		

2.4.6 Gagne's Learning Theory

Robert M. Gagne was involved in the structural analysis of the learning processes and the design of instruction. By devising a systematic approach to instruction his theories strongly influence the design of many instructional programmes. For Gagne it was important to recognize the importance of process in learning, and outcomes were seen as the main criteria of successful instruction. Robert M. Gagne distinguishes between two types of conditions namely internal and external. The internal conditions can be described as states and include attention, motivation and recall. The external conditions can be thought of as factors surrounding ones behaviour, and include the arrangement and timing of stimulus events. Gagne's learning theory consists of five major categories of human capabilities as provided in Table 2.1.

Table 2.1: Categories of Gagne's Learning Theory

Categories	Examples
Verbal information	Learning the alphabet
Intellectual skills	Addition and subtraction
Cognitive strategies: inductive and deductive reasoning	Exploring the physical and chemical changes
Attitudes	How one feels about protecting the environment
Motor skills	Drawing, typing and driving

Gagne proposed that all learning must proceed from simple to complex in well-defined stages. Each step of the evolving content or skill is to be defined by a careful examination

of the entire learning sequence. These learning types are arranged from simple to complex. The hierarchy suggests that lower steps must be acquired before higher steps are learnt because the mode of instruction is sequential.

Gagne's eight types of learning are discussed below.

- **Type 1. Signal learning:** The individual acquires a conditioned response to a given signal (a red traffic light for example); the learning is involuntary.
- **Type 2. Stimulus-Response learning:** Repeating words or numbers, for example, the individual responds to specific stimuli; the correct response is rewarded.
- **Type 3. Chain learning or chaining:** Using a pencil to copy and writing numbers in a sequence. Two or more previously learned Stimulus-Response connections are linked together.
- **Type 4. Verbal association learning:** Writing numbers by 100s and 500s. Chains that are verbal e.g., a learner identifies an object and calls it by its proper name (e.g., 'the red ball'). Or, finds a Hindi or French equivalent for an English word.
- **Type 5. Multiple discrimination learning:** Interpreting and constructing simple graphs. The learner learns to distinguish between motor and verbal chains, which she/he has already acquired.
- **Type 6. Concept learning:** Interpreting simple graphs. A common response to a class of stimuli; in learning a concept the learner responds to stimuli by identifying its abstract characteristics like shape, colour, etc.
- **Type 7. Rule learning:** Cognitive ability to apply relationships between two or more concepts. For example; 'at 100° C water will boil'. Here temperature and boiling point are two concepts related by a rule.
- **Type 8. Problem solving:** The learner uses the rules learned to achieve some goals; problem solving is the combined product of two or more lower order rules. It thus requires an internal event i.e., thinking to take place for solving a problem. For example, a learner is posed with a problem to prove that air has pressure. For solving this problem she/he has to learn a few lower order rules, such as: (i) air can support a column of water; (experiment with the help of a tumbler, a piece of card board and water), (ii) the weight of air is approximately 15 pound per square inch on every surface in every direction; (iii) air pushes upwards as well as downwards.

Gagne's (1965) theory of conditions of learning has several implications for instructional design in the distance education system. The design of instruction should involve:

- analyzing requirements.
- selecting media and designing the instructional events. Additionally the instructional designer must keep in mind the following points when developing methods of instruction.

Skills should be learned one at a time and each new skill learned should build on previously acquired skills.

The analysis phase must identify and describe the prerequisite lower level skills and knowledge required for an instructional objective:

- Lower level objectives must be mastered before higher-level ones.
- Objectives must be stipulated in concrete behavioural terms.
- Positive reinforcement should be used in a repetitive manner.

Check Your Progress 3

- Note:** i) Write your answer in the space given below.
ii) Check your answer with the answer given at the end of this Unit.

Provide examples from your personal experiences as a distance learner for Gagne's Rule learning and Problem solving levels of learning.

.....

.....

.....

.....

Behaviourists were unable to explain certain social behaviours. For example, adult learners do not imitate all behaviour that has been reinforced. Furthermore, they may imitate new behaviour after their first initial observation without having been reinforced for the behaviour. Because of these observations, Albert Bandura (1977) departed from the traditional operant conditioning stating that an individual could model behaviour by observing the behaviour of another person, which is known as social learning.

2.4.7 Social Learning Theory

Social learning theorists believed in the use of controlled laboratory experiments to find out about learning, but they did not believe that they could find out about human learning from experiments on animals. Social learning theory builds upon operant conditioning principles, but concern themselves primarily with the ways in which people acquire behaviour appropriate to their social context and to their immediate circumstances. One of the main social theorists is Albert Bandura, who expanded on behavioural principles, while acknowledging the importance of cognitive processes such as thinking, memory, and problem solving. Bandura stresses the role of internal cognitive structures, which are thoughts or memories of the brain which allow people to learn through observation or imitation of others. Bandura and others believed that the major incentive for learning is identification with other people. It is called social learning because it concerns itself mostly with the ways in which people acquire behaviour appropriate to their social context and to their immediate circumstances. Learning occurs through observing and copying other people's behaviour. Social learning is also sometimes referred to as observational learning theory.

Three principles are applied to the social learning theory. These are:

- Much human learning is a function of observing the behaviour of others.
- We learn to imitate by receiving reinforcement for performing certain behaviour, and maintain this imitative behaviour through continued reinforcement.
- Imitation or observational learning can be explained in terms of operant conditioning principles, provided it is correct to say that people can imagine both the reinforcement and the behaviour of models.

How does learning occur?

Bandura distinguishes between the acquisition of knowledge (learning) and the observable performance based on that knowledge (behaviour). He suggests that we all may know more than we show. Students may have learned how to add simple fractions, but perform badly on a test because they are anxious or sick or misread the question. Bandura notes that there are four important elements or processes associated

with observational learning. These are the desired behaviour (attention), retaining information or impressions (retention), producing the behaviours (motor reproduction), and wanting to repeat these behaviours (intrinsic motivation). We have explained these concepts below:

- **Attention:** You may have noticed how the sound (volume) of the television increases to attract attention during the commercial breaks. Like that, anything that attracts our attention is going to have an effect on observational or social learning. If the illustration/graphic presented in instructional material is interesting and novel, we are likely to turn our attention to learning.
- **Retention:** The ability to store information is an important part of the learning process and retention of the newly learned behaviour is essential for social learning. You store both verbal and written representation (such as step-by-step instructions or labels that describe the actions to be performed).
- **Reproduce:** In this step you actively perform the behaviour that has been observed. However, attention paid the observation and retaining the information has an impact on procreation imitating and duplication of information by a learner.
- **Intrinsic motivation and reinforcement:** Though we may acquire a skill or behaviour through observation we may not perform that behaviour until there is some motivation to do so. If we anticipate being reinforced for imitating the actions of a model, we may be motivated to pay attention, remember and reproduce the behaviours. Reinforcement is a significant component in learning. But in social learning theories, the value and role of reinforcement is expanded to include the social aspects of the environment. For example, social learning theory allows psychologists to explain why learners learn different skills in different countries or cultures. Social learning theories also include direct reinforcement, vicarious reinforcement and self reinforcement.
 - i) *Direct reinforcement* occurs during the process of modelling. For example, after you receive a good grade from your tutor, you receive praises from your counsellor or peers.
 - ii) *Vicarious reinforcement* occurs when we see others being rewarded or punished for particular actions and then modify our behaviour as if we had received the consequences ourselves.
 - iii) *Self reinforcement* is one of the most important academic reinforcers. Here, the students are reinforced by their personal goals, standards or criteria they have set for themselves; they don't depend on the reinforcement of others. For example, students may read and learn French literature because they enjoy reading or because they have discovered that such reading is essential to earn a good grade. Therefore, learning French is reinforcing for them because of their personal values.

Check Your Progress 4

- Note:** i) Write your answer in the space given below.
 ii) Check your answer with the answer given at the end of this Unit.

Describe the processes involved in Bandura's Social Learning.

.....

.....

.....

2.5 APPLICATION OF BEHAVIOURISM IN INSTRUCTIONAL DESIGN

In the previous sections, you learnt about behaviourist views on learning. This section will examine the implication of a behaviourist perspective on learning for designing instruction. To use the principles of operant conditioning a teacher has to plan and design instruction in precise steps, which are as follows:

- Define the desired behaviour.
- Identify the successive steps that are required if the student is to reach this standard.
- Immediately reinforce approximations to the desired behaviour.
- Communicate your ideas with your students.
- Change the frequency of your reinforcement as the students' behaviour changes (fading).
- Provide rewards for achieving desired behaviour.

In using operant conditioning to design instruction the steps could be adopted as presented in Fig. 2.2.

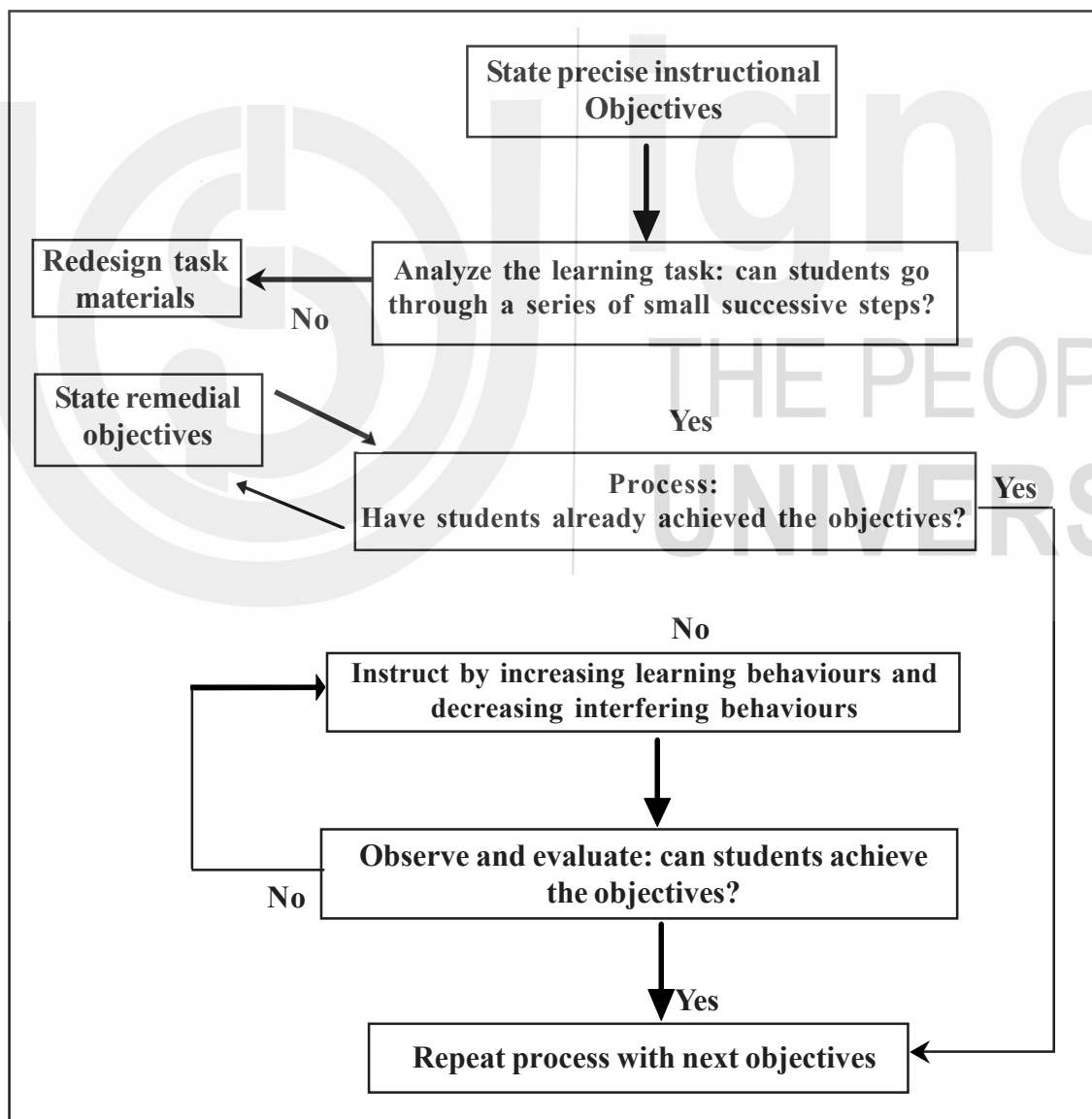


Fig. 2.2: A model of instructional design using the principles of operant conditioning

As illustrated, the principles of learning derived from behavioural theories can potentially affect instructional design decisions in many ways. One important implication is arranging schedules and types of reinforcement to optimally enhance learner motivation and achievement. Note that, although “reinforcement” sometimes consists of extrinsic rewards such as stars, verbal praise, or points credited toward grades, it often takes the simple form of feedback about the correctness of the response.

A second broad implication of behavioural theory is the need for designers to perform a task analysis before developing instructional materials. A task analysis defines the content needed to address the key instructional problem, thereby guiding the identification of objectives and development of instructional strategies, lesson material, and test items and creating smaller steps and increased opportunities for reinforcement.

Third, behaviourism strongly supports the usage of instructional objectives, particularly the behavioural type proposed by Robert Mager in 1984. Such objectives clearly identify the overt responses reflecting mastery of the content, the level of achievement indicating acceptable performance, and the conditions under which the evaluation takes place. Using such objectives, the instructor can assess objectively and reliably the degree of learning attained for each lesson goal.

Fourth, behavioral theories have inspired the development of several influential and evidence based instructional strategies and broader course designs. These include classic approaches such as Programmed Instruction by Skinner, Personalized System of Instruction (PSI) by Keller, Mastery Learning by Bloom, and Direct Instruction by Englemann & Carnine. These models and their many derivatives incorporate task analysis, precise content objectives, highly sequenced instruction, active responding, and reinforcement linked directly to performance.

Specifying behavioural objectives

From a behaviorist perspective, the planning of instruction would start from an initial statement of the change of behaviour. This change in behaviour can take the form of the attainment of new knowledge, the acquisition of a new skill or a change of attitude. These three types of behaviour are: Cognitive, Affective and Psychomotor.

In 1956 Benjamin Bloom and his colleagues began development of a taxonomy in the cognitive, attitudinal (affective) and psychomotor domains. Robert Mager stated that the use of instructional objectives prompted interest in learners and educators. Gagne and Briggs who also had backgrounds in military and industrial psychology developed a set of instructions for writing objectives that was based on Mager’s work. By the late 1960’s most units were presented using behavioural objectives.

Behavioural objectives state that successful learners should be able to demonstrate what that they have learned. Each objective should have an outcome that can be easily measured and should state the conditions under which this behaviour will be achieved. We have discussed the three domains of human behaviour in detail, and a list of general and specific objectives in Unit 13 of Block 3.

There are three rules to follow when specifying an objective in behavioural terms:

- i) The objective has to describe behaviour that is observable and measurable or assessable;
- ii) The objective has to describe the desired direction of the change in behaviour;
- iii) The objective should describe the behaviour in the context of the content that has to be measured.

Programmed Instruction: B.F. Skinner proposed the Programmed Instruction, which is a major educational practice based on operant conditioning. Programmed Instruction is used as individualized instruction, which is developed keeping in view of individual learners and their learning pace.

The special features of programmed learning are as follows:

- A logical sequence of information is presented, one small unit at a time to the individual student.
- The student makes an active response to each unit.
- The student gets immediate knowledge of whether his or her result is correct or not.
- Each student works at his or her own pace.
- Programmers aim to get the student to perform in a very specific way.

Based on operant conditioning, Skinner's teaching machine was developed requiring the learner to complete or answer a question and then receive feedback on the correctness of the response.

Programmed instruction is no longer based exclusively on operant conditioning, mainly because work with different programmes has shown that instructional design principles are more important than the principles of reinforcement. It has been found that the factors basic to a good instructional package include the scope and sequence of the programme, the presentation mode, the sequencing of the frames, the difficulty of the steps between frames, and the assumptions made about students' pre-existing knowledge, motivation and capacity for independent work.

Gagne's work has made significant contributions to the scientific knowledge-base in the field of instructional technology, particularly in the area of instructional design. He outlined several steps that should be used to design instruction, which include:

- Identify the types of learning outcomes.
- Each outcome may have prerequisite knowledge or skills that must be identified.
- Identify the internal conditions or processes the learner must have to achieve the outcomes.
- Identify the external conditions or instruction needed to achieve the outcomes.
- Specify the learning context.
- Record the characteristics of the learners.
- Select the media for instruction.
- Plan to motivate the learners.
- The instruction is tested with learners in the form of formative evaluation.
- After the instruction has been used summative evaluation is used to judge the effectiveness of the instruction.

With the advent of behaviouristic approaches to instruction and the later developments in the field, individualized instruction took shape in the context of the open and distance learning system. Self learning materials are prepared, which are individual paced. The planning of designing instructions materials was preceded by behavioural objectives, sequencing and organizing the instruction etc. The behaviouristic approach to learning aimed at mastery learning, which includes continuous evaluation of competencies followed by remedial teaching where the students had failed to master the competencies.

Educational technology and Computer-Assisted Instruction (CAI) were also based on the behaviouristic principles that involved drill-and-practice controlled by the programme developer rather than the learner. Self instructional programmes were designed that included pre-test and post-tests and the self-directed assessment of students after completing the course.

2.6 LET US SUM UP

In this Unit we have described the Behaviouristic learning theories. The theory of behaviourism concentrates on the study of overt behaviours that can be observed and measured. Some key theorists in the development of the behaviourist learning theories were Pavlov, Watson, Thorndike and Skinner.

Behavioural learning theories offer us some insights into designing instruction effectively. Behaviourist theories emphasize the role of reinforcement in shaping students' behaviours. The applications of behaviouristic learning theories have had an impact on instruction. This may be seen in planning instruction, which begins with the specification of objectives followed by the teaching-learning process and evaluation, which tends to measure the attainment of the objectives.

Further, the learning theories have influenced the instructional methods, which are individualized in nature. The concept of programmed learning was evolved with the significant features of behaviourism, like prescribed objectives to be mastered, and concepts to be learnt in the form of frames followed by reinforcement, self assessment and remediation. Educational technology and computer-assisted instruction later came into the instructional scene, which were based on the behaviouristic principles.

2.7 CHECK YOUR PROGRESS: HINTS TO ANSWERS

Check Your Progress 1

- 1) Please see sub-section 2.4.1.
- 2) Application of the process of stimulus and response theory in classical conditioning:
 - Assessment of the entry behaviours of the distance learners before designing instructional materials.
 - Statement of learning objectives, which decide what to present and how to assess a student's learning.
 - Analyse what is involved in the learning tasks of distance learners.
 - Develop a sequence of learning tasks that move from the simple to complex.
 - Design assessment strategies to measure a student's learning in relation to the stated objectives.
 - Use guidance, feedback and rewards to reinforce the key points of learning and the process of learning.
- 3) Similarities and differences that you find between the theories of Watson, Pavlov and Guthrie. Please read sub-sections 2.4.1, 2.4.2 and 2.4.3.

Check Your Progress 2

- 1) Please see sub-section 2.4.1 for classical conditioning and sub-section 2.4.5 for operand conditioning and compare them.

Check Your Progress 3

- 1) Please see sub-section 2.4.6 type 7 rule learning and type 8 problem solving.

Type 7. Rule learning: : Cognitive ability to apply relationships between two or more concepts.

Problem solving: The learner uses the rules learned to achieve some goals; problem solving is the combined product of two or more lower order rules. It thus requires an internal event i.e., thinking to take place for solving a problem. For example, a learner is posed with a problem to prove that air has pressure.

Check Your Progress 4

- 1) Please see sub-section 2.4.7 and write about three principles of Bandura's social learning.



UNIT 3 COGNITIVIST SCHOOL OF THOUGHT

Structure

- 3.1 Introduction
- 3.2 Learning Outcomes
- 3.3 What is Cognitivism?
- 3.4 Information Processing Theory
- 3.5 Jean Piaget's View of Cognitive Development
- 3.6 Bruner's Theory of Instruction
 - 3.6.1 Modes of Representation
 - 3.6.2 The Process of Learning
 - 3.6.3 The Formation of Learning Structures
 - 3.6.4 Concept Formation
 - 3.6.5 Discovery Learning
- 3.7 David Ausubel's Theory of Learning
 - 3.7.1 The Processes of Meaningful Learning
 - 3.7.2 Implications for Instructional Design
- 3.8 Humanistic Perspective in Learning
 - 3.8.1 Maslow's Hierarchy of Needs
 - 3.8.1.1 Instructional Implication of Maslow's Views
 - 3.8.2 Roger's Views on Learning
- 3.9 Cognitive Theories and Their Implications
 - 3.9.1 Cognitive Task Analysis
 - 3.9.2 Cognitive Approach to Learner Analysis
- 3.10 Let Us Sum Up
- 3.11 Check Your Progress: Hints to Answers

3.1 INTRODUCTION

In the previous Unit, we have discussed the different learning theories related to the behaviourist school of thought. As you have read through the Unit, you must have realized that the theories were developed as a way of trying to explain learning theorists' observations about how animals and human learn. Each theory had its weaknesses and strengths. Each of these theories provided us with different views about learning. In this Unit, we will be discussing different ideas about how human beings learn. These ideas come under a broad spectrum of the Cognitive school of thought.

In this Unit, you will become aware of learning and its process according to Gestalt theory and three major cognitive theories that are broadly classified under information processing theory to which the eminent psychologists like Jean Piaget, Jerome S. Bruner and David P. Ausubel have contributed.

This Unit will also help you to see the ideas presented under cognitive theories in the actual learning context. The applications of cognitive theories in the context of open and distance learning for designing instruction, developing learning tasks etc., are discussed along with the activities and exercises to facilitate your understanding and application abilities, and to interact with the material.

3.2 LEARNING OUTCOMES

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

- explain the characteristics of the cognitive prospective of learning;
- describe information processing theory;
- explain Bruner's theory of instruction;
- discuss Ausubel's learning theory;
- explain the humanistic perspectives of learning, and
- write the implications of cognitive theories for designing instruction.

3.3 WHAT IS COGNITIVISM?

Cognitivism is an internal process of learning, understanding, motivation and retention. The mind is broad and complex into which event-responses are absorbed. The brain and mind are the centre of an organism changing and being changed by the environment in a reciprocal manner. Cognitive theorists stress the importance of unobservable processes or mental events that are involved in learning, such as thinking, memory, perceptions, intentions and emotions. Education psychologist Thomas L. Good and Jene E. Brophey refer to cognitive theory in the following passage.

“Cognitive theorists recognize that much learning involves associations established through contiguity and repetition. They also acknowledge the importance of reinforcement, although they stress its role in providing feedback about the correctness of responses over its role as a motivator. However, even while accepting such behaviouristic concepts, cognitive theorists view learning as involving the acquisition or reorganization of the cognitive structures through which humans process and store information.”

The common meaning of cognition is '*knowing*'. In psychological theories, this includes the processes of thinking and learning. Cognitive theories consider how human beings organize, store and use information.

Cognition includes how we perceive and attend to things happening around us, and extending beyond these to the so called higher order processes of remembering, reflective and creative thinking, the use of language and problem solving in various forms.

The major historical roots of modern cognitive theories of learning lie in Gestalt psychology and the field theory of Kurt Lewin. To cognitive theorists, the essence of learning is the perception of new relationships among concepts. Learning is the rearrangement of what one knows and understands. Cognitive structures, goal oriented behaviour, and providing opportunities for intuitive thinking are stressed.

The cognitive psychologists believe that knowledge is organized in our mind into sections or groups. Each section of information is called a schema. Knowledge is stored as linked ideas in our mind. As learning occurs there is a change in the amount of knowledge as well as in the arrangement of information. Thus, as we learn the size and the organization of our schemata changes. The information processing theory, and the work of cognitivists like Piaget, Bruner and Ausubel fall under the category of the cognitivist school of learning. The details are discussed in the following sections.

3.4 INFORMATION PROCESSING THEORY

Information processing theory emphasises on the working of the mind. It attempts to account for the ways in which learners receive, store, integrate, retrieve and use information through the process of perception and memory. Learning is thus viewed as a kind of information input, which is stored until some future time when it is retrieved to be used in a similar or a different situation. This section examines the stages of information processing and explains the ways in which they promote learning.

Information processing theory is not a single theory of learning. It is more a set of related terms and ideas that allow certain kinds of theory to be constructed. Information processing theory compares the human mind to a computer. We can see that the information processing theory emphasizes upon the cognitive mechanisms by which information is processed, that is, the active role of the learner, and the importance of relating the knowledge, which is already stored as new knowledge in the process of knowing. In their conception, the mind is a processing system in which knowledge is represented in the form of symbols, and processing is fundamentally symbol manipulation according to a set of rules. A variety of frameworks are used to characterize cognition and cognitive processing. These are as follows:

- A computer language with a precisely defined syntax and set of procedures.
- Graphic models (flow charts, designs, etc.,) that represent the temporal course of processing information and embody particular assumption or theories as to the organization of knowledge in memory.
- Higher order concepts; such as plans, schemata, scripts and frames that embody larger units of cognitive organization.

The information processing view divides learning into three phases:

- 1) Attending to new information, and
- 2) Acquiring and retaining information;
- 3) Retrieving information from memory and transferring it to a new situation.

Information Processing Model

Information is processed in a step wise manner. The input from the senses first enters a sensory register it is then processed in short term memory, and then it is transferred to long term memory for storage and retrieval.

- **Sensory Register:** Input is received from the senses, which lasts from less than a second to four seconds and then disappears through decay or replacement. Much of the information never becomes short-term memory but all information is monitored at some level and acted upon if necessary. For example, when you sit quietly for at least two minutes and be aware of everything; you can hear, feel, smell or taste and you will realize how much is going on, how many different sounds you can hear, and the range of feelings, taste and the smells you experience. Psychologists call these as sensory data.
- **Short-Term Memory (STM):** The sensory input that is important or interesting is transferred from the sensory register to the Short-Term Memory. Memory can be retained here for up to 20 seconds or more if reviewed repeatedly. Short term memory can hold up to 7 plus or minus 2 items. The Long-Term Memory capacity can be increased if material is chunked into meaningful parts.

- **Long Term Memory and Storage (LTM):** The Long-Term Memory stores information from STM for long-term use. Long term memory has unlimited capacity. Some materials are ‘forced’ into the Long-Term Memory by rote memorization and over learning. Deeper levels of processing, such as generating linkages between old and new information are much better for the successful retention of material.

Check Your Progress 1

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

- 1) Define cognitivism and explain it in your own words.

.....

.....

.....

.....

.....

- 2) List the three phases of learning according to information processing theory.

.....

.....

.....

.....

.....

.....

Let us look into the views of other cognitive theorists about how our mind organizes knowledge. Their contributions are discussed in the following section.

3.5 JEAN PIAGET’S VIEW OF COGNITIVE DEVELOPMENT

Jean Piaget (1896-1980) was one of the 20th Century’s most influential researchers in the area of developmental psychology. Piaget’s theory highlights the need for understanding the learner’s level of cognitive development and designing the instruction accordingly. According to him, the learner should be given due importance or a control place while planning the curriculum.

We will consider here only the important points related to designing instruction. The term ‘schema’ describes the way in which newly acquired knowledge and experience is organised and stored internally. Piaget considered a schema to be a mental category or structure, which contains knowledge and experience that we possess pertaining to an object or occurrence.

As our knowledge and experience increase, the schema changes and becomes more complex to accommodate this. This is how cognitive development takes place.

- **How is knowledge organized in the mind?**

Piaget believed that in our mind, knowledge is organized into sections or groups which are called a schema. He suggested that there are several other processes associated with learning. They are as follows:

Assimilation: New information is added to the existing schema. That is, during assimilation, we interpret the external world in terms of what we already know.

Accommodation: The schema are changed to include new information which does not fit into the existing schema. We must change our beliefs to include this new knowledge. We adjust old schema or create new ones after noticing that our current thinking does not capture or explain our new experiences.

Organization: As we start to think about the information, we also use the other process called organization. We start creating links between the different schemas. The internal rearrangement and linking together of schemas form a strongly interconnected cognitive system. For example, if you think about a subject you know well, you will be able to link lots of different topics. The thought processes that help you to make these links are called organization.

Equilibrium: According to Piaget there has to be a balance between assimilation and accommodation. It is necessary to ensure the developing student's efficient interaction with the environments.

Disequilibrium: This is a state of conflict between one's existing knowledge and new experience. It is a state of imbalance between assimilation and accommodation.

Application of the principles of Piaget's approach to design instruction

Piaget's ideas have had a major impact on education especially at the preschool and early primary school levels. There are four important principles, which underline Piaget's approach that could be used for designing instruction.

- ***An emphasis on learning by discovery***

Instead of presenting ready-made knowledge verbally, distance teachers/instructional designers/open and distance learning specialists should provide a rich variety of activities to help students explore and discover relationships for themselves.

- ***Sensitivity to learner's readiness to learn***

Piaget believed that appropriate learning experiences build on learner's current level of thinking. Distance teachers/instructional designers/open and distance learning specialists should keep in mind a students' development and introduce new experience, which will challenge the students' current ideas.

- ***Acceptance of individual differences***

Teachers/instructional designers need to make an effort to arrange activities for individual students or groups of students rather than just presenting information for the whole group.

- ***Creating a learning environment***

Piaget thought that the most effective method of helping students to develop their schema was through the interaction with the peers. These interactions prompted cognitive conflicts so that students were more likely to change their existing schema through the processes of accommodation and assimilation.

3.6 BRUNER'S THEORY OF INSTRUCTION

In the previous section you have studied about Jean Piaget. In this section we will study how Jerome S. Bruner defines learning as the process in which learner receives the instruction and work independently without support of a teacher. According to him instruction should take into account:

- i) the nature of students as knowers,
- ii) the nature of knowledge, and
- iii) the nature of the process of getting knowledge.

3.6.1 Modes of Representation

Jerome Seymour Bruner is an American psychologist who has contributed to cognitive psychology and cognitive learning theory in educational psychology, as well as to history and to the general philosophy of education. Bruner theorized that learners go through three major stages of intellectual development. These are:

- i) **Enactive stage:** In this stage, learners learn about the world around them by acting on objects. In a sense, an object is what you can do with it. A glass is used to drink while a chair is to sit on.
- ii) **Iconic stage:** Learners progress from enactive stage to iconic stage where experiences and objects are represented as concrete images. The learner, no longer need to manipulate objects in order to learn about them, but can learn through models, demonstrations and pictures.
- iii) **Symbolic stage:** Finally learners enter the symbolic stage when they develop the capacity to think abstractly with symbols. In this stage individuals go beyond the present and concrete experiences to create hypotheses.

Bruner realised that the instruction of the learner should also be sequenced. In other words, for learning to occur best, a learner should first experience it, then react to it concretely, and finally symbolize it. Rather than neatly delineated stages, the modes of representation are integrated and only loosely sequential as they translate into each other. Symbolic representation remains the ultimate mode, for it 'is clearly the most mysterious of the three.'

Bruner's theory suggests it is efficacious when faced with new material to follow a progression from enactive to iconic to symbolic representation; this holds true even for adult learners. Bruner's work also suggests that a learner (even of a very young age) is capable of learning any study material so long as the instruction is organized appropriately.

Bruner suggests a system of coding in which people form a hierarchical arrangement of related categories. Each successively higher level of category becomes more specific, echoing understanding of knowledge acquisition. In accordance with this understanding of learning, Bruner proposed the spiral curriculum, in which each subject or skill area is revisited at intervals, at a more sophisticated level each time.

3.6.2 The Process of Learning

To Bruner what is important is not the memorization of facts, but the process of acquiring knowledge. The process of stating a problem, selecting data sources, gathering data, processing data, and making inferences are more important than whether or not students learn a set of facts. Instead of presenting students with conclusions, the distance teacher/instructional designer/open and distance learning specialist should structure the learning situation, so that the students learn how to work with data to make inferences. That is, they should learn the procedures or methods of inquiry.

According to Bruner, learning is a matter of rearranging or transforming evidence. It is a type of thinking in which the student goes beyond the information given to gain new insights and generalisations.

3.6.3 The Formation of Learning Structures

Bruner lists four advantages of emphasizing structure in designing instruction:

- 1) Understanding the fundamental structure of a subject makes it more comprehensible. We understand the material better if it is logically organised.
- 2) A structure permits the student to narrow the gap between elementary and advanced knowledge. If given the appropriate learning experiences, every distance learner can understand some of the basic concepts in a subject area.
- 3) Unless detail is organised into structured patterns, it is rapidly forgotten. We remember the study material better, can actually remember more study material, and are better able to retrieve study material from our memory when it is logically organized study.
- 4) An understanding of the fundamental principles and ideas facilitates adequate transfer.

3.6.4 Concept Formation

The inductive processes of learning play a role in the formation of learning structures, which consist of concepts and coding systems. Bruner assumes that a student's interaction with the world always involves categorization or conceptualization. The formation of concepts takes place by identifying similar properties in the objects. Categorization permits the recognition of objects, because it is only through the use of concepts that any object can be identified and communicated. Concepts are then organized into coding systems. Coding systemizes a structure of concepts that ranges from the very specific to the generic. Generic concepts include more specific concepts. The coding system may include concepts at several levels of generality, each becoming more inclusive as they become generic and less defined by specifics. The formation of coding systems for human thought processes is important because of the role they play in retention of information, transfer of learning, and the inquiry process.

3.6.5 Discovery Learning

The emphasis on mastering an inductive process of discovering knowledge, understanding the fundamental cognitive structures of a subject, using intuitive as well as analytical reasoning, and relying upon intrinsic motivation is encapsulated in a teaching method which Bruner calls the discovery learning. Discovery learning is also discussed briefly in Unit 4 of this Block.

Discovery learning takes place when students rearrange or transform evidence in such a way that go beyond the reassembled evidence to additional new insights. Using this method, the teacher/instructional designer/open and distance learning specialist present a set of problems to students who then explore them for solutions and for rules that would allow the solutions of other, similar problems. The teacher/instructional designer/open and distance learning specialist guides the students through an inductive inquiry process similar to the process used by the scientists who originally discovered the concepts and the theories in the specific subject area. As a result, students group and reorganize the material being studied. They discover the relationships that exist among concepts and organize them into coding systems. We have discussed these applications in Table 3.1.

Table 3.1: Application of Bruner's Discovery Learning approach to Distance Education

For teachers/instructional designers/ODL specialists	For learners
• Redefine teaching role as facilitator rather than transmitter of knowledge. • Stimulate learning and inquiry by setting challenging problems for students to solve. • Provide resource rich learning environment. • Provide opportunities for students to interact with material actively, iconically and symbolically. • Allow for individual differences in ability, interest and prior experience. • Monitor the quality of learning taking place in terms of students' ability, interest and experience. • Revisit material of increasingly higher levels of abstraction.	• Participate actively in learning experiences. • Ask questions while investigating like, how, why, different from and so on. • Observe directly, draw diagrams and pictures. Record the observations and describe your experiences. • Infer and generalize from your experiences. • Revisit the concept, or redesign your investigation based if needed. • Verify that all your inquiries or hypotheses are answered through your discovery.

3.7 DAVID AUSUBEL'S THEORY OF LEARNING

David Ausubel was a cognitive psychologist who is credited with the learning theory of advance organizers. His theory, like Gagne's, suggests how teachers/instructional designers can best arrange the conditions that facilitate learning for students. The overarching idea in Ausubel's theory is that knowledge is hierarchically organized; that new information is meaningful to the extent that it can be related (attached, anchored) to what is already known.

3.7.1 The Processes of Meaningful Learning

Ausubel proposed advanced organizers through which meaningful learning can occur. The three types of subsumptions follow.

A) Subsumption theory

A primary process in learning is subsumption in which new material is related to relevant ideas in the existing cognitive structure on a substantive, non-verbatim basis. Cognitive structures represent the residue of all learning experiences; forgetting occurs because certain details get integrated and lose their individual identity.

- **Derivative subsumption:** This refers to learning that occurs when a child builds upon concepts already mastered. For example, if learners are learning about apples, they will compare characteristics of red and green apples, small and large apples, sour and sweet apples and so on and build an overall concept of what apples are and what one can do with them.
- **Correlative subsumption:** Here the concepts are extended. For example, learners learn about apples, bananas and mangoes. In each case, comparisons are made and concepts extended. For example, learners learn that some

skins of fruits can be eaten while others are thrown away or can be used in the compost heap for obtaining manure later. Subsumptions reinforce an underlying principle of effective learning, which is to start with familiar material and extend it. For this reason general principles are often given, which are then tested through examples.

- ***Obliterative subsumption:*** This refers to the distinguishing ability of the material to be learnt. If we want the study material to be remembered, it must have some distinguishing characteristics, otherwise it will be forgotten. For example, it would be important to point out why some apples are best used for eating raw and while some can be used for making apple pie by cooking. In other words, similarities and differences should be highlighted to understand a concept better.

B) Meaningful reception learning

In reception learning the material to be learnt is presented to the learners in a relatively complete and organized form. You have learnt in the discovery approach to learning that learners are expected to discover much of the study materials themselves and to organize it in their own way. Ausubel stresses meaningful learning, as opposed to rote learning or memorization; and reception, or received knowledge, rather than discovery learning. Ausubel maintains that learning is through reception, and that discovery learning is inefficient and not necessary in most circumstances. According to him, the focus of attention should be on how to make reception learning most effective.

To help learners learn verbal material, Ausubel recommends what he calls reception learning in which material is organized from the top down, that is, from the most inclusive to the most specific. He also advocates the use of advance organizers. An organizer is a set of ideas or concepts that is given to the learner before the material to be learned. It is meant to provide the stable cognitive structure to which new learning can be anchored. Organizers can also be used to facilitate the recall of facts.

Advance Organizer entails the use of introductory materials with a high level of generality that introduce new material and facilitate learning by providing an anchoring idea to which the new idea can be attached. Cognitive theorists believe that it is essential to relate new knowledge to existing information learnt. Distance teachers/instructional designers, open and distance learning specialists can facilitate learning by organizing information presented so that new concepts are easily relatable to concepts already learnt. Examples of devices that may be used include: pictures, titles of stories, reviews of previously learnt concepts, short video segments, a paradigm, a grammar rule, etc.

C) Progressive differentiation

According to Ausubel, the purpose of progressive differentiation is to increase the stability and clarity of anchoring ideas. The basic idea here is that, if you're presenting three related topics A, B, and C, rather than presenting all of topic A, then going on to B, etc., you would take a spiral approach. That is, when you go through the study material, you would teach the big ideas (i.e., those highest in the hierarchy) in all three topics, and then on successive steps you would begin to elaborate the details. Along the way you would point out principles that the three topics had in common, and things that differentiated them.

3.7.2 Implications for Instructional Design

The instructional events can be arranged based on Ausubel's meaningful Reception Learning:

- Logically organize the study material.
- Link material to what learners already know.
- Relate the study material directly to learners existing concepts.
- Use effective expository teaching methods in particular explanation, narration and demonstration.
- Present advance organizers to the learner before the study material to be learnt is presented.
- Present study material to be learned in a variety of contexts.
- Review the study material presented and learnt and provide effective feedback.
- Apply acquired learning in novel situations to demonstrate transferability.

Check Your Progress 2

- Note:** i) Write your answer in the space given below.
ii) Check your answer with the answer given at the end of this Unit.

In what way is Ausubel's theory of learning similar to Piaget's and Bruner's learning theories? In what ways are these different? Discuss.

3.8 HUMANSITIC PERSPECTIVE IN LEARNING

American psychologists Abraham Maslow and Carl Rogers have contributed to the development of humanistic perspective in learning. These theorists focused on the development of a genuine concern for learners and respect for the worth of others. The underlying principles of the humanistic perspectives in learning are:

- It is an optimistic view of humanity in which individuals strive, within their own personal limitations, to achieve the maximum personal growth.
- It focuses on individuality or uniqueness of the person rather than the similarities in people.
- It views people as being self-determining and free to make their own choices.

3.8.1 Maslow's Heirarchy of Needs

Abraham Maslow (1908-1970) has been long recognized as one of the leading proponents of humanistic psychology. His work started with the study of human needs and their gratification, which influenced the understanding of human motivation.

Maslow believed that some human needs, like physiological needs, are basic to other needs and that certain needs must be satisfied before the individual becomes concerned with higher needs. Physiological needs (food, water, sleep, etc.) are most basic and hence demand immediate satisfaction. Once these needs are satisfied, needs at the next level emerge i.e. the need for good health and for safety and security from harm and danger. This is followed by the need for love and belonging. Maslow assumed that if the lower needs are satisfied, the motivation is directed towards highest level i.e. self actualization – the need to develop the self potential, to become who one is capable of becoming. Self-actualization is “not so much a matter of what a person does, as how much he feels about what he is doing”.

Maslow distinguished the first four needs in the hierarchy from the latter ones. He identified the former as deficiency needs and the latter as growth needs. Generally, the gratification of deficiency needs depends on other people, whereas gratification of growth needs depends more on one’s own self.

3.8.1.1 Instructional Implications of Maslow’s Views

Maslow’s hierarchy of human needs has important implications that the instructional designers should take into account while designing instruction. A teacher may have difficulty in understanding why certain students do not complete assignments, are restless in the counselling session or are completely uninterested in activities. The counsellor assumes that the desire to learn is an important need for all students, but Maslow suggested that interest or motivation to learn may not develop until other basic needs have been met. For example, students who attend academic counselling sessions with personal/family problems, anxieties or fears, may not become self-actualized individuals.

3.8.2 Roger’s Views on Learning

Carl Rogers (1902-1987), a humanistic psychologist, has influenced educational thought and practice to a great extent. He advocated an educational approach that tries to make learning and teaching more humanistic, and thus more personal and meaningful. He has given certain important humanistic learning principles, which are central to his educational philosophy. These principles are briefly discussed here:

- **Desire to learn:** One of the foremost beliefs of Rogers is that humans have a natural desire to learn. You must have watched student’s curiosity and eagerness to explore their environment, to ask questions, and to seek solutions. This inherent eagerness to learn is a basic assumption in humanistic education.
- **Learning should be meaningful to students:** The second principle that Rogers emphasized is that significant or meaningful learning occurs when students perceive it as relevant to their own needs and purposes. Students learn best and most rapidly when they perceive learning as personally significant. Think of a student who quickly learns to operate a computer in order to enjoy a favourite game. Learning, according to humanistic psychologists, is purposeful and certainly motivated by the need to know.
- **Learning without threat:** The third principle propounded by Rogers is that learning is best acquired and retained in an environment free from threat. The process of learning is enhanced when students can test their abilities; try new experiences, or even make mistakes without the sting of criticism or ridicule.
- **Self-initiated learning:** For Rogers and other humanists, learning is most significant and lasting when it is self-initiated and when it involves both the feelings and the mind of the learner. If the learner is allowed freedom and autonomy, the

learning becomes highly motivating and gives the student an opportunity to how to learn. When students learn on their own, they have an opportunity to make judgements, choices and evaluations. In addition to being self-initiated, learning should involve aspects of the person – cognitive as well as affective.

3.9 COGNITIVE THEORIES AND THEIR IMPLICATIONS

The cognitive theories by different psychologists discussed in this unit have a great influence over distance learning process for designing instruction. Though they have differed in certain aspects, one may see that they have certain commonalities as follows:

- Emphasis on learner and learning process.
- Importance given to the cognitive structures already existing in learner.
- The capability of the mind to process the information and store it.
- The capability of mind of higher cognitive skills.
- Need for a proper learning environment.
- Limitation of memorization in meaningful learning.
- Role of cognition in formation and attainment of concepts.
- Importance of direct experience with objects or surroundings and involvement in activities in learning.

On the whole, it is seen that the main concern of the cognitivists was the learner and the learning process. The cognitive processes that need to be developed through providing different learning tasks were given due importance. In order to design instruction that will support learning, it is essential that we understand the nature of the tasks that learners will be performing. The cognitive task analysis and the learner analysis for designing instruction are described in the following sub-section.

3.9.1 Cognitive Task Analysis

Cognitive task analysis grew out of the cognitive learning theories discussed above to facilitate learning and to develop problem-solving abilities in learners. It has proved to be a useful tool for describing performance in complex problem-solving domains.

The first step in the design of any instruction is a task analysis to determine what should be presented in distance learning materials. Task analysis for instructional design is a process of analyzing and articulating the kind of learning that you expect the learners to know how to perform. Task analysis is necessary to:

- determine the goals and objectives of learning.
- decide the operational components of jobs, skills, learning goals or objectives, that is, to describe what task performers do, how they perform a task or apply a skill and how they think before, during, and after learning.
- identify what type of knowledge states (declarative, structural, and procedural knowledge) characterize a job or task; which tasks, skills, or goals ought to be presented, that is, how to select learning outcomes that are appropriate for instructional development.
- know which tasks are most important that have priority for a commitment of training resources.
- know the sequence in which tasks are performed and should be learned and taught.

- select and design instructional activities, strategies, and techniques that foster learning.
- select appropriate media and learning environments.
- construct performance assessments and evaluation.

Task analysis is the most critical step in instructional planning. Based on the types of knowledge stated above, the task analysis solves three problems for a teacher/instructional designer as follows:

- 1) It defines the content skills and procedures related to student performance or marginalizes them. This is a crucial step, since most planners will be working with known-yet-not-completely-known contents.
- 2) Because the reflection process compels a teacher/instructional designer to work at each individual step, skills and procedures that underlie the contents come to light.
- 3) During this planning, a teacher/instructional designer would be able to visualize contents from the learner's perspective. Using this knowledge one can not only gain subject and students' prior knowledge insight, but also plan for appropriate instructional teaching and assessing strategies.

Techniques of Task analysis

Topic analysis

The steps involved in conducting topic analysis are as follows:

- Identify different content structures (facts, concepts, principles, interpersonal skills, process skills, etc.).
- Group the related content structures from different subjects and their implied competencies.
- Arrange the various components into logical and sequential order.
- Prepare the final outline of the topic to represent your task analysis.

Procedural analysis

The steps involved in conducting procedural analysis are as follows:

- a) What does the learner perform?
 - Identify the action in each step that the learner must perform.
 - These actions are either psychomotor or mental.
- b) What does the learner need to know to do the above steps?
 - What knowledge (information) is necessary?
 - What does the learner need to know about their sources (referrals)?
- c) How does the learner demonstrate using the information in conducting an action?
 - What meta-procedural and meta-cognitive knowledge skills did one use?
 - What physical or mental activities did one undertake?
- d) What stimulus material or background information and local knowledge resources were used in the above steps?
 - What material, equipment, hands-on activity did one work on?
 - What local or situational experiences (expertise) had been used?
- e) How best can these aspects of planning be represented in the final draft of planning?
 - What representational strategies are possible? (Concept maps, audio-visual schema, table format)

- How best the above representational strategies be organized for inclusion in further assessment planning? (Stating standards, integrated objectives, table of specifications, blueprints, etc.)

3.9.2 Cognitive Approach to Learner Analysis

The key to instructional design is to work around the distance learners rather than the content's learning. It is very important to analyze the learner groups before the instruction is planned. Learner styles are key in developing effective self learning materials.

The teacher/instructional designer must be able to identify the target learners. Prior to this one should have an understanding of learner characteristics in order to analyze the learners before planning learning experiences.

To summarize the above discussion, we can apply principles of learning derived from cognitive theories, which can potentially affect instructional design as follows:

- The first implication is reminding the designer that learners at different stages of cognitive development do not think and process information in the same manner. Learning materials and activities need to be designed appropriately to fit developmental needs.
- The second implication is that unless the presented information is stored in the long-term memory it will be quickly forgotten. Meaningful learning, which occurs when new information can be related to existing knowledge, is much more resistant to forgetting than is rote memorization. Thus, by using examples, analogies, explanations, and advance organizers, designers can increase the chances for meaningful learning to occur.

3.10 LET US SUM UP

In this unit, we have focused on the three cognitive psychologists, Piaget, Bruner and Ausubel, whose work have potential use for distance teachers/instructional designers/open and distance learning specialists. Piaget stresses the ability to adapt to one's environment through actively building cognitive organization, attempting to assimilate new experiences into one's cognitive structures and accommodating the cognitive structures to one's experiences when they cannot be assimilated. The stages of development suggested by Piaget reflect the course of development from simple to complex, from concrete to abstract, and from the senses and immediate perceptions to the use of abstract symbols and thought. He places importance on the prior knowledge or existing schema as cognitive structures play a role in learning new information. The second theory of cognitive development is Bruner's theory, which hypothesizes that there are three stages of cognitive growth namely understanding the environment through action, imagery and symbol systems (enactive, iconic and symbolic).

Ausubel's work focuses on expository teaching. Advance organizers can be used to activate students' present cognitive structure. Ausubel also emphasizes the necessity for building meaningful cognitive structures, but is more concerned than Bruner about students' readiness to learn content.

The humanistic perspective of learning focuses on educational goals that help students to learn more about themselves and make independent decisions. This theory emphasizes on learning situations that are learner- centered and are oriented towards the discovery method.

3.11 CHECK YOUR PROGRESS: HINTS TO ANSWERS

Check Your Progress 1

- 1) Please see section 3.3. Please also read section 3.9 to better understand this learning theory.
- 2) Please see section 3.4.

Check Your Progress-2

- 1) Compare the sections 3.5, 3.6 and 3.7.



UNIT 4 CONSTRUCTIVIST SCHOOL OF THOUGHT

Structure

- 4.1 Introduction
- 4.2 Learning Outcomes
- 4.3 What is Constructivism
- 4.4 Constructivism and Instructional Design
 - 4.4.1 Discovery Learning
 - 4.4.2 Zone of Proximal Development
 - 4.4.3 Scaffolding
 - 4.4.4 Cognitive Apprenticeship
 - 4.4.5 Coaching
 - 4.4.6 Contextual Learning
- 4.5 Application of Constructivism in Instructional Design
 - 4.5.1 Anchored Instruction
- 4.6 Let Us Sum Up
- 4.7 Check Your Progress: Hints to Answers

4.1 INTRODUCTION

The different schools of learning that have evolved through times show us how an array of ideas and establishment of developmental schools resulted in schools of thoughts such as behaviourism and cognitivism.

Behaviouristic school of thought associates learning with response strengthening where the learner is repeatedly cued to give simple responses followed by immediate feedback, and receives rewards and punishment accordingly. It focuses on observable changes in behaviour, and new behavioural pattern being repeated until it becomes automatic. Cognitivism is based on the thought process behind the behaviour. Changes in behaviour are observed, and used as indicators to what is happening inside the learner's mind, while constructivism tells that we all construct our own perspective of the world through individual experiences and schema. Constructivism focuses on preparing the learner to solve problems in ambiguous situations.

This unit discusses the meaning of constructivism, its essential features, the main principles of constructivism that play a role in creating a learning environment where learners construct knowledge on their own, and problem-based learning that lead to constructing knowledge and other cognitive processes and their assessment in different sections. The unit also incorporates several activities and exercises for you to do during the course of your interaction with the study material.

4.2 LEARNING OUTCOMES

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

- explain the meaning of constructivism and its essential features;
- analyze the social and psychological constructivists' views and their applicability to design instruction;
- design learning contexts in which students learn through discovery method;

- explain the meanings of Zone of Proximal Development (ZPD), cognitive apprenticeship and contextual learning and their relationship with each other in the construction of knowledge;
- describe the use of scaffolding in forming cognitive structures; and
- write the implications of this theory for designing instruction.

4.3 WHAT IS CONSTRUCTIVISM?

All knowledge is constructed and consists of what individuals create and express. It is also claimed that all knowledge is tentative, subjective and personal, since individuals make their own meaning from their beliefs and experiences.

What is knowledge? What is knowing? How do we come to know what we know? These were important questions that became the concern for the epistemologists or philosophers who studied knowledge. In the history of epistemology, the trend has been to move from a static, passive view of knowledge towards a more adaptive and active view. It is a theory of learning that has roots in both philosophy and psychology. It has a long history and major theorists such as John Dewey, Jean Piaget, Maria Montessori, Jerome Bruner and Lev Vygotsky have contributed to the field.

Constructivism suggests that individuals create their own understanding based on the interaction of what they already know and believe, and the phenomena or ideas with which they come into contact. It is a theory of how the learner constructs knowledge from experience, which is unique to each individual. Constructivism is a system of explanations of how learners, as individuals, adapt and refine knowledge. Here, learners actively restructure knowledge in highly individualized ways, based on intellectual configurations on existing knowledge and formal instructional experiences.

Among the constructivists, there are those who focus on the individual acting as sole agent in the process of constructing and reconstructing meaning. Others focus on the socio-cultural context of the individual, which influences the construction of knowledge. There are different schools of constructivism, some of which are discussed below.

- **Trivial Constructivism:** This view of learning emphasises that learning occurs when a learner actively constructs a knowledge representation. Here, the learner constructs his/her own understanding of the world by reflecting on his/her experiences. In the learning process, the learner selects, organises and integrates information to construct knowledge. Here, the learner is an active player in the process of constructing knowledge. Therefore, instructions are to be provided to the learner with appropriate experiences with a view that enables them to construct knowledge.
- **Social Constructivism:** In this view, the idea is that learning occurs in a socio-constructural context of the learner through social interaction.

Students have also to include the social and cultural settings, which they learn and which also have impact on students as they change their ideas. From this perspective, sometimes referred to as 'situated cognition', the cultural and the social background of students, use of language, and how meaning is derived from various contexts play a role in the students' construction of ideas. In other words, constructivist learning has a social and cultural aspect. Social context and language are therefore 'fundamental to any learning'. Social constructivism recognizes these aspects of learning and knowledge construction.

Vygotsky is one of the exponents of social constructivism. Social constructivism views each learner as a unique individual with unique needs and backgrounds. The learner is also seen as complex and multidimensional. Social constructivism acknowledges the uniqueness and complexity of the learner. It utilises encouragement and rewards as an integral part of learning.

From the social constructivist viewpoint, it is important to take into account the background and culture of the learner throughout the learning process, as this background also helps to shape the knowledge and truth that the learner creates, discovers and attains in the learning process.

Based on the above discussion, we may say that constructivism acknowledges that:

- knowledge is not fully known and fixed,
- there is a real world that we experience, but many ways to structure the world,
- knowledge is somewhat personal. The learner plays an active role in the personal creation of knowledge through experiences, and
- learning is a social process in which the learner constructs meaning that is influenced by the interaction of prior knowledge and new learning events.

Check Your Progress 1

Note: i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

1) Explain the concept of Constructivism in your own words.

.....

.....

.....

.....

2) Describe different types of Constructivism.

.....

.....

.....

.....

4.4 CONSTRUCTIVISM AND INSTRUCTIONAL DESIGN

As you have seen in the preceding sections, constructivism emphasizes knowledge construction rather than the reproduction of knowledge in the form of rote memory. Knowledge construction takes place in individual contexts and through negotiating and collaborating with the group members. The learner's previous knowledge, beliefs and attitudes are considered in the knowledge construction process. The process of constructing knowledge involves observing relationship between the concepts and viewing things in a holistic or integrated manner. Constructing knowledge is through discovery. Therefore, learning is inquiry-based and discovery-based. The role of an instructional designer is to set up problems or projects, and provide mechanisms to monitor, to explain and, guide the direction of inquiry to the learner.

The essential features of constructivism that find prominence in the instructional design are discussed in the following sub-sections.

4.4.1 Discovery Learning

Learning through discovery is an important component involved in constructing knowledge. Jerome Bruner is often credited with originating the concept of discovery learning in the 1960s, but his ideas are very similar to those of earlier psychologists like John Dewey. In the opinion of Bruner, the “Practice in discovering for oneself teaches one to acquire information in a way that makes that information more readily viable in problem solving” (Bruner, 1961, p.26). This philosophy later became the discovery learning movement of the 1960s. This philosophical movement suggests that we should ‘learn by doing’, which is the important core of constructivism.

Construction of meanings or concepts or principles, etc., take place through discovery where the learners are placed in problem-solving situations. The learner draws on his/her own experience and prior knowledge and interacts with his/her environment by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments. The learners construct new ideas by selecting and transforming ideas, propounding tentative views, and by taking ownership of the learning process and outcomes. For this reason, instruction must be concerned with presenting experiences and contexts that make learners willing and able to learn through discovery of meaning. According to Bruner, information or knowledge is most effectively gained by personal discovery and that the goal of education should be intellectual development. The curricular materials designed for learners should foster the development of problem solving skills through inquiry and discovery.

One of the main reasons for constructing knowledge through discovery is that “you cannot teach people everything they need to know. The best way you can do this is to position them where they can find what they need to know, when they need to know it”. Thus, constructing knowledge through discovery can be equated to the proverb ‘teaching how to catch fish rather than giving him/her fish’, because it reduces the dependency of the student on information.

4.4.2 Zone of Proximal Development (ZPD)

Vygotsky emphasized that learners begin learning from their surroundings, from people around, and from their social world. He believed that our social world is the source of all concepts, ideas, facts, skills and attitudes. All personal psychological processes begin as social processes shared among people. Let us look into some of the ideas of Vygotsky that play a vital role in learning.

According to Vygotsky, there are three ways of learning:

- 1) Imitative learning where one person tries to imitate the other.
- 2) Instructed learning where learners internalise the instructions of the teacher and use these to control their learning.
- 3) Collaborative learning where a group of peers strives to understand each other and through their interactions, learning occurs.

Let us see how Vygotsky’s ideas contribute to the process of learning. Vygotsky thought that through instruction, learners would develop the skills associated with living successfully in the culture. In particular, he was interested in collaborative activity between learners and more matured members of the society, through which children will be able to master activities and think in ways that have meaning in their culture. The concept, called Zone of Proximal Development (ZPD), explains how learning occurs.

Zone of Proximal Development (ZPD)

The distance between the actual development level of a learner as determined by independent problem solving, and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers (Vygotsky 1978).

Vygotsky recognised that there is a gap between what the person could do without assistance and what they could do if some help was provided. He called this gap “the Zone of Proximal Development”. When we provide a set of temporary supports so that someone can complete a task, we are working in their Zone of Proximal Development. This is typically thought of as each person’s range of potential for learning, where that learning is culturally shaped by the social environment. A learner ultimately appropriates and internalizes the knowledge transacted through assisted performance so that it becomes their own. A distance teacher instructional designer has to design learning within this zone.

According to psychologists Ronald Gallimore and Ronald Tharp (1990), there are four stages of Zone of Proximal Development that a learner goes through:

First stage: In this stage, the learner’s performance is assisted by more capable persons, such as parents, teachers, and peers.

Second stage: In this stage, there is less dependence on external assistance and the performance begins to become internalised. The learners help themselves by using self-directed speech.

Third stage: In this stage, the performance is developed, automated and fossilised. At this time assistance from others and self-directed speech is not required. Task performance is smooth and integrated, and internalised and automated.

Fourth stage: In this stage, deautomatization of performance takes place, which leads the individual to re-enter the ZPD. For example, at times, even, well learnt responses are forgotten, or become rusty. At these times, the individual re-enters the ZPD and consciously talks through the matter internally or seeks external assistance. To this extent there is a continual movement in and out of the ZPD. Gallimore and Tharp term this a ‘recursion’.

4.4.3 Scaffolding

In the previous sections, you have seen that Vygotsky’s theory suggests that students learn through contact with more capable members of a society. The more capable member organises activities so that the students participate in real activities at their own level of capability. The system of support is called a scaffold. The activity is organised so that it is within the learner’s zone of proximal development. To place learning in the ZPD, an appropriate level of difficulty needs to be established. This level, assumed to be at the proximal level, must be challenging. The adult then needs to provide for assisted performance. This is referred to as instruction. The adult provides guided practice to the child with a clear sense of the goal or outcome of the learner’s performance. As with scaffolding around a building, it is gradually removed, so that the learner can perform the task independently.

4.4.4 Cognitive Apprenticeship

Cognitive apprenticeships are situated within the social constructivist paradigm. Students work in teams on projects or problems with close scaffolding of the instructor. Cognitive apprenticeships are representative of Vygotskian Zones of Proximal Development in which the students’ tasks are slightly more difficult than they can manage independently, requiring the aid of their peers and instructor to succeed.

Cognitive apprenticeship is an approach to the learning process where a master of a skill teaches that skill to an apprentice. Constructivist approaches to human learning have led to the development of a theory of cognitive apprenticeship, which holds that the masters of a skill often fail to take into account the implicit processes involved in carrying out complex skills when they are novices or beginners. To combat these tendencies, “cognitive apprenticeships” are designed, among other things, to bring these tacit processes into the open, where students can observe, enact, and practice them with help or assistance from the teacher. By using processes, such as modelling and coaching, cognitive apprenticeships also support the three stages of skill acquisition. They are: the cognitive stage, the associative stage, and the autonomous stage.

In the cognitive stage, learners develop declarative understanding of the skill. In the associative stage, mistakes and misinterpretations learnt in the cognitive stage are detected and eliminated, while in the associative stage, associations between the critical elements involved in the skill are strengthened. Finally, in the autonomous stage, the learner’s skill becomes honed and perfected until it is executed at an expert level. For example, in traditional apprenticeships the apprentice learns a trade such as tailoring or carpentry by working under a master teacher. The cognitive apprenticeships allow the master to model behaviours in a real world context with cognitive modeling. By listening to the master explain exactly what she is doing and thinking as she models the skill, the apprentice can identify relevant behaviours and develop a conceptual model of the processes involved. The apprentice then attempts to imitate those behaviours with the master observing and providing coaching.

4.4.5 Coaching

Coaching provides assistance at the most critical level – the skill level just beyond what the learner/apprentice could accomplish by herself. This may be referred to as the Zone of Proximal Development, where fostering development within this zone leads to the most rapid development. The coaching process includes additional modeling as necessary, corrective feedback, and reminders, all intended to bring the apprentice’s performance closer to that of the master’s. As the apprentice becomes more skilled through the repetition of this process, the feedback and instruction provided by the master “fades” until the apprentice is, ideally, performing the skill at a close approximation of the master level. A part of the effectiveness of the cognitive apprenticeship model comes from learning in context. Coaching and scaffolding is a key part of situated learning materials.

It is argued that cognitive apprenticeships are less effective when skills and concepts are taught independent of their real world context and situation. Situations might be said to co-produce knowledge through activity. It is also argued that learning and cognition are fundamentally “situated” In cognitive apprenticeships; the activity being taught is modeled in real world situations.

4.4.6 Contextual Learning

In the preceding sections we saw that learners construct meanings by connecting the experiences, which they are already exposed to in various contexts with the new learning. The teacher/instructor/academic counselors plays a role of scaffolder while the learner makes connections.

Contextualized learning is a proven concept that incorporates much of the most recent research in cognitive science. The contextual approach recognizes that learning is a

complex and multifaceted process that goes far beyond drill-oriented, stimulus-and-response methodologies.

In contexts, learning occurs only when students process new information or knowledge in such a way that it makes sense to them in their own frames of reference (their own inner worlds of memory, experience, and response). This approach to learning and teaching assumes, that the mind naturally seeks meaning in context, that is, in relation to the person's current environment, and that it does so by searching for relationships that make sense and appear useful.

Contextual learning focuses on the multiple aspects of any learning environment, whether a classroom, a laboratory, a computer lab or a worksite. It encourages distance teachers to choose and/or design learning environments that incorporate as many different forms of experience as possible (social, cultural, physical, and psychological) in working toward the desired learning outcomes. In such an environment, students discover meaningful relationships between abstract ideas and practical applications in the context of the real world. Concepts are internalized through the process of discovering, reinforcing, and relating. For example, in a biology or chemistry class, students might learn basic science concept of plants by observing different types of plants and their structure, and relate them while studying about the modifications of roots, stems and leaves.

Contextual learning helps students to relate the subject matter content to real world situations and motivate them to make connections between knowledge and its applications to their lives as family members, citizens, and workers and engage in the hard work that learning requires.

Contextual Instruction and Learning (CIL) strategies

- **Problem based learning:** Contextual learning can be problem based where the students begin with a simulated or real problem. Students use critical thinking skills and a scientific approach to inquire to address the problem or issue. They may also draw upon multiple content areas to solve these problems. Worthwhile problems that are relevant to students' families, school experiences, workplaces, and communities hold greater personal meaning for students.
- **Using multiple contexts:** While constructing knowledge, the students might use various resources and contexts, such as community, neighborhood, family, school and so on. We have already seen that knowledge cannot be separated from the physical and social context in which it develops. How and where a person acquires and creates knowledge is, therefore, very important. The contextual learning experiences are enriched when students learn skills in multiple contexts.
- **Drawing upon student diversity:** Students come from diverse backgrounds with differences in values, social mores, and perspectives. These differences can be the impetus for learning and can add complexity to the CIL experience. Team collaboration and group learning activities respect students' diverse histories, broaden perspectives, and build inter-personal skills.
- **Self-regulated learning:** Ultimately, students must become lifelong learners. Lifelong learners are able to seek out, analyze, and use information with little to no supervision. To do so, students must become more aware how they process information, employ problem-solving strategies, and use background knowledge. Contextual experiences should allow for trial and error; provide time and structure for reflection; and provide adequate support to assist students to move from dependent to independent learning.

- **Interdependent learning groups:** Students will be influenced by and will contribute to the knowledge and beliefs of others. Learning groups, or learning communities are established in workplaces and institutions with an effort to share knowledge, focus on goals, and allow all to teach and learn from each other. When learning communities are established in different institutions, educators act as coaches, facilitators, and mentors.
- **Authentic assessment:** Contextual learning is intended to build knowledge and skills in meaningful ways by engaging students in real life, or authentic contexts. Assessment of learning should correspond with the methods and purposes of instruction. Authentic assessments show among other things that learning has occurred; are blended into the teaching/learning process; and provide students with opportunities and direction for improvement. Authentic assessment is used to monitor student progress and inform teaching practices.

Activities, such as team teaching, cooperative learning, integrated learning, work-based learning, service learning, problem-based learning, and other support that are contextual in nature are required in a distance learning context where the constructivist approach to learning is intended.

Check Your Progress 2

- Note:** i) Write your answers in the space given below.
ii) Check your answers with the answers given at the end of this Unit.

- 1) Explain the concept of discovery learning.

.....

.....

.....

.....

- 2) What is Scaffolding in educational learning terms?

.....

.....

.....

4.5 APPLICATION OF CONSTRUCTIVISM IN INSTRUCTIONAL DESIGN

It is necessary to change our perspectives of a learner, learning process and learning system, so that a conducive, democratic learning environment is created for the learners where they can explore, analyze, share ideas, reflect, communicate and learn together in groups. Each learner needs to be valued for his or her own experiences that he/she brings to the learning environment. The role of a distance teacher/unit designer becomes more critical in a constructivist learning situation when compared to that of a conventional teacher. We will expand this concept in the following sections that concentrate on creating a constructivist distance learning with various approaches and techniques. Constructivism can be applied to the distance education instruction scenario wherein the students while going through the study materials construct meanings on their own by connecting the known knowledge to the unknown, explore through activities and discover, solve problems through engaging in meaningful tasks, share knowledge with peer groups e.g., through online discuss forums, apply or extend the meanings

constructed to the new situations, and assess themselves through reflective exercises etc.

In the context of the constructivist pedagogy, the views about a learner, learning process and the teacher's planning of a unit undergo a vast change. This section discusses one of the learning cycles and the unit plan format that can be used by teachers/instructional designers for visualizing and creating learning situations in the classrooms.

4.5.1 Anchored Instruction

The anchored instruction approach is an attempt to help a learner become more actively engaged in learning in a situation or anchoring instruction in a unit. The learning environments are designed to provoke the kinds of thoughtful engagement that helps learners develop effective thinking skills and attitudes that contribute to effective problem solving and critical thinking.

Therefore, learning activities should be designed around an anchor, which is often a story, adventure, or situation that includes a problem or issue to be dealt with that, which is of interest to the learners. Instructional materials should include rich resources that learners can explore as they try to decide how to solve a problem.

Thus, we see that anchored instruction requires putting the learner in the context of a problem. The students 'play' an authentic role while investigating the problem, identifying gaps to their knowledge, researching the information needed to solve the problem and developing solutions.

Characteristics of anchored instruction: Learning activities should be designed around an 'anchor', which is based on a contextualized case study or problem situation. The following may be taken into consideration:

- Distance learning materials should allow exploration by the learner to allow active manipulation, questioning and involvement in the situation.
- Learners identify with problem and become actively involved in generating solutions.
- The distance educator should use instructional materials and websites to provide the context of a problem. This might include news clips, pictures or graphics. Features, such as a virtual field trip, virtual tours, and simulations could act as anchors.
- Learners can use the World Wide Web to search for information needed to solve the problem, identify pictures, graphics, video clips and audio clips that help them develop a solution to a problem.

From the above discussion we can say that anchored instruction is a learner- centered, contextualized approach to learning. In this approach the learner begins with a problem to be solved rather than content to be mastered. Anchored instruction is also a type of problem based learning that uses a complex interesting situation as an anchor for learning.

Problem-based learning (PBL) which includes anchored instruction is a total approach to students learning. PBL is both a curriculum and a process. The curriculum consists of carefully selected and designed-problems that demand from the learner an acquisition of critical knowledge, problem solving proficiency, self-directed learning strategies, and team participation skills. The process replicates the commonly used systemic approach to resolving problems or meeting challenges that are encountered in life and in a career. In problem-based learning, the roles of a teacher and student change. The

students assume increasing responsibility for their learning, giving them more motivation and more feelings of accomplishment, setting the pattern for them to become successful lifelong learners. The faculty in turn becomes resources, tutors, and evaluators, guiding the students in their problems solving efforts. Thus, we can suggest that anchored instruction is a student centered, contextualized approach to learning. In this approach the learner begins with a problem to be solved rather than content to be mastered. The concept of anchored instruction was stimulated by the merit knowledge problem, which states that knowledge can be recallable only when the individual is questioned explicitly, about the context in which it was learnt. The issue of learning transfer, situated cognition and collaborative learning are primary concerns in anchored instruction. It emphasizes the importance of creating an anchor that generates interest and enables subjects to identify and define problem, and to pay attention to their own perception and comprehension of these problems.

Vygotsky's theory emphasizes that social interactions can facilitate learners' progression to more advanced ways of thinking and problem solving. Instructional designers should, therefore, consider opportunities to incorporate into lesson designs, cooperative learning or tutoring from peers or adults.

4.6 LET US SUM UP

Constructivism suggests that individuals create their own understandings based upon the interaction of what they already know and believe and the phenomena or ideas with which they come into contact. Constructivism is a descriptive theory of learning, which has its roots in philosophy, cognitive psychology and sociology as well. Constructivism is an approach to learning that permits students to form their own concepts and models of those things they observe in the natural world. There are different types of constructivism, such as trivial, social constructivism. This School of thought recognizes that the students have a Zone of Proximal Development and instructional materials should be designed using questions, discussions and scaffolding.

4.7 CHECK YOUR PROGRESS: HINTS TO ANSWERS

Check Your Progress 1

- 1) Please look at section 4.3. Constructivism deals with the idea that individual creates their own understanding based upon their own experiences and therefore learning is highly individualised.
- 2) Please see section 4.3 and read about the trivial constructivism and social constructivism.

Check Your Progress 2

- 3) Please see sub-section 4.4.1. In discovery learning, the learner draws upon his/her own prior knowledge, experiences, interaction and construct new ideas. This leads to knowledge gained by personal discovery.
- 4) Please see sub-section 4.4.3. Scaffolding is based on Vygotsy's theory that learners learn from contact with other learners and members of society and this provides them a support system for their learning and helps them to learn better.

REFERENCES

- Ausubel, D.P. (1968). *Educational psychology: A cognitive view*. New York: Holt, Rinehart and Winston.
- Bandura, A. (1969). *Principles of behaviour modification*. New York: Holt, Rinehart & Winston
- Bigge, M.L. (1971). *Learning theories for teachers*. New York: Harper & Row.
- Biswas, P.K. (2007). Instructional design and distance education. In *Open and distance learning: Theory and practice, training module for academic counsellors*, New Delhi, India: IGNOU, pp. 34-43.
- Boud, D., & Feletti, G. (1997). *The challenge of problem-based learning*, 2nd ed. London: Kogan Page.
- Borko, H., & Putman, R.T. (1996). Learning to teach. In D. Berliner and R. Calfee (eds). *Handbook of educational psychology* (pp. 673-708). New York: Simon and Schuster Macmillan.
- Confrey, J. (1990). What constructivism implies for teaching. In R. Davis, C. Maher & N. Noddings (Eds) *Constructivist views on the teaching and learning of mathematics*, National Council of Teachers of Mathematics, Reston, Virginia, pp.107-122.
- Dabbagh, N., & Benson, A.D. (2007). Technology, globalization and distance education: Pedagogical models and constructs. In *The sage handbook of research in international education*, edited by Mary Hayden, Jack Levy and Jeff Thompson, Sage Publications.
- Dembo, M.H. (1994). *Applying educational psychology* (5th ed.). White Plains, NY: Longman Publishing Group.
- Devereux, Jane (2000). *Primary science (developing subject knowledge)*. London: Sage Pub. Inc.
- Duch, B.J., Groh, S.E., & Allen, D.E. (2001). *The power of problem-based learning*. Virginia: Stylus.
- Entwistle, A., & Entwistle, N.J. (1992). Experiences of understanding in revising for degree examinations. *Learning and Instruction*, 2(1), pp. 1-22.
- Ertmer, P.A., & Newby, T.J. (1993). Behaviourism, cognitivism, and constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly*, 6(4), 50-70.
- Esler, W.K., & Esler, M.K. (2001). *Teaching elementary science*. Wadsworth Publishing Company.
- Fosnot, C.T. (1996). *Constructivism: Theory, perspectives and practice*. New York, Teachers College, Columbia University.
- Gagne, R.M. (1985). *Conditions of learning* (4th ed). New York; Holt, Rinehart and Winston.
- Gagne, R.M., (1985). *The conditions of learning and theory of instruction*. New York: CBS College Publishing.
- Gagne, R.M., Briggs, J.L., & Wager, W.W. (1988). *Principles of instructional design* (3rd ed.). Orlando, Florida: Holt, Rinehart and Winston Inc.

- Glaserfeld, E. von (1995). A constructivist approach to teaching. In L.P. Steffe & J. Gale (eds). *Constructivism in Education*, (pp. 3-16). New Jersey: Lawrence Erlbaum.
- Good, T.L., & Brophy, J.E. (1990). *Educational psychology: A realistic approach*. (4th Ed.). White Plains, NY: Longman Publishing Company.
- Haughey, M. (2010). Teaching and learning in distance education before the digital age. In *An introduction to distance education, understanding teaching and learning in a new era*. Edited by M.F. Cleveland-Innes and D.R. Garrison, New York and London: Routledge Taylor & Francis Group.
- Inhelder, B., & Piaget, J. (1958). *The growth of logical thinking from childhood to adolescence*, New York: Basic Books.
- Jennings, T. (1986). *The young scientist investigates: Teacher's book of practical work*. Oxford: Oxford University Press.
- Johnson, D.W. (1979). *Educational psychology*. Englewood Cliffs, N.J.: Prentice Hall.
- Keppell, J.M. (2007). *Instructional design: Case studies in communities of practice*. Information Science Publishing, Hershey, PA 17033.
- Maslow, A.H. (1954). *Motivation and personality*. New York: Harper and Row.
- Mathews, M.R. (1998). *Constructivism in science education: A philosophical examination*. Dordrecht: Kluwer Academic Publishers.
- Mayer, R.E. (1982). Learning. In H.E. Mitzel (Ed.) *Encyclopedia of educational research* (pp. 1040-1058). New York: The Free Press.
- Mayer, R.E., Dow, G. T., & Mayer, S. (2001). Multimedia learning in an interactive self-explaining environment: What works in the design of agent-based microwords. *Journal of educational Psychology*, 95(4), 806-812.
- Merrill, M.D. (2007). A task-centered instruction strategy. *Journal of Research on Technology in Education*, 40(1) xx-xxx.
- Mishra, S. (2008). *Understanding learning technologies*, Ansari Road, New Delhi: Viva Books Pvt. Ltd.
- Mishra, S., & Jain, S. (2002). *Designing an online learning environment for participatory management of displacement, resettlement and rehabilitation*. Paper presented in the 2nd Pan-Commonwealth Conference on Open Learning held at Durban, South Africa from 28 July to 3rd August 2002. Available <http://www.col.org/pcf2/papers/mishra.pdf>. Accessed on 2004/05/19.
- Morrison, G.R., Ross, S.M., Kemp, J.E., & Kalman, H. (2011). *Designing effective instruction* (6th ed.). N.Y., United States of America: John Wiley & Sons. Inc., pp. 386-387.
- Novak, D.J., & Gowin, B. (1984). *Learning how to learn*, New York: Cambridge University Press.
- Norton, P., & Wiburg, K.M. (1998). *Teaching with technology*. Orlando, FL: Harcourt Brace & Company
- Osborne, F.J. (1996). Beyond constructivism, *Science Education*, 80(1). 53-82.
- Owen, S.V., Blount, H.P., & Moscow, H. (1978). *Educational psychology: An introduction*, Boston: Little Brown & Company.

- Reigeluth, C.M. (1983). *Instructional-design theories and models: An overview of their current status*. (Ed.) Hillsdale, NJ: Lawrence Erlbaum Associates, INC.
- Richey, R.C. (1986). *The theoretical and conceptual bases of instructional design*. London: Kogan Page Ltd. .
- Rogers, C. (1977). Humanistic education. In Patterson, C.H. *Foundations for a Theory of Instruction and Educational Psychology*. New York: Harper and Row.
- Romiszowski, A.J. (1981). *Designing instructional system*, London: Kogan Page.
- Saunders, N.H. (1962). *The teaching of general science in tropical secondary schools*. Oxford: Oxford University Press.
- Seels, B., & Richey, R. (1994). *Instructional technology: The definitions and domains of the field*. Washington DC: Association for Educational Communications and Technology.
- Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, 2(1), 3-10.
- Starkey, L. (2012). *Teaching and learning in the digital age*, Routledge, Tylor and Francis Group, pp. 4-70.
- Steffe, L.P. & Gale, J. (1995) *Constructivism in education*, New Jersey: Lawrence Erlbaum Associates Publishers.
- Turner, T. & DiMarco, W. (1988). *Learning to teach science in the secondary school – A companion to school experience*. USA: Routledge.
- Villalba, C., & Romiszowski, A.J. (2001). Current and ideal practice in designing, developing and delivering web-based training. In Khan, B.H. (ed.) *Web-based training* (pp. 325-342). Englewood Cliff, NJ: ETP.
- Vygotsky, L. (1994). The development of academic concepts in school aged children. In Veer, R. v.d. & Valsiner, J. (eds.), *The Vygotsky reader* (pp. 1-388). Oxford, UK: Wiley-Blackwell.
- Wadsworth, B.J. (1984). *Piaget's theory of cognitive and affective development*. White Plains, N.Y.: Longman Inc.
- Wilson, B.G. (1997). Thoughts on theory in educational technology. *Educational Technology*, January-February, 22-27.
- Woolfolk, A. (1995). *Educational psychology*, 7th Edition, Boston: Allyn and Bacon.
- Yager, R.E. (1991). The constructivist learning model towards real reform in science education, *Science Teacher*, 58(6), 52-57.



ignou
THE PEOPLE'S
UNIVERSITY