UNIT 1 THEORIES OF LEARNING

Structure

1.0 OBJECTIVES

After having worked through this unit, you should be able to:

- define learning and its basic conditions,
- explain various theories of learning and their educational implications,
- describe learning outcomes in three domains — cognitive, affective and psychomotor,
- write the required instructional objectives for a unit/lesson.

1.1 INTRODUCTION

In most open and distance learning systems print material is the chief teaching medium. Teaching a learner through self-learning print materials is different from any other kind of teaching. The process of designing, developing and producing these materials is quite different from that used in the production of text books, lecture notes, journal articles and training manuals. However, it is important to remember that a distance teaching text

is not the same as a text book, because the material produced in print for independent learning has to carry out all the functions a teacher who would fulfil in a conventional situation such as guiding, motivating, explaining, discussing, asking questions, assessing the learner's progress, giving appropriate remedial measures, and providing advice. Those who are writing distance teaching print materials have to consider the characteristics of the print medium and how print is a convenient medium for the delivery of educational material to remote students, who may not have access to new technologies. Printed texts are comparatively cost-effective and easily designed, developed and delivered. Print material is the most convenient medium to work with, being self-contained, portable and easy to access. In this unit, we will discuss the theories and principles on the basis of which the distance teaching texts are developed.

It may happen sometimes that certain skills are adequately learned and practiced by us without our being aware of the theoretical basis of those skills or the principles behind their successful functioning. But if we know the theories as well, the practice of our skills maybe improved. You may drive a car well without being a car mechanic yourself, but if you also know the mechanism, it may improve your efficiency as a driver. In the field of education, your knowledge of various theories of learning will be very useful when you consciously attempt to practice and improve your teaching/learning skills.

Curriculum, syllabi, *text design*, teaching methods and, modes of evaluation are all based on certain theories of learning. These theories are generally derived from past experience, or formulated to serve the needs of the present and the future. If we want to implement our educational plan or improve the practice of teaching/learning or change the educational system itself, we should acquire the necessary knowledge of various theories of learning before we take any concrete steps in operational terms. Until recently, the design of the majority of distance teaching text materials have been based on various theories of learning from the cognitive, behavioural and information processing families. There is, however, a growing body of literature on the practice of designing materials from a constructive perspective, which have presented as principles that should guide design. In this unit we discuss Behaviourism, Cognitivism and Constructivism as well the possible synthesis of the first two of these. We indicate the general educational implications of these theories and try to link them with distance education. For a more specific discussion on the implications of these theories for distance education, you may turn to Unit 3 of this block.

The purpose of this unit is to acquaint you with the concept of learning, the various theories of learning and the learning outcomes in three domains: cognitive, affective and psychomotor along with their implications in designing print materials.

1.2 THE CONCEPT OF LEARNING

Conceptually, 'learning' in the conventional sense is the process of assimilation of knowledge resulting from the interaction between the teacher and the taught. The idea of the traditional teacher-student relationship is, however, impossible to achieve with the growing democratisation of education and the increasing demand for learning or continuing education. In distance education, the scope for personal contact and its role in the teaching and learning process are limited. The concept of learning thus needs to be reinterpreted in terms of distance education. In distance education, learning takes place not through the mediation of a teacher but primarily through the mediation of text materials and electronic gadgets. As you know, in distance education we deal with adult learners, who use their experience to create construct knowledge, a process which is otherwise known as experiential learning. In this section, along with considering the other meanings of 'learning', we will discuss the concept of experiential learning and constructivism. If we look at the process of learning and teaching at a distance from the point of view of pedagogies, it is more or less integrated combination of forms of learning which are developed in classroom teaching (*Otto Peters*, 1998). These include:

- Learning by reading printed material (textbooks, manuals, lexicons, scientific literature, lecture notes).
- Learning by means of guided self-teaching (counselling at the commencement of studies, counselling by tutors, consulting reading lists).
- Learning by means of independent scientific work (preparation for written examination, the writing of assignments).
- Learning by means of personal communications (use of the consultation hours of university teaching staff, and of course counselling, peer interaction, practical case-work, project work, seminars etc.).
- Learning with the help of multi-media.
- Learning by participating in traditional academic teaching (lectures, seminars, counselling sessions, laboratory work).

What follows below is an elaboration of the theme introduced earlier.

1.2.1 Learning and performance

Learning is a relatively permanent change in behaviour, and it is the result of reinforced practice.

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 something which she/he could not do before. A person may know something, and yet may not have learned 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. We use the term 'behavioural tendency' to maintain the distinction between learning and performance. In this context when we speak of relatively permanent change in behaviour, we refer to a change in performance.

1.2.2 Learning and cognitive development

We may also define learning in terms of cognitive development. Cognitivists say that learning is the changing or reorganisation of cognitive structures, which involves an acquisition of knowledge and the transformation of new knowledge. Looked at this way, 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.

1.2.3 Learning and maturation

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 anatomical maturation. A child walks once its legs are strong enough to support its weight.

1.2.4 Experiential learning and constructivism

Experiential learning has been a very influential idea in recent years. It is argued by Kolb (1984) that mature adults have much to offer to the educational process from their life experiences. Peter (1997) argues that to some extent experiential learning is constructivism in an adult context. Kolb (1984) describes experiential learning as the process whereby knowledge is created through the transformation of experience while Knowles (1984) and Brookfield (1986) link it to self-directed learning. There is certainly a very strong element of self-direction in learning as in a classic study of the constructivist movement. Knowles (1984) postulates certain assumptions about andragogy (the teaching of adults as opposed to pedagogy, which is the teaching of children) and experiential learning. Most of these assumptions also seem to apply to constructivism. Kolb (1984) listed the essential characteristics of experiential learning which are applicable to constructivist theory.

These characteristics are:

1. Learning is a continuous process grounded in experience.
2. Learning is a holistic process of adaptation to the world.

3. Learning involves transactions between the person and the environment.
4. Learning is the process of creating knowledge.
5. The process of learning requires the resolution of conflicts between diametrically opposed modes of adaptation to the world.

As a result of the seminal contributions of Kolb (1984) and Knowles (1984) there is a style of teaching adults that involves making use of their experiential learning. This is different from pedagogy, in which the teacher instructs the students but does not take experiential learning into account in any way. Andragogy involves the construction of experiential learning into the learning cycle as stated below (fig 1).

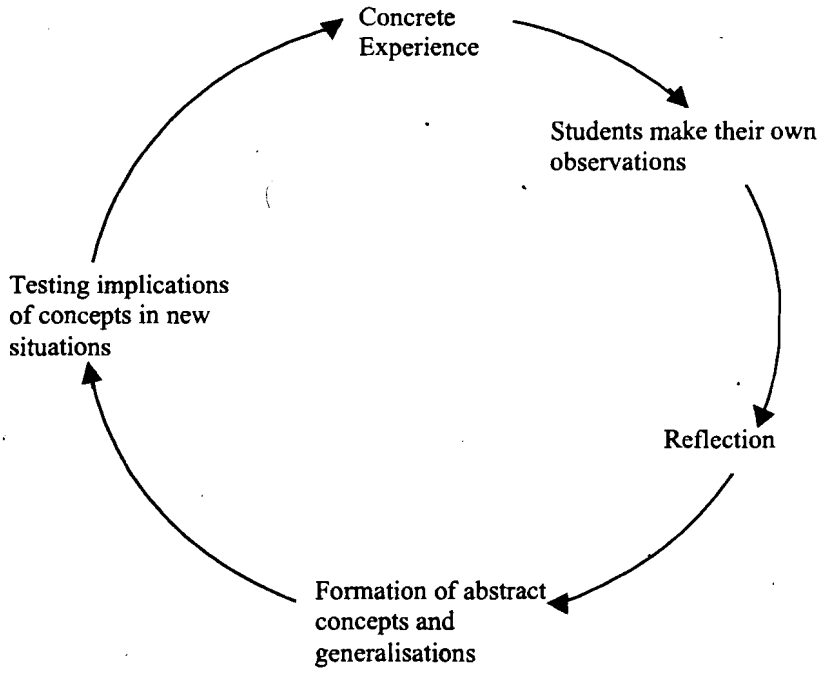

Fig.1: Kolb's Experiential Learning Model

This cycle explains that the students are encouraged to reflect on their own experiences and to come to conclusions that modify their cognitive structures. They are then ready for the next cycle of experiential learning.

Learning and constructivism

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 s/he then uses to deal with any new experiences in that field.

Constructivist learning is about the elaboration of concepts, as they operate in a real context. Learners elaborate concepts through questioning, critical analysis, application of the concept and by, reflection-on-action.

To learn constructively is to actively process new information, use structured experiential activity and analyse life experiences, solve problems, examine critically one's existing mental framework, explore belief systems and assess one's learning.

The learner's existing mental framework and learning needs are agents in the interpretation and construction of knowledge.

To prepare the materials constructively is to provide opportunities for complex processing of information related to a learner's needs and knowledge of the world, to design relevant and real world (authentic) tasks, provide complex stimuli, challenge the learner's existing knowledge structures and values, acknowledge vague structures in knowledge, help learners revisit material in greater depths, confirm the learning identified by learners, and help learners to arrive at correct solutions.

But one of the limitations of this approach is that it does not fully take into account the way in which social processes, such as peer interaction, collaboration and the use of language, which contribute to learning. The main emphasis of *constructivism* is on individual development through the use of resources and on the accommodation of new experiences to existing understanding.

The role of the tutor/counsellor in a constructivist learning environment is to facilitate learning through the provision of programming tasks, and to support individual development by creating a micro-world. There is no specific place for language, dialogue and communication in developing cognition.

The drill and practice approach of behaviourism makes the role of the teacher redundant, while the constructivist approach reinstates learning by discovery, where the role of the teacher is that of a facilitator, someone who works in a supervisory capacity. You can see this difference from the figure given below.

Theory	Behaviourist	Constructivist
Activities	Drill and Practice Tutorials	Independent learning, experiential learning, programming
Learning Processes	Individual instructional and feedback, drill and practice	Generalisable skills based on individual discovery

Fig.2: Difference between Behaviourist and Constructivist approach

Implications for the design process of course materials

The curriculum of distance education should provide experiential learning situations for the adult learners and the organisation of the content should encourage the learners to realise the consequences of their experiences. The process of designing distance teaching materials should be consistent with constructivist theory. The course materials should be developed for use in a constructivist learning environment. The course materials should evolve through a process of construction of knowledge, reflection and social interactions. The five conditions for creating constructivist learning environments can be applied to the process of designing self-learning materials. The five conditions are:

1. Embrace the complexity of the *design* process.
2. Provide for *social negotiations* as an integral part of designing.
3. Examine information *relevant* to the design of the instruction at multiple times from *multiple* perspectives.
4. Nurture *flexibility* in the design process.
5. Emphasise *learner-centered* design.

1.2.5 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 responses to them. In teaching, we are always interested in making the students make connections between a particular stimulus and responses to it.

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 relatively longer periods 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. Because of the complexity of the concept of 'reinforcement' and because of its importance, we shall here explain it in detail. We can use reinforcement in different ways to produce different effects, i.e. the effect of different types of learning in the students. In the process of reinforcement, an organism/learner is presented with a particular stimulus (i.e. reinforcer) before and after it elicits desired responses. In a given situation, the organism will tend to repeat the responses for which

reinforcement is given and to discontinue responses for which it is not. We can distinguish a reinforcer from other stimuli because it has a particular effect on behaviour.

Feedback is providing the knowledge that the responses are correct or that they require amendment, also functions as reinforcement in strengthening the responses to be learned. 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 the quality of his/her work. The teacher, whether in the classroom or in a distance learning situation, needs to make systematic plans to provide feedback before moving on to new learning materials. Available evidence indicates that active response with direct feedback is superior to passive response with indirect feedback.

A very weak reinforcement may be sufficient for controlling one's behaviour effectively if it is wisely used. We cannot say that a particular activity or event is in fact a reinforcement until we have evidence that it has strengthened the behaviour of the individual concerned.

iv) Generalisation and discrimination: Both generalisation 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, generalisation and discrimination.

In many situations, we observe that a child, when confronted with a new stimulus, makes a response previously learnt to respond to a similar type of stimulus. We call this behaviour 'generalisation' (or stimulus generalisation). 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. A child, for example, 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.

1.2.6 Approaches to learning (Deep and Surface)

In sub-section 1.2.1 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, memorising and reproducing the facts, making sense of the abstract concepts, interpreting and understanding the reality in a different way due to learning.

In this sub-section we will focus on different approaches to learning and we would explain whether there is an internal relationship between the approaches that students adopt 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 memorisation or understanding or intended to develop skills and then to work with the materials appropriately. These approaches to learning are described as *deep and surface.*

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);
- personalises 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, relates evidence to a 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.

And a learner who adopts a *surface approach*

- observes the task as a demand to be met, or as 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;
- relies on memorisation, tries to reproduce the surface aspects of the task. In other words, if a learner wants to display symptoms of having learned something, s/he will adopt a surface level approach.

The specific forms of approaches in the specific learning tasks and content domain are researched by distance education practitioners. A large number of studies have been carried out in which approaches to learning and the outcomes of learning have been described. *Marton and Booth* (1996) observed that the students adopted approaches to the tasks they undertook according to their experience of those specific occasions. The outcomes of those tasks were associated with the approaches adopted there, specific to that situation. Some studies have indicated that individual students do indeed adopt different approaches to particular tasks. Other researchers,

however, have found it reasonable to make the assumption that individuals have a predominant approach when tackling the tasks of learning, and they have tried to determine the extent to which they adopt such an approach to their studies in general. *Ramsden and Entwistle* (1983) developed questionnaires and interview questions to study how students approach learning. Sample items for such measurement are shown below in the box:

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 systematic relationship was found between the attributes and approaches adopted, for example, the perception of heavy work loads, poor presentation, lack of choice of content and method, and examinations that demanded reproduction. On the other hand, the perception of good teaching and good presentation and freedom to choose what and how to study, are all related to deep approaches to leaning.

The features of learning that are typically associated with deep and surface approaches were used by *Biggs* (1994) in developing questionnaires to identify how students approach their study i.e., learning process questionnaire and study process questionnaire. These were used mainly in Australia and Southeast Asia.

Kember (1996) has stated that deep learners begin with an intention to understand and maintain a vigorous interaction with content, whereas the surface learner's main intention is to complete the task requirements, which are regarded as external impositions. The implication is that deep learning is somehow better than surface learning because 'understanding' is achieved. ..

Lyall and McNamara (2000) had conducted a study on a population of 137 enrolled students, who has been studying through distance education at tertiary level for at least one year. These learners stated deep learning as understanding and considered this as the better way of learning, since they would be able to retain the knowledge for longer, thus forming a more

substantial base on which to build further learning. This building-up of knowledge was considered to be a very important learning strategy.

The results of this study emphasise 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 resort to surface learning approach. These circumstances are usually external, such as work commitments, family responsibilities, limitations of study space and isolation from the institution.

In this section we have discussed in detail the concept of learning. From the analysis of the pedagogical structure of distance education, and principles of andragogy, we can infer that learning is a 'central basic function of human life' and the distance learners are very pragmatic about their studies and tend to use the more flexible 'strategic' approach to learning. Learning in adulthood becomes constructivist in approach when high flexibility of the learning and teaching strategies are aimed at bringing about quick changes in content and media. The nature of these strategies is of paramount importance in the design of learning materials and the development of a suitable distance teaching paradigm, particularly if new technology is to be used for delivery.

Check Your Progress 1

What is the basic difference between behaviourism and cognitivism? Write in ten lines.

Note : a) Write your answer in the space given below.
b) Compare your answer with the one given at the end of this unit.

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1.3 THEORIES OF LEARNING: BEHAVIOURISM

Views on learning are based on different philosophical and psychological ideas about human nature and how it learns. Educators work on the basis of various theories of learning. The prominent learning theories we intend to

discuss in sections 1.3 and 1.4 are: behaviourism, cognitivism and the possible synthesis of the two in section 1.5.

1.3.1 Behaviourist views

Behaviourism is among the most dominant of modern theories of learning. The behaviourist view is quite comprehensive and includes a variety of thoughts, but all these thoughts suggest a common approach to learning in terms of the development of connections between stimuli received and responses displayed by organisms/learners.

After conducting laboratory experiments with animals, behaviourists concluded that learning is a process by which stimulus and response bonds are established when a successful response immediately and frequently follows a stimulus. They assumed that people are similar to machines, and considered irrelevant any reference to the role of the mind. Most of the basic behavioural research has been conducted on animals. The applications of these research studies, however relate to a wide range of human behaviours. In this context, we can summarize the major principles of the theories to key behaviourists such as Thorndike, Pavlov and Skinner. These theories have most influence upon the development of a theory of design. According to behavioural theories, 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 learners to demonstrate these behaviours.

The early behaviourist, Edward L. Thorndike has put forward three main laws of learning: The law of effect, the law of readiness and the law of exercise. The law of effect stresses the importance of the effect of a stimulus-response (S-R). Satisfying results reinforce the response while inadequate results weaken it. Reward and punishment are, therefore, important ingredients of learning. The law of readiness indicates the learner's willingness to make (S-R) connection while the law of exercise is related to the strengthening of the connection through practice.

The mechanistic outlook of learning has been developed by a later generation of behaviourists. They suggest that learning something is a process similar to habit formation through conditioning which links desired responses to stimuli. A prominent theorist among them is B.F. Skinner who propagated the concept of *operant conditioning*. His idea will be discussed in sub-section 1.3.3 of this unit.

1.3.2 Educational implications

The behaviourist approach to learning has greatly influenced modern educational practices. Behaviourists have conceived of *teaching* as a manipulation of the environment in order to produce desired behavioural changes in learners and thus make education more effective. They suggest

the adoption of the following three principles towards making a teaching-learning transaction yield desirable results.

- knowledge of results and use of positive reinforcement,
- minimum delay in reinforcement, and
- elaboration of complex behaviour by dividing learning into a series of small steps.

One of the major contributions of behaviourists to education is their emphasis on *defining objectives in behavioural terms*. They have stressed the need for stating objectives in the form of *overt behaviour* which can be observed and measured. The role of teachers becomes very crucial in deciding what changes of behaviour the learners should display when they learn, and in teaching in such a way that learners can attain those behavioural changes.

Behaviourist principles have also influenced contemporary approaches to evaluation. For instance, Bloom has suggested a model of 'taxonomy of educational objectives' based on the hierarchy of learning objectives: This will be discussed in section 1.6 of this unit.

Another example of the educational uses to which a behaviourist approach can be put, is individualising instruction such as a personalised system of instruction based on reinforcement theory that has been widely used in education.

1.3.3 Skinner's theory of operant conditioning

Skinner (1958) propagated a theory related to stimulus-response relationship and reinforcement. In his view, learning is a change in behaviour. As the learner learns, his/her responses in terms of changed behaviour increase. Learning is, therefore, formally defined by him as a change in the likelihood or probability of a response.

Operant conditioning is a learning force which effects the desired response more frequently by providing a reinforcing stimulus immediately following the response. The most important principle of this type of learning is that behaviour changes according to its immediate 'consequences'. Pleasurable consequences strengthen behaviour while unpleasant consequences weaken it. For example, in Skinner's famous experiment, a pigeon pecks the red ball and gets food. Because of food (reinforcement), the pigeon is likely to peck the same ball again and again.

In *operant conditioning*, learning activities are divided into many small steps/tasks and reinforced one by one. The operant-the response/behaviour or act — is strengthened so as to increase the probability of its recurrence in the future. Three external conditions – reinforcement, contiguity and practice – must be provided to promote or to effect operant conditioning.

Reinforcement

The most important aspect of Skinner's theory of learning relates to the role of reinforcement. An organism/learner is presented with a particular stimulus – a reinforcer – after it makes a response. In a given situation, the organism/learner will tend to repeat responses for which it is reinforced.

Skinner made a distinction between positive and negative reinforcements. Positive reinforcement is a stimulus which increases the probability of desired responses. Usually, it is a positive reward. Praise, smiles, or a prize, are examples of positive reinforcement. In negative reinforcement, the desired behaviour is more likely to occur if such stimulus/reinforcement is removed. For example, we can close windows and doors to avoid hearing loud noises or we can avoid wrong answers by giving right answers. Here noise and wrong answers are negative reinforcers. Thus a negative reinforcer is a negative reward – the avoidance of which gives us relief from an unpleasant state of affairs. Skinner did not equate negative reinforcement with punishment.

Educational implications

The basic implication of *operant conditioning* for instructional activities is their dependence on observable behaviour. For Skinner, reinforcement facilitates learning. Further, he thinks that the most effective control on human learning requires instrumental aids. Broadly, Skinner's theory has made the following contributions to the practice of education:

a) Teaching Machines: Teaching machines, in the sense of systematic approaches to teaching with the help of machines, deserve attention as they have strongly influenced distance education both in theory and in practice. In this method, machines present the individual learners with a series of questions to be answered, problems to be solved, or exercises to be done. In addition, they provide automatic feedback to the learners. Teaching through machines and electronic gadgets encourages learners to take an 'active' part in the instructional process. The use of mechanical teaching devices has the following advantages:

i) Right answers are immediately reinforced. Machines encourage and sometimes even compel the learner to come up with the right answers.
ii) Mere manipulation of the machines will probably provide enough reinforcement to keep an average student at study for a suitable period each day.
iii) Any learner who is forced to leave the activity of learning for a certain period can return at any time and continue from where he/she left off.
iv) Each student can proceed with his/her learning on an individual basis at his/her own pace.

v) The teacher is forced to arrange and design the content carefully in a hierarchical order.

vi) There is constant interaction between the teaching material and the learner, thus sustaining the learning process.

vii) After evaluating the progress of the learner, the teacher can supply necessary supplementary reinforcement. Thus, machines make it compulsory that any given material be thoroughly understood before the student moves on to the next set of materials.

b) Programmed Instruction: Programmed instruction is a self-learning system in which the subject matter is broken up into small bits and presented in logical sequences. Each step builds deliberately upon the preceding one. A learner progresses through the sequence of steps at his/her own pace. Each step presents some new information about the theme that is being taught through the programme. At the end of each step there is a question to be answered by the learner. After the question is answered, the learner is expected to check his/her answer with the correct answer supplied in the programme. This correct answer functions as a reinforcing stimulus. Thus, the process of reinforcement is an inbuilt feature of programmed materials.

Let us sum up Skinner's theory of operant conditioning in the following table :

Table 1 : Summary of Skinner's theory of operant conditioning

Sl.No	Basic Element	Explanation
1.	Assumption	Behavioural change is a function of external environmental conditions and events
2.	Learning	Change in behaviour represented by a visible response
3.	Learning outcomes	New responses/behaviour
4.	Components of learning	Stimulus (discrimination)-Response-Stimulus (reinforcement)
5.	Applications to educational practice	– Analysis of readiness and motivation – Individual learning materials – Teaching machines – Analysis of aversive classroom practices and interactive classroom situations – Scheduling reinforcement – Transfer of response-stimulus relationship to the solution of new problems.

Check Your Progress 2

State how behaviourist principles operate in teaching machines.

Note : a) Write your answer in the space given below.
b) Compare your answer with the one given at the end of this unit.

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1.4 THEORIES OF LEARNING: COGNITIVE APPROACH

The cognitive approach deals mainly with the psychological aspects of human behaviour. We have discussed this approach in detail along with its application to educational practices in the following sub-sections.

1.4.1 Cognitive approach

'Cognitive approach' has taken an important place in the psychology of learning over the last few decades, and has posed a challenge to behaviourism. It has put back on the agenda the nature of the complex mental process of a learner. While conducting experimental investigation, cognitivism takes into consideration activities such as perception, concept formation, language use, thinking, understanding, problem solving, attention and memory.

Thus, the cognitive approach is concerned with the individual's inner psychological functioning, and it strongly contends the behaviourist's emphasis on overt behaviour.

Cognitive theorists have made investigations to show that people learn by perceiving, comprehending and conceptualising problems. The comprehension of concepts and rules is transferable to the solution of new problems or from one situation to another. The cognitivists in arguing that people grasp things as a whole, are, therefore opposing the behaviourist approach to teaching which employs drills to memorise the information.

Cognitivists believe that learning is a question both of insight formation and of successful problem solving, and not a mechanical sequence of stimuli and

responses. And so, teaching, according to them, should encourage understanding based on problem solving and insight formation.

Information processing

The contemporary cognitivists equate human mental activities with the process that goes on in a 'computer' in operation. They conceptualise human beings as information processing systems. The following discussion explains the process of information system and the three different types of memories, each of which serves a different function in the total process. The three different types of memories are : (i) the sensory memory, (ii) short-term memory and (iii) the long-term memory. The sensory memory receives information into the system either visually or in an auditory form. This type of memory refers to the active mental process by which knowledge is coded or represented. The short-term memory refers to the process by which knowledge is organised, stored and accessed. The long-term memory refers to the mental process by which the information is integrated with previously stored information in short-term memory. When an average person speaks of something being learned, the implication is that the knowledge has been put into long-term memory. One of the most important aspects of long-term memory is that it can be consciously controlled. Information processing is a psychological activity consisting of information being received by the senses and information items being selected and passed on to short-memory where encoding processes transfer them to the long-term memory. Long-term memory provides a store from where information can be retrieved in order to make a response. This process maybe represented diagrammatically as follows :

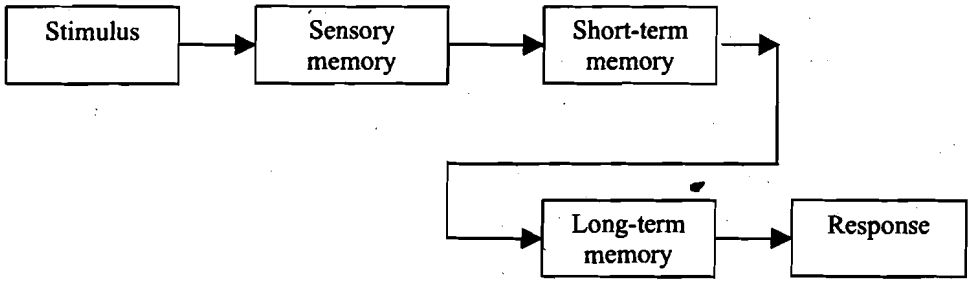

Fig. 3: An Information Processing Model

There are a number of elements which are central to a cognitive theory of learning. To begin with, the individual is seen as having an active relationship with the environment. S/he has intentions and goals, and thinks of alternative strategies to achieve these goals. Thinking is essentially a purposive activity. Learning is, therefore, an intelligent and active process. Within this process, issues of perception are very important because perceptual activity is the first relationship between a person and his/her environment or situation. The individual interacts with the situation and this interaction leads to relativity in perception as he/she organises the stimulus into meaningful patterns. Thus an individual acquires knowledge through

his/her interaction with the environment and stores this knowledge for use in new situations.

Learning as a cognitive process

For cognitivists, learning is a cognitive process. In the process of learning, certain changes take place in the cognitive structure of the learner, and these changes help him/her develop an understanding of the concept that is being learnt or taught. Thus, learning goals are not achieved simply by performing activities but by grasping the meaning of things in a way that can be transferred to the solution of new problems.

Feedback

One of the important elements of cognitive approach is the notion of 'feedback'. The learning situation is seen as one in which an individual confronts a problem, develops a hypothesis based on the knowledge already present in his/her memory and then tries it out. The consequences of his/her action then provide him/her with the required feedback so that the correct solutions are confirmed and the incorrect ones rejected.

1.4.2 Educational implications

What is the contribution of this school of thought to educational practices? Cognitive psychologists have investigated complex mental behaviours in a scientific way. And their views are becoming increasingly important in their application to education and instruction. The major emphasis of this approach is on how to design educational activities in order to promote cognitive learning. We describe below the major educational implications of this approach.

i) The most important aspect of the cognitive approach to education relates to promoting retention of knowledge acquired through learning. The ability to retain knowledge depends on how well it is understood. 'Understanding' can help us conceptually locate the information we store in our memory and create new cognitive structures to efficiently use our long-term memory in new situations as well.

ii) Teaching materials should be planned on the basis of the theory of discovery. Instructional methods should, therefore, emphasize the learners' competence for spontaneous discovery, which implies that active learning methods should be adopted to motivate the learner to rediscover the facts or to find solutions to the problems.

iii) This approach emphasises appropriate decisions regarding the instructional objectives, the analysis of prerequisite behaviour, and the teaching methods.

iv) Such an approach also stresses problem-oriented learning. By raising problems and then solving them, it tells us how to teach in a reflective way.

v) Lastly, it emphasises the study of learner characteristics which can be used by the teacher to expand the quality and quantity of the student's insights.

Check Your Progress 3

a) Identify three important educational implications of the cognitive approach to learning.

b) Point out at least two similarities between cognitivism and behaviourism regarding the conditions of learning.

Note : a) Write your answer in the space given below.
b) Compare your answer with the one given at the end of this unit.

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1.4.3 Bruner's discovery learning

Jerome S. Bruner (1966) is a proponent of cognitive learning and a developmental psychologist who is primarily interested in the development of mental abilities. His approach to psychology is eclectic (i.e. he selects the best or the most useful features from the various conflicting theories available). He looks at human beings as information processors, thinkers and creators, and treats the learner as a reactive organism who actively selects, structures, retains and transforms learning/information to achieve certain goals.

Bruner suggests that people have primary needs, other than animal drives. One of these might be called 'curiosity' which keeps an organism active even in the absence of organic states of tension. So our cognitive activity is not always dominated only by the need for such things as food or sex. Accordingly, Bruner thinks of learning as a goal directed activity which satisfies this drive, and answers the curiosity of the learner.

Learning as a cognitive process

Bruner describes the learner as a problem solver, i.e. one who interacts with his/her environment to test hypotheses and to develop generalisations. The goal of education, according to Bruner, should be cognitive development, and the content of learning should foster the development of problem solving skills through the processes of inquiry and discovery.

In Bruner's view, the *cognitive process* encloses three almost simultaneous processes:

- Acquisition of new knowledge/information
- Transformation of acquired knowledge
- Checking the adequacy of the new knowledge.

The *modes* of cognitive development are described by Bruner in terms of three hierarchical levels/modes.

The first mode is called '*enactive*'. It is the representation of knowledge through actions. For example, a child who enactively knows how to ride a bicycle may not be able to describe the procedure. The second mode is '*iconic*'. It is based upon internal imagery. Knowledge is represented by a set of images/graphics/drawings that stand for a concept but do not fully define it. For example, drawing can represent the 'triangle' diagrammatically, without explaining the concept of 'triangularity'. The third and the most advanced mode is that of '*symbolic* representation'. It is the use of words and other symbols to describe a concept or an experience. Symbolic representation is based upon an abstract, arbitrary and more flexible system of thought. At this stage, language becomes more important as a medium of both of the reception and the expression of ideas. For example, at this stage the child can explain the concept of 'triangularity' or the concept behind the operation of a bicycle.

Autonomous learning

Bruner advocates autonomy in learning. He suggests that when the learner is allowed to approach learning as an act of discovery, s/he will increasingly engage him/herself in learning, with the autonomy of self-reward. In other words, the learner provides for his/her own stimulation and in this way arouses his or her own curiosity.

The studies of Bruner and his associates indicate that learners can be taught to generate their own instructional method and strategy for learning. A

learner learns to study independently and acquires skills to establish his/her own standard in the same way that any scientist/author/researcher does. In this way, the feedback needed from the teacher is at a minimum. Bruner argues that the teacher's role here must be to create an environment in which learners can learn on their own without the help of any pre-packaged information. He suggests that learners should also learn through their active involvement with content. His work was thus influential in the open school movement and other humanistic approaches to learning. The most important goal of education, Bruner feels, is to teach learners how to value learning for its own sake, enabling them to acquire on their own the knowledge they need.

According to Bruner, learning should be flexible and exploratory. Institutions should arouse learners' curiosity, minimise the risk of failure and make the activities relevant to them.

Bruner's theory of instruction

Bruner defines learning as a process in which a learner achieves instructional objectives with little or no help from the teacher. He emphasises 'the training of students in the use of mind' with confidence, energy and honesty. Thus, a theory of instruction should take into account:

a) the ways of structuring knowledge,
b) the presentation sequence,
c) the motivating experience, and
d) the nature of pacing of rewards and punishment.

In his theory of instruction, Bruner puts forth his original ideas concerning the most effective way of achieving knowledge and skills. For him, a theory of instruction should cover the following major aspects:

i) The emphasis should be placed upon the learners' skills in handling things, and in perceiving and grasping the subject. The learner's approach to learning should be such that s/he should be able to use the acquired knowledge in solving problems.
ii) The subject matter should be presented enactively, iconically and symbolically so that learners can acquire optimal comprehension and a generalised set of basic ideas or principles.
iii) Bruner recognises the role of extrinsic and intrinsic rewards in promoting learning, but he thinks that intrinsic rewards are more important. He sees intrinsic rewards in the form of the satisfaction gained from solving problems quickly, the interest and involvement in learning, the pleasure received from the intellectual mastery of it, etc.
iv) Discovery learning increases motivation and strengthens the learner's tendency to carry out his/her learning activities with the autonomy that goes along with self-reward. Discovery learning teaches the learner the techniques of problem solving and results in a

better retention of what is learned because the learner acquires the knowledge through his/her own efforts.

v) Intellectual honesty, i.e. willingness to check and correct one's ideas and notions, or one's adopted solutions to problems, should be cultivated.

In section 1.3 and 1.4, we have discussed in detail the behaviourist and cognitivist approaches to learning and their educational implications.

Let us compare behaviourism and cognitivism through a schematic representation of both approaches to learning.

Table 2 : Behaviourist and cognitive approaches to learning : A Comparison

Elements	Behaviourist Approach	Cognitive Approach
Basic Premise	Learning is a function of environmental conditions, stimuli and responses, stimulus substitution, i.e. an existing response becomes associated with new stimuli. Concentrates on observed response and ignores mental processes.	Learning involves a perceptual reorganisation. Learning is related to insights. Emphasises information processing and human memory
Learning Formula	Stimulus-Response-Reinforcement	Stimulus-Cognitive Processes
Process of Learning	Relationship between stimulus and response.	Learning as insight
Entry Behaviour	Entry behaviour determines the starting point from which complex behaviour can be conditioned.	Previous knowledge is used as a base from which a learner can develop his/her own new cognitive structure.
Motivation	Organic drives such as hunger, fear, anger, love, etc.	Goal, curiosity and expectation
Major Contribution	Analysis of readiness and motivation. Transfer of stimulus control scheduling. Reinforcement analysis of aversive classroom practice. Individualised learning materials.	Linking new learning to cognitive structure. Providing aids in comprehension. Problem solving and long term memory

Check Your Progress 4

Give at least three components pertaining to theory of instruction proposed by Bruner.

Note : a) Write your answer in the space given below.
b) Compare your answer with the one given at the end of this unit.

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1.5 SYNTHESIS OF THE BEHAVIOURIST AND THE COGNITIVE APPROACHES

The behaviourist concentrates on the external stimulus and conditions provided by the environment for learning or bringing about changes in behaviour. Cognitive theories, on the other hand, stress the internal conditions of learning, viz. perceptual reorganisation, insight, information processing and memory. But in reality, learning depends on both external and internal conditions. To make this point clear we present below the views of Robert M. Gagné whose approach is said to be a synthesis of cognitivism and behaviourism.

1.5.1 Gagné's views on learning

Robert M. Gagné is a prominent educational psychologist whose ideas on the 'conditions of learning' are generally employed in every teaching-learning process. He identifies the factors which account for the complex nature of human learning and his point of view is often used to underpin the mechanistic instructional technology that is associated with behaviour modification and 'performance or competency based education'

Gagné (1984) has described learning as a change in the behaviour of an individual that is retained and that makes possible a corresponding change in his or her behaviour in a particular situation. According to him, learning is a process that takes place inside an individual's brain (comparable to organic processes such as digestion ad respiration). The most important

aspects of a learner are 'his senses, his central nervous system, and his muscles'.

Gagné combined a basic behaviourist position with elements of cognitive thought and built an hierarchieal model of the different types of learning. He thus shows the way in which a unifying theory may be able to explain how different kinds of learning relate to each other. He synthesized the existing theories of learning and tried to provide a consistent explanation for all types of learning with the help of a set of psychological principles of learning. For example, learners learn best when information is presented in logical sequences consisting of short units with a clear framework.

Conditions of learning

Gagné identifies *eight conditions* of learning, or learning types or varieties of learning, beginning with the simple ones and ending with the complex ones. Although Gagne refers to these conditions as learning types, he is primarily interested in the observable behaviour and performance which are the products of these conditions. In these conditions of learning he combined the basic behaviourist view with cognitive theory to present a hierarchical model of different types of learning. Here, we shall give a brief description of the types of learning Gagné talks about.

Type		Brief Description
1)	Signal learning	The individual acquires a conditioned response to a given signal, the learning is involuntary.
2)	Stimulus-response learning	The individual makes responses to specific stimuli; the correct response is rewarded.
3)	Chaining	Two or more previously learned stimulus-response connections are linked together.
4)	Verbal association	Chains that are verbal, e.g. a child identifies an object and calls it by its proper name (e.g. 'the red ball'), or it finds a Hindi or French equivalent for an English word.
5)	Multiple discrimination	The learner learns to distinguish between motor and verbal chains which s/he has already acquired.
6)	Concept learning	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.
7)	Rule learning	In learning a rule we relate two or more concepts. For example: 'at

		100°C water will boil'. Here temperature and boiling-point are two concepts related by a rule.
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 s/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 15pound per square inch on every surface in every direction, (iii) air pushes upwards as well as downwards.

Phases of learning

Gagné has identified *nine* stages of cognitive processing that are essential to learning and which need to be executed in a sequential order. These stages are: 1) gaining attention; 2) informing the learner of the objectives; 3) stimulating recall of prerequisite learning; 4) presenting the stimulus material; 5) providing learning guidance; 6) eliciting the performance; 7) providing feedback about performance correctness; 8) assessing the performance; 9) enhancing retention and transfer. By sequencing instruction in this way, one creates external conditions which complement the internal condition. These phases of learning are the typical series of external and internal events that constitute a single learning act. The internal conditions of learning include two factors— the learner's psychological state and the cognitive processes required for learning. The internal processes may be influenced by external events in the form of environmental stimulation.

The importance of these phases is that they are present in every act of learning and are performed in different ways for different varieties of learning. They are:

i) preparation for learning,
ii) acquisition and performance, and
iii) transfer of learning.

Preparation for learning initiates the individual into the learning task, while acquisition and performance refer to the assimilation of the new knowledge

or of the capability. Depending on the complexity of the skill to be learned, these phases may require anything from one to several sessions. Finally, transfer of learning may take place sometime after the acquisition of the new skill. A brief account of the categories is given below:

Category	Phases and their Functions
Preparation for learning	Drawing learners' attention to the stimulus. Informing the learners of learning goals/objectives. Providing recall of prerequisite behaviour/learning.
Acquisition of performance	Presenting stimulus materials: Permitting temporary storage of stimulus features in working memory. Transferring stimulus features and related information to long-term memory. Retrieving stored information. Activating response. Providing information and feedback about the correctness of performance.
Transfer of learning	Providing additional cues for later recall of capability and assessment of performance (cueing retrieval or serve as a signal for getting back the information). Enhancing retention and transfer of learning to new situations/contexts (Generalisation).

The Gagné's model of instruction

The foundation of Gagné's model relates to his conception of the organization of knowledge in terms of outcomes of learning. This structure concentrates on general classification of learning tasks, thus relating to all content areas. This model includes five types/varieties of learning. Gagné identifies five types or varieties of learning. They are: verbal information skill, intellectual skill, motor skill, cognitive strategies, and attitudes. Each type of learning is acquired in different ways, i.e. each requires a different set of prerequisite skills and a different set of cognitive-processes (i.e. internal conditions of learning). Gagné accepts that environmental stimuli (i.e. external conditions of learning) are required to support the learner's cognitive processes during learning. Thus, human learning is the result of interaction between the learner's internal variables (states and cognitive processes) and the external (events of instruction/ stimulus) ones. In other words, Gagné attempts to synthesise the basic principles of cognitivism and behaviourism. The varieties of learning identified by Gagné are summarised below:

Verbal information skill provides the ability to state or to recall information (facts, definitions, labels, etc). This has to be developed to meet the needs of any particular subject matter.

Intellectual skill

Intellectual skills are the most important ones, involving mental operations. They include conceptualisation of the environment, differentiating things from each other, understanding concepts, seeing relationships between things. Reading, writing, and handling of numbers are the other abilities which come under this variety of skill. These abilities range from the simple to the complex.

Motor skill

Motor skills are physical skills. These include the ability to perform a sequence of physical movements.

Cognitive strategies

Cognitive strategies refer to the learner's thinking, remembering and learning—the procedures we use for ordering and processing information internally. They are learned over long periods of time.

Attitudes

Attitudes are deep-rooted in us and we find it difficult to change them. They determine our predisposition towards positive or negative responses to an object. Our attitudes strongly affect our motivation for learning.

1.5.2 Educational implications of Gagné's theory of learning

We present here three broad educational implications of Gagné's theory of learning.

i)Prerequisite behaviour: Gagné advocated that processes of learning move from the simple to the complex. The learner has to develop prerequisite capabilities before s/he acquires new terminal behaviour. Thus the use of an hierarchy of learning and task analysis are integral parts of instructional transactions.

ii) Learners' characteristics: Learners' individual differences, readiness and motivation to learn are the important issues to be considered before designing instructional activities.

iii) Cognitive process and instruction: The transfer of learning, the self-management skills of the learner, and teaching learners the skills of problem solving are integral parts of the internal conditions of learning, applicable to

instruction. The skill of learning 'how to learn' should be developed in the learner and the emphasis should be on the learner's individuality.

Check Your Progress 5

Point out at least four cognitivist and two behaviourist elements in Gagné's synthesis of the two approaches to learning.

Note: a) Write your answer in the space given below.
b) Compare your answer with the one given at the end of the unit.

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1.6 THE TAXONOMY OF LEARNING OUTCOMES

The desirable outcome of learning experiences — the way individuals are to act, think or feel as a result of participating in some instructional activities — can be classified into three domains, viz. *Cognitive, Affective* and *Psychomotor*. Bloom and his associates classified educational behaviour from the simple to the complex, based on the level of learning and

developed a taxonomy of learning outcomes. We shall describe briefly all the three domains which include different types of learning outcomes. Each domain consists of a list of general objectives stated for a programme or a course. Each general objective has a pool of specific *learning outcomes/objective.* These specific learning objectives are stated in a unit in behavioural terms. These objectives clearly convey what a distance learner will be able to do after going through a unit. They are also known as instructional objectives or learning outcomes. Each objective begins with an *action verb* that indicates definite observable and measurable response (e.g., identifies, defines, recalls etc.). In the following discussion, you may note that with each general objective (viz., knowledge), we have provided a few instructional objectives (viz., names, defines, states etc.). For example, in a course of Diet and Nutrition, the general objective is to *know* the basic components of Diet, but the specific instructional objective should be *name* at least five principle components of a balanced diet or *define* the term balanced diet.

1.6.1 Cognitive domain

This domain includes learning objectives which deal with the 'recall' or 'recognition' of knowledge and the development of intellectual abilities and skills. This is known as the knowledge component of educational objectives (distance teaching is particularly effective in developing the cognitive domain of learners).

Given below are the six stages of cognitive learning:

i) Knowledge: Knowledge is defined as the remembering of previously learned material. This may involve the recall of a wide range of learning material, from specific facts to complete theories. Knowledge represents the lowest level of learning outcomes in the cognitive domain. It is indicated by the repetition of responses that have been practiced through learning experiences. The specific learning outcomes are: names, defines, labels, states and selects.

ii) Understanding: It is defined as the ability to grasp the meaning of material. It is the behaviour which represents new responses in relation to and in addition to those previously practiced and learned. The specific learning outcomes are: interpretations, translations, summaries, analyses, detection of similarities and differences and comparisons etc.

iii) Application: It refers to the ability to use learned material in new and concrete situations. It is an act of putting theories, rules, methods, concepts, principles or laws to practical uses or new situations. The specific learning outcomes are: discovers, produces, relates, solves, uses and predicts.

iv) Analysis: It refers to the ability to break down material into its component parts so that its organisational structure may be understood. This may include the identification of the parts, finding out relationships

between parts, and explaining the organizational principles involved. The specific learning outcomes are: identifies, illustrates, sub-divides and differentiates.

v) **Synthesis**: Synthesis refers to the ability to put parts together to form a new whole. This may involve the production of a unique communication, a plan of operations (research proposal) etc. The specific learning outcomes are: categorises, combines, designs, rearranges, summarises, writes, and reconstructs.

vi) **Evaluation**: It is concerned with the value judgement of any statement, achievement of the learner and material. The judgements are to be based on definite criteria. Learning outcome in this area are the highest in the cognitive hierarchy because they contain elements of all of the other categories, plus value judgements based on clearly defined criteria. The specific learning outcomes are: appraises, compares, justifies, summarises and supports.

1.6.2 Affective domain

This is related to the attitudinal domain of educational objectives. Learning in the affective domain pertains to changes in interest, attitudes, values, and to the development of appreciation and adequate adjustment needed for effective learning. This is a higher level of learning, and it has a close relationship with cognitive and behavioural changes. This relationship is operative at the instructional as well as the evaluative level. Each form/instance of affective behaviour has a corresponding one of cognitive behaviour. In certain cases, promoting attitudinal changes may demand an element of face-to-face teaching in distance education. Therefore, in certain cases audio-visual media and face-to-face contact sessions are resorted to.

Stages of affective learning

i) **Reception**: It refers to the learner's willingness to attend to particular phenomena or stimuli (textbook, activities, etc). At this stage, the learner becomes sensitive to the existence of certain phenomena and stimuli. For example, he or she becomes willing to receive instruction in English. Such willingness is the first requisite for the successful learning of a foreign language. The specific learning outcomes are: chooses, describes, identifies, selects, replies and uses.

ii) **Responding**: It refers to the active participation on the part of the distance learner. The learner is sufficiently motivated to actively respond to the stimuli, for example, he or she becomes eager to participate in the cultural activities organised by other countries. Learning outcomes in this area may emphasise acquiescence in responding (a distance learner completes assignments, participates in teleconference and shows interest in the subject). The specific learning outcomes are discusses, performs, answers, presents and writes.

iii) Valuing: The behaviour of a learner shows that a situation/an object/ phenomenon, has value or worth for him/her. For example, a belief in the importance of civic responsibility in society. However, you may not fulfil such responsibilities in each and every situation when it comes to actual social practices but you internalise the set of specified values, and express simple acceptance or a commitment. The specific learning outcomes are: reports, completes, explains, justifies and studies.

iv) Organisation: This is essentially an advancement/ extension of state (iii), i.e. valuing stage. In this context we can infer that organisation is concerned with bringing together different values, resolving conflicts between them, and building an internally consistent value system. For example, preparing a vocational plan that satisfies the human need for both economic security and social service. The specific learning outcomes are: arranges, combines, modifies and prepares etc.

v) Characterisation by a value or value complex: At this level, the values which have a place in the individual value hierarchy, are organised into some kind of internally consistent system. This system controls the behaviour of an individual. Thus, a set of values or the pattern of behaviour as a result of learning or repeated experience in society becomes a way of life or the character of an individual. Having reached this stage, the individual unlike the one we suggested in item (iii) above will fulfil the social responsibilities at all costs. The specific learning outcomes are: displays, listens, revises, solves, uses and verifies.

1.6.3 Psychomotor domain

This domain pertains to the manipulative or psychomotor skills of educational competency. Face-to-face teaching within the overall framework of distance teaching can ensure learning of this kind. For example, driving can be learnt more effectively under the direct supervision of an instructor, after the learner has attended to a television lesson on 'how to drive a car'.

Psychomotor learning has three characteristics:

i) Response chains: Learning of skills involves a chain of motor responses, i.e. the muscular movements in swimming or driving or writing.

ii) Movement coordination: Coordination of perception and motor skills is necessary here. For example, a child starts riding a bicycle by acquiring this coordination.

iii) Response patterns: Organisation of stimulus-response chains into large response patterns. For example, a child can ride a bicycle or motorcycle without making an error after he/she masters the skill in question.

There are seven stages of psychomotor-learning. They are: perception, set, guided response, mechanism, complex overt response, adaptation and origination.

1. Perception is the process of becoming aware of objects, qualities or relations by way of sense organs. This level is concerned with the use of the sense organs to obtain cues that guide motor activity. The specific learning outcomes are: chooses, identifies, selects and relates etc.

2. Set is a preparatory adjustment of readiness for a particular kind of action. It refers to readiness to take a particular type of action. The specific learning outcomes are: begins, moves, reacts and volunteers etc.

3. Guided response is an early step in the development of skills. It is the overt behavioural act of a learner under the guidance of a counsellor or tutor. Readiness is a prerequisite for this kind of response. It includes imitation, and trial and error. The specific learning outcomes are: assembles, builds, sketches, manipulates and constructs etc.

4. Mechanism means that the learned response has become habitual. At this level, the learner has achieved a certain level of confidence and proficiency. The specific learning outcomes are: displays, measures, organises and builds etc.

5. Complex overt response is the skillful performance of motor activities that involve complex movement patterns. Proficiency is indicated by a quick and accurate performance requiring a minimum energy. The specific learning outcomes are: assembles, constructs, fixes, organises and manipulates etc.

6. Adaptation is concerned with skills that are so well developed that the learner can modify movement patterns to fit special requirements or to meet a problem situation. The specific learning outcomes are: adapts, rearranges, reorganises and revises etc.

7. Origination refers to the creating of new movement patterns to fit a particular situation or specific problem. The specific learning outcomes are: arranges, combines, designs and originates.

Check Your Progress 6

Imagine at least three different learning situations where the needs of the three domains of learning we have talked about should be met for successful learning.

Note: a) Write your answer in the space given below.
b) Compare your answer with the one given at the end of this unit.

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1.7 LET US SUM UP

We have discussed in brief some of the most influential approaches to learning, and touched upon their educational implications. We have presented the views of the behaviourist school, and the cognitivist school as well as the views of those who have attempted to synthesise or combine them. And we have also indicated the usefulness of an eclectic stand in this regard. Although there are many important theories in each school, we have not discussed all of them. Under the behaviourist school we have selected only B.F. Skinner for a specific illustration. Similarly, under the cognitive school we have chosen just one theorist, Bruner, as an example. Our own stand, as you must have noted, is eclectic. Behaviourism and cognitivism present two different approaches to learning, but we need not prefer one to the other. Gagné's synthesis of these two approaches shows that we may use those aspects of any approach to learning which can serve our purpose.

This eclectic position is particularly useful in the system of distance education system which tries to be most pragmatic in its approach to learning. The contributions of different approaches of learning belonging to different schools of thoughts and of individual educationists with different theoretical affiliations do meet the varied demands of the distance education system. This has been the primary consideration for discussing behaviourism, cognitivism, constructivism, the views of Gagne, Bruner and

Bloom's model for levels of learning, but we have not in this unit related them to distance learning as such. However, you will find a better and more specific understanding of the implications of these theories for distance education in unit 3 of this block.

Check Your Progress: Possible Answers

1) Behaviourism views learning as the automatic response of an organism to stimuli or environment. Cognitivism, on the contrary, considers learning a mental activity—the functioning of the human brain which receives, processes and retrieves information. In other words, behaviourism treats human learning at par with biological or impulsive reactions of animals to their environment, whereas cognitivism emphasises the conscious elements of the human mind which selects the information it needs and decides whether or not to respond to a particular stimulus and in what way.

2) A teaching machine provides immediate feedback to the learner, ensures right responses and reinforces them. The programmes of a teaching machine are preplanned. An exercise is repeated till the learner learns what the programme expects him/her to do. Behaviourist principles such as stimulus-response relationship, reward for the right response and the repetition or reinforcement of the right response operate in the teaching/learning method used in teaching machines.

3) a) The following may be considered very important educational implications of cognitivism:
   i) Retention of information (or memory) which leads to new cognitive structures.
   ii) Discovery learning which motivates the learner and encourages active learning.
   iii) Emphasis on problem solving and reflective learning.

   b) Behaviourism and cognitivism are similar in emphasising the importance of:
   i) Feedback, and
   ii) Practice/reinforcement.

4. Bruner is a cognitivist for the following reasons:

   i) By putting forth the three modes (i.e. enactive, iconic and symbolic) of the representation of knowledge, Bruner recognises the role of the human mind in comprehending reality.
   ii) He views 'learning' as 'goal oriented', and not as a mere biological or impulsive response to external stimuli.

iii) His theory of instruction emphasises the principal cognitive elements of autonomy and the problem solving capabilities of the learner.

5. In Gagnés synthesis of the cognitivist and the behaviourist approaches to learning, we may notice the following elements:

   a) Cognitivist elements:
      i) information processing,
      ii) intellectual skills—from the simple to the complex,
      iii) recognition of individual and attitudinal differences in learners, and
      iv) transfer of knowledge and skills.
   b) Behaviourist elements:
      i) Gagné's emphasis on the observable behaviour and the performance of the learner, and
      ii) His dependence on the Stimulus-Response factor derived from the theories of Thorndike and Skinner.

6) A sample answer: Think of a situation where you want to become an astronaut or a cosmonaut. Here, perfect coordination between the three domains of learning is necessary. The teaching/learning situation, in this case, should meet your needs at the cognitive, the psychomotor and the affective domains because it requires you to know and to understand (many things connected with space research), perform (the psychomotor functions) and keep your emotional stability while on the job.