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# UNIT 12 COGNITIVE LEARNING AND ITS ORGANISATION

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## 12.1 INTRODUCTION

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Cognitive learning refers to the learning processes and experiences resulting from application of brain. The learner's intellectual development and functioning is the focus of cognitive learning. It encompasses most of the learning events occurring either in school or out of the school situations. In many cases cognitive learning also provides the foundation for psychomotor and affective learning programmes. It happens because of the need of the individual to acquire knowledge and understanding of the concepts and other related aspects, which would later serve as the basis of the psycho-motor or affective learning. For example, an individual attempting to acquire the skill of driving a motor vehicle should know about the different parts of the vehicle, which are directly involved in the process of driving. These aspects of learning involve cognition. Similarly, to give an example of affective learning it is seen that a person's attitude towards an object, a person or an issue changes when he/she acquires knowledge and understanding of the learning theme.

As such, cognitive learning plays a vital role in the individual's intellectual and mental functioning. The individuals mental and intellectual alertness influences his/her behaviour.

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## 12.2 OBJECTIVES

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After studying this unit you should be able to:

- understand the meaning, nature and scope of cognitive learning;
- state the different processes through which cognitive learning takes place;
- explain the importance of cognitive learning;
- describe the elements of cognitive learning and how they are related to each other; and
- explain the organisational procedure of the different elements of cognitive learning.

## 12.3 COGNITIVE LEARNING

### 12.3.1 Meaning of Cognitive Learning

Cognitive learning has its origin in the term cognition, which refers to a broad spectrum of activities, such as, thinking, conceiving, reasoning, knowing, understanding, establishing relationship etc. A number of psychologists have used the term cognition to refer to intellectual behaviours in which the underlying characteristics are of abstract nature. Broadly, cognition is understood as a general concept embracing all forms of knowing. It includes perceiving, imaging, reasoning, judging etc. Cognition is differentiated from conation and affection.

There are four basic units of cognition. These units are schema, symbols, concepts and rules. Siann and Ugwuegbu (1985) have differentiated and distinguished among the different units of cognition. The term *Schemata* (plural schema) has been extensively used by Piaget (1975) in his stage approach to cognitive development. Schema, according to Ault (1977) are stored conceptualisations of experiences, the ways of organising prior sensory events. They are necessarily not pictorial representations or images, nor are they tied to language. Schema in the simplest form refers to the idea of something.

A **symbol** generally refers to a thing it represents, signifies or indicates other than itself. For example, the word 'God' refers to the concept of God. Similarly the picture of a horse refers to a distinct kind of four footed animal called horse having a number of special features and characteristics which differentiate it from all other kinds of animals; but the picture itself is not a horse. Likewise, the symbols used in mathematics, for example, a triangle or quadrangle etc. refer to certain classes of geometrical figures. Symbols are also used to indicate different forms of traffic signals on the roads, mathematical operations and formula of musical notations etc. All such symbols refer to different classes of objects, events, operations, symptoms, actions and the like. Symbols are also used in lieu of certain verbal expressions through language to explain the respective representations.

A symbol enables an individual viewer to get the mental picture of all the characteristics and features of the object, which the symbol represents. The symbolised characteristics give rise to concepts in the mind of the individual. A **concept** refers to a general idea or meaning usually expressed by a word, symbol, sign or attribute. The concept is formed by means of combination of several elements, characteristics or features of the objects concerned, which are gathered through different sources and are stored in the forms of experiences. Ausubel (1978) and Entwistle (1985) explained concepts as objects, events, situations or properties that possess certain critical attributes and are designated through some symbols or signs. Klausmeier and Ripple (1971) defined concepts as mental constructs characterized by their psychological meaningfulness, structure and transferability, which enable an individual to cognize the features and events belonging to the same class and as different from the features and events belonging to other classes. A concept also helps in cognizing its co-concepts or sub-concepts. For example, when we say the concept 'school' it brings in automatically to mind its related concepts like the class, students, working personnel, teaching-learning situation and several such other sub concepts. The sub-concepts or co-concepts enable the person to get the clues of tracing out the relationship existing among them and also to find out solution to the problems arising from them involving the main concepts. A proper understanding of the concept may help the person to get clue for understanding some other concepts remotely related to it. For example, the process of flying of a bird may help in understanding the flying mechanism of an aeroplane.

The concepts may be in the form of concrete objects, events and ideas. These are comparatively simpler concepts. There are also concepts which are complex and

abstract in nature. These have comparatively higher difficulty level of understanding and conceptualization. For example, the concept of a pen is easier to understand because of its simple and observable features and characteristics, such as; shape, size, colour and texture. On the contrary, the complex concepts like sincerity, kindness, socialism etc. have many abstract characteristics, and are thus more difficult to comprehend and conceptualise. Usually the attributes of abstract or complex concepts are of varied nature and are different. For example, the features necessary for explaining the concept of 'kindness' are not similar to those required for explaining the concept of 'solidarity'.

The fourth unit of cognition is the **rule or principle**. Usually a rule or a principle is established when there is a need for finding out the relationship between two or more concepts. For example, at the day break, the darkness of the night vanishes. This statement comprises of concepts like (i) the day break, which is an event and (ii) the darkness vanishes which is another event. These two concepts are correlated with each other and governed by the general rule that darkness vanishes because of the presence of light.

### Check Your Progress 1

**Note:** Write your answers in the space given below.

1) Name the different units of cognition.

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2) Differentiate a schema from a symbol.

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3) Explain the nature of concepts.

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### 12.3.2 Nature and Scope of Cognitive Learning

You know that most of the school learning programmes involve cognitive learning. The teachers usually put a lot of effort and time in enabling the learners to acquire various facts, concepts, rules and principles and cognitive skills related to the subject areas they are teaching, like language, mathematics, science and social science etc. The learning exercises involved in such processes are the different forms of cognitive learning. These processes, as we may analyse, involve the learners' ability of cognition or the cognitive skills, and hence the cognitive learning.

Such learning programmes definitely involve various mental processes of which perception, concept formation, memory and reasoning are the major ones. These processes encompass many sub-processes all of which refer to some sort of mental functioning in relation to cognition.

Information processing is a major strategy of cognitive learning which attempts to describe how the knowledge of various objects, ideas, facts, concepts of the world outside and inside one's own environment is acquired, stored and retrieved from memory. This mental process of the individual is quite analogous to the functioning of a computer in which the information is fed from outside, processed, and stored. The same information when needed is retrieved for use and restored.

The processes of association and generalization assist the cognitive learning. The individual acquires new knowledge by associating his/her previous knowledge with the new ones and the process of generalization enables him/her to apply the acquired knowledge in new relevant situations.

Cognitive learning is not confined to the acquisition of knowledge for which it provides the base. It also leads to higher mental processes like understanding, analysing, reasoning, synthesizing, comparing and evaluating. It gradually broadens the mental horizon.

Cognitive learning provides the base for psychomotor and affective learning. For the purpose of acquiring psychomotor skills an individual has to acquire the basic knowledge and understanding of the skill related to learning situation, comprising of the methods, materials and appliances for which the cognitive learning provides the base. Similarly, cognitive learning enables an individual to acquire factual knowledge relating to the various aspects of affective learning. Affective learning covers the modifications of the learner's behaviour in the feeling domains like interests, attitudes, temperament, sympathy etc. These modifications are usually possible because of the knowledge, understanding and similar processes of cognitive functioning. As the individual is exposed to the stimulus causing affective learning, he/she acquires new type of experiences, which affect his/her previous feeling tone resulting in modifications in affective learning.

Cognitive learning is facilitated by different cognitive processes. These processes enable the individual to acquire and retain knowledge about various objects, events, facts, principles etc. and to apply it as and when required. These processes have been discussed in the following section.

### **12.3.3 Processes of Cognitive Learning**

The cognitive process is facilitated by perception, concept formation, memory and reasoning. These processes do not operate as water tight compartments and are not mutually exclusive. These are interrelated and often overlapping.

#### **a) Perception**

Perception is the interpretation of sensations acquired by the sense organs. In other words, it is the interpretation of the sensory experiences. It may also be defined as the sensation as it is interpreted through the learning experiences of the individual. The role of perception is seen in the gestaltic process of learning in which the perception of the whole or the total situation is interpreted in the context of achieving the goal of learning. In this process the learning situation is perceived in relation to the psychological field, which includes the theme or object of perception including the situation, the perceiver and the complex psychological background relating the two.

The quality of learning depends upon the nature of perception. The clearer the learner perceives, the better is the learning. This process is affected by the individual's age, as the quality of perception is known to improve with age. It is also influenced by attention and earlier experiences of the perceiver.

## b) Concept Formation

Concept formation is another important process of cognition. The nature of concept as a unit of cognition has been discussed earlier. The concepts help to classify the objects both animate and inanimate, ideas, principles and events those relate to use in the environment.

In the process of categorising we tend to seek commonality of characteristics among the objects or elements of which the category is to be formed. As a result, a new category is formed. In other words, this is the formation of a new concept. The terms concept formation and concept attainment or concept learning have subtle differences in their meanings and uses. Concept attainment or concept learning refers to acquisition of a concept, which is already existing. But concept formation refers to, as the term implies, structuring a new concept. In certain cases, the learner's concept learning or concept acquisition may be just equivalent to concept formation. In case of a new learner the concept learnt is new to the learner, and is as good as the formation of a new concept. In view of this, the terms concept formation and concept learning are often used synonymously to refer to the process of abstraction of a set of qualities, properties or features that can be taken to represent a concept (Arthur, 1985). However, it may be observed that the term concept formation is restricted to the actual acquisition of the concept whereas the term concept learning is used for the conditions under which one learns to apply the concept which is already formed or learned.

## c) Memory

Memory is another important aspect or process of cognitive learning. It refers to the storage of learned or acquired experiences of a person. Without memory learning is not conceivable. It is a function of the mind that is responsible for retaining information about stimuli, events, images, ideas etc. after the original stimuli are no longer present. The term is also used to indicate storage of information in the individual's mind. The information so stored can be recalled by the individual. The term may also refer to the information retained in the mind. Memory is a very complex mental process. It has wider application in teaching-learning process. It is affected by certain internal as well as external factors concerning the individual, the material to be retained in memory, and the learning environment which may not be within the individual's control. There are a number of inter-individual and intra-individual differences in memory. For example, one may have better memory for numbers than words.

## d) Reasoning

Reasoning is the fourth process of cognition, which is almost a culmination of the earlier stated three processes, namely; perception, concept formation and memory. Reasoning involves all these processes in some form or other. Actually they form the basis of reasoning, which is considered as one of the highest mental activities. It involves logical analysis of the facts, events, principles in the way of establishing cause and effect relationship. Learning of principles and abstractions is possible due to the process of reasoning.

These refer to the processes of thinking and mental recognition of cause and effect relationships. This helps to predict an event on the basis of an observed cause and in some other cases affects the influence of an appropriate cause on an observed event. The validity of the process of reasoning is judged from the point of view of its accuracy in predicting the cause and effect relationship.

Reasoning is closely related to problem solving activities. In our problem solving behaviour we formulate certain hypotheses and test them to arrive at an appropriate solution of the problem. Thus, the process of reasoning involves the mental activities concerning formulation and testing of hypotheses to find out solutions of the problem(s).

Reasoning as well as the problem solving ability of the individual develop with age. Although reasoning and problem solving competencies appear at an early age, reasoning remains confined to concrete and personal objects and mostly to the child's immediate environment. As the child grows older, there is a gradual increase in his/her ability to state a problem in words and to verbalise its solution (Garrison *et al.*, 1967).

### Check Your Progress 2

**Note:** Write your answers in the space given below.

- 1) Name any three internal factors which affect cognitive learning.  
 .....  
 .....  
 .....
- 2) Mark the following statements T or F for true and false statements respectively.
  - a) Cognitive learning is confined to the acquisition of knowledge and understanding. ( )
  - b) The external factors that affect the learner's cognitive learning refer mostly to the social factors. ( )
  - c) Cognitive learning is mostly affected by the learner's perception. ( )
  - d) Recognition is concerned with the storage of one's acquired knowledge. ( )
  - e) Reasoning and problem solving are independent of each other. ( )

## 12.4 ORGANISATION OF COGNITIVE LEARNING

We have discussed earlier broadly the meaning of cognition and the term cognitive learning as derived from it. The cognitive learning theory deals with the problems of how individuals gain knowledge and understanding of the objects, facts and principles surrounding them in their environment and how through their cognition they act in relation to their environment (Bigge, 1981). In the context of learning the term environment does not refer to the physical environment of learning alone. It encompasses the overall characteristics of the learner, the goals of the learner, the demands of what is to be learned and how the learner interacts with his/her immediate total environment. The cognitive learning as we have discussed earlier constitutes mainly the learning involving the mental processes. Out of all the mental processes involved in cognitive learning the major ones are perception, concept formation or concept attainment, memory and reasoning. For strengthening the cognitive learning process we need to organise these processes effectively.

### 12.4.1 Organising Perceptual Learning

Perception as a process of cognitive learning has been discussed earlier. In the discovery approach there is thrust on perception of the total learning situation. Unless the total situation is perceived by the learner, learning cannot be fully effective. Perception provides the base for cognition. The term perception refers to a coherent unity of the sensory inputs like, visualising, listening and feeling an object or stimulus, which the individual has to perceive or about which the individual needs to acquire perceptual

experiences. Perception is defined as the process of determining the meaning of what is sensed (Klaskay, 1984). For example, an individual senses a stimulus with his/her sense organs by way of seeing it, or listening about it, or feeling its shape, size, texture etc. and also in some cases by smelling or through taste. Through perception the individual also differentiates the characteristics of the stimulus in focus from similar other objects or stimuli.

Researches have focussed on three major characteristics of sensing stimuli, such as the visual sensory register, auditory sensory register and tactile sensory register. Perception starts with sensing processes. The data or the information gathered through the sense organs are interpreted by the sensory registers resulting in perception. Thus perception assists in acquiring information, which lay the foundation of cognitive learning. It covers the entire sequence of events from the presentation of the stimulus physically to its phenomenological experience. Thus, the perceptual process includes the physical, physiological, neurological, sensory, cognitive and affective components. Thus the term perception is used in a very broad sense.

Perception, by its very nature plays a significant role in cognitive learning. The individual acquires various experiences through different sense organs, which are interpreted in relation to the individual's previous learning experiences, already existing in his/her mind. These previous learning experiences may be in the form of schema, symbol, concept and rule. The new experiences in the form of information, facts, objects and such other elements are associated with the previous experiences through a type of mental process, broadly termed as information processing. Through this mental activity the new concept inputs which may be in the form of idea, image, fact and knowledge are considered as parts of information organised and stored in the mind. This storage may exist in its real form or in a modified form. However, it is the new learning experience for the individual, which adds to his/her existing stock of cognitive experiences. Thus perception helps in acquiring new information, which serves as the basis for developing the individual's cognitive experiences.

In the previous paragraphs we have discussed how the perceptual process helps in acquiring new ideas, facts, concepts etc. which are translated to information through information processing. The acquiring of new information does not remain at knowledge level only. It may be pointed out that acquiring of knowledge is the fundamental step for cognitive learning. Cognitive learning is not limited to the act of knowing or gathering new fact, idea or information; it further continues in terms of higher mental processes like understanding, analysing, reasoning, comparing, synthesizing and evaluating. As such, perception and perceptual process help in laying the foundation for activating or leading the mind towards higher mental processes.

The information processing models of the mind's thought and action view that the cognitive and perceptual operations take place in stages, such as input, coding, storage, retrieval, decoding and output. According to many psychologists, the information processing involves classic mental processes of perception, memory, thinking, reasoning, decision making, problem solving etc. (Reber, 1985). In the process of acquiring higher intellectual abilities, perception plays an important role through a process that Piaget referred to as adaptation. Adaptation as a mental activity consists of either changing the response to the environment or changing the current schemata to reconcile with the environment. The process of adaptation takes place in two forms, assimilation and accommodation. Assimilation takes place when the individual's existing schemata influence his/her response to the newly experienced stimulus. For example, a child may be having the schema of a writing equipment, say pencil. When he/she sees a pen, which is another form of writing equipment, he/she confuses it with the pencil because the pencil schema is already there in the mind. On the other hand, the process of accommodation changes the already existing schemata. Continuing with the previous example, the child after perceiving the second stimulus (the pen), in the proper perspective finds out its differential feature and thereby his/her previous or the former

schemata get modified; rather new schema is formed. Therefore, the most important thing in cognitive development, as you have seen, is the perception of the learning situation or the learning environment.

The learner's capacity for cognitive learning depends upon certain external and internal factors. Among the external factors, the learner's environment at home and community are important. Along with this, the learning environment at the school also largely affects cognitive learning. Therefore, emphasis is placed on providing better learning environment at school and home for ensuring improvement in cognitive learning. The role of perception in the individual's cognitive development is not confined to formal learning situation only. Eggen and Kauchak (1992) pointed out that other factors also influence the individual's cognitive development. For example, social development of the individual has a very significant contribution in such adjustment and the self-management as an effective member of the society. This is possible through proper social interaction during which the individual acquires numerous cognitive competencies in the social context. Piaget also postulated social interaction as a critical factor in the cognitive development of the individual (Hensen and Eller, 1999). Vygotsky emphasised the role of social and cultural influences on the cognitive development of children. An important element in the process of the children's cognitive development occurring through social and cultural interaction is that this process need not be awaited for long, till they enter fullfledged social life as grown up and responsible members of the society. Vygotsky gave importance to cultural factors in cognitive development alongwith the individual's growth process.

There is need to place emphasis on perception for the development of cognitive learning. Perception takes place through different sense organs. If more and more sensory perceptions can be involved in the learning process, the learning will be strengthened. In classroom learning situations there is thus, the need for emphasising the use of visual perceptions of the students along with the teachers auditory communications, accompanied by the verbal interactions between student and the teacher and vice versa. The teacher should try to explore, and use improved type of teaching-learning strategies for enabling students to acquire learning experiences through different sensory perceptions. As summarised by Hensen and Eller (1999) some of the instructional strategies for improving perceptual learning in class room context as suggested by Piaget, Bruner and Vygotsky are as follows.

The teacher requires to know the child's potentials for learning. He/she should also try to understand the child's learning style, and the characteristics of learning process in order to ensure better learning. Further, he/she should understand the mental operations taking place in the learner's mind when he/she perceives the objects of learning; so that the teacher can devise and use appropriate techniques for each individual learner to learn effectively.

The teacher should keep in mind that learning takes place better through use of concrete objects in case of the young learners. Therefore, the teacher should try to use or relate their learning materials to concrete objects, facts, events, phenomena and the like. The approach should be such that the learners can use their sensory perceptions in different ways, like feeling, seeing, listening, manipulating and other sensory perceptions. In case the school learning programme has limitations for providing direct learning experiences, steps can be taken to provide such experience through audio-visual and other types of teaching aids.

The teacher should try to utilise the discovery approach to enable students to find out the results of learning by participating in some learning activities. In other words, the techniques of learning by doing should be adopted by the teacher or by directly involving the learners in the process of learning. For such an approach, the teacher's instructions need not be confined to classroom situation. Field trips and other observational methods and techniques should be made available to the learners so that they can acquire the desired learning experiences through direct participation. In learning situations where

direct learning experiences cannot be provided, teacher should attempt to give vicarious learning experiences through contrived and simulated learning situations that make room for indirect observation.

The teacher should allow the students to proceed at their own pace of learning and according to their individual capacity. It may be remembered that, there are individual differences among the learners in their speed and capacity of learning. A teacher should give attention to individual learners.

According to Vygotsky, the social experiences of the learner have impact on his/her cognitive process. The learner gets ample opportunity to develop his/her cognition through adequate social interaction. Normally the young learners in schools have almost no scope for social interaction in their day to day social life. Therefore, the teacher should organise simulated social situations under appropriate settings to provide them social experiences through necessary interactions.

### **Check Your Progress 3**

**Note:** Write your answers in the space given below.

- 1) Name and indicate the nature and types of learning caused through various sensory perceptions.
  - a) .....
  - b) .....
  - c) .....
  - d) .....
  - e) .....
- 2) How do sensory perceptions help in cognition?
 

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- 3) Mark the following statements as true or false by indicating T or F respectively as the case may be.
  - a) Auditory communications are not necessary in perceptual learning. ( T / F )
  - b) Adaptation results both from assimilation and accommodation. ( T / F )
  - c) Sensory experience has little effect on cognitive learning. ( T / F )
  - d) Perceptual learning has no role in acquiring higher intellectual abilities. ( T / F )

### **12.4.2 Organising Concept Learning**

Learning of concepts is an important objective of school education programme. But concept learning is not confined to formal learning situations. We learn various concepts in real life situation. Certain aspects of it have been discussed earlier in this unit. However, it should be noted that concept learning lays the foundation for cognitive learning.

Concept formation and concept learning are often used synonymously to refer to the process of abstraction of a quality, property or set of features that can be taken to represent a concept. However, some authors use the term formation for actual acquisition of the concept; and the concept learning to indicate the conditions under which the individual learns how to apply a known or acquired concept. For example, the formation of the concept of 'triangle' refers to acquiring some idea about the nature and characteristics of triangles whereas the learning of that concept goes beyond the scope of acquiring such information. The learning of the concept of triangle by the child is indicated by his/her capacity to identify the shape of a triangle among the shapes of various other geometrical figures. Both concept formation and concept learning occupy vital position in the process of cognitive learning. The classroom instructional objectives are directed towards them.

Acquiring of information is the basis of concept formation which ultimately leads to concept learning. Information is acquired through various sources and different sense organs, as discussed earlier. When a piece of new information is acquired it is processed in the mind leading to the formation of a concept on the basis of its interaction with the related concepts stored in the mind. The processing of any information in the mind takes place according to certain rules and principles. Concept learning as well as the learning of principles are closely related to language learning, because most of the concepts are in the form of symbols and are experienced in the form of words.

According to Carroll (1964) in a meaningful verbal or written expression, there is complex relationship among the words used leading to mean a concept. In this process a word either in the verbal or in the written form conveys certain meaning to the listener or the reader. Such meaning leads to the formation of a concept. It is essential that a particular word conveys the same meaning to the communicator as well as to the receiver or listener. Anything contrary will lead to a confusing situation for conveying the concepts. Therefore, the meanings of words are to be given in societal acceptable forms. There are several instances of words conveying the meanings of different concepts, but they do not convey different meaning to the speaker as well as the listener.

The basic consideration is that the concepts are socially standardised and have wider acceptance. There are also instances of some concept words conveying different meaning. Usually such concept words create confusion for the speaker and the listeners. In the learning of children, particularly in the case of language learning, use of such concepts should be avoided. It seems thus evident that language facilitates concept learning. In some cases concept learning may also be possible without the use of any language or by using a language, which is not well developed. But in such cases concept learning is not found much effective; for example, concepts cannot be well developed through the use of uncommon dialects, and concept learning can not be facilitated. It remains restricted in applicability.

Let us now discuss some of the practical approaches to concept learning. As concept learning is facilitated through the use of language, greater emphasis should be placed on explaining and exposing the concepts through the use of language. This means greater use of the meaningful, precise and understandable language for expressing the concepts for the benefit of the learners.

The learners' expected competency in the use of concepts is to be kept in mind while teaching him/her about the concepts. In other words, the learning outcomes in respect of a concept should be assessed in terms of the learner's competency in using that concept.

Concept learning is found facilitated by sequencing the related concepts. While sequencing the concepts, attention should be given to their difficulty levels. The easier concepts are to be taken up first and then the more difficult ones. The sequencing of concepts is to be considered also from the point of view of their concreteness. The

concrete concepts should be presented first followed by the abstract ones. The learning of abstract concepts poses difficulty for the learner's understanding in the absence of concrete examples. In this context, it may be pointed out that the complex concepts should be reduced to simpler forms before presenting.

Before presenting the new concepts to learners, there is need to ascertain their entry level behaviour in respect of such concepts. In case the learner has no idea or knowledge of the new concepts, the first task would be to make verbal associations with the concept. There is lot of commonality between verbal learning and concept learning (Underwood, 1966). The following key points should be emphasised in concept learning.

- Attributes of the concepts should be emphasized in explaining them.
- The concepts are to be worded in correct terms, which would convey the meaning and nature of its functioning or any other remarkable characteristics.
- The nature of the concept needs to be explained and made clear to the learner because knowledge of the definitional and structural characteristics of the concept facilitate its learning.
- Both the positive and negative attributes, characteristics and examples of the concepts are to be presented to the learners for a better grasp of them.
- The concepts to be learned should relate to the day to day life experiences of the learners. Learning by doing, discovery learning and problem-solving are considered suitable strategies for the learning of concepts in relevant situations.
- In the course of concept learning, provision should be made for feedback on interim attainment by the learners.
- Concept learning can be better accomplished through concrete situations. Presentation of concrete objects and events relating to the concept facilitates the learning of such concepts. But this may not be exactly possible in many situations. In lieu of the concrete or real objects provision may be made through contrived or simulated situations.

### 12.4.3 Associational Learning

Learning through association or associational learning is not situation or time specific. The process of associational learning starts from the early stage of an individual's life and continues till the end. It cannot be compared with any formal learning situation. Rather it takes place in all possible informal and formal learning situations, at home, at school, at work and in the community. The basic element in this learning is the process of association. Association refers to the process of relating learners' present experience with his/her earlier experiences for using these relationships in the present and future course of learning (Skinner, 1960). The process of associational learning has made the human civilization possible to make progress from primitive to modern life. The individual's learning experiences gained through both the real and vicarious situations become more meaningful if related to his/her previous experiences. The present learning experiences are aroused through the process of association with the earlier related experiences. As a result of such association the present experiences take on a new meaning. Memory functions as an essential aid in learning through associations, but association does not help in memory. However, memory is an important part of associational learning and it helps in strengthening associations.

Through the association process, the child starts to associate symbols with objects, for example, the word 'pen' with a particular type of writing material; the chemical symbols with a particular type of chemical compound or a reaction. The associational learning takes place inside as well as outside the classroom situations.

The associational learning can be categorised as automatic association, concept formation and generalisation. All of these are mostly verbal and symbolic in nature.

They usually follow the sequence from facts to concepts and from concept to generalisations. Facts are often regarded as automatic associations, for example, 'mammals' refers to a category of animals rearing their offsprings on breast feeding; 3 multiplied by 2 gives the same results as 3 added 2 times and the word 'toy' means a type of play material for kids.

In order to make the learning meaningful and clear, the association between the word, fact or information and its meaning should be made automatic.

#### 12.4.4 Generalisation in Learning

Generalisation refers to establishing relationship between two or more concepts or facts on the basis of certain rules, laws and principles. The generalizations are not arbitrarily made. It is deriving and establishing relationships among concepts, facts and phenomena etc. For example, we know the conceptual fact that  $2+2+2=6$  which is the process of addition of three 2s. We also know that 3 times 2 is equal to 6 or we say  $3 \times 2 = 6$ . We can take similar other examples and can establish the relationship between two separate conceptual facts that the process of multiplication in arithmetic involves repeated addition of the same number for the given number of times. Through such generalization the learner is able to acquire a new generalised concept which is based on certain simpler conceptual facts. In this example, the conceptual facts are (i) continuous addition of the same number for a given number of times leading to a result of summation; and (ii) simple arithmetic multiplication of the given number by the number of times of the previous case. The results of both the arithmetical operations establish the new generalized concept that 'multiplication is continuous addition'.

The process of generalisation of concepts has the characteristic of transferability. The transfer may be within the same situation or extend to other situations. This is also true for all types of concepts in general that the generalized concepts assist in problem solving. The processes of generalizations of concepts and problem solving are mutually dependent on each other. Generalizations facilitate in problem solving situations and in some cases generalizations are made through problem-solving.

The learner's level of attainment in concept learning is indicated through his/her ability for drawing generalizations from the learning of the related concepts. When an individual has acquired certain concepts he/she should have the ability to apply these concepts in other relevant situations. It may be in the form of presenting a problem involving these concepts. In view of its utility in education emphasis is placed on the learner's ability for making generalizations in classroom teaching-learning situations.

#### Check Your Progress 4

- 1) Fill in the blanks in the following sentences.
  - a) Concept formation and ..... are used synonymously to refer to the process of abstraction that can be taken to represent a concept.
  - b) There should be greater emphasis on ..... for making the concepts meaningful.
  - c) Attainment in concept learning can be better tested through the learner's competence in .....
  - d) The concepts to be learned should relate to the day to day ..... of the learners.
  - e) Concept learning can be better accomplished through ..... situation.

### 12.4.5 Strategies for Enhancing Memory

Memory plays an important role in cognitive learning. Much of cognitive learning coming under school education depends on memorization. Even the higher cognitive learning processes, like analysing, reasoning, synthesizing and evaluating etc. have their base in memorization. Without memory it is difficult to conceive of learning. Memory is interlocked with perception; and perception serves as the basis for cognitive learning. In a sense, the development of human civilization has become possible mostly because of human memory. All inventions, discoveries and developments in scientific, technological and social fields are based on this. The continuity in scientific innovations and experiments is maintained because the scientists and the innovators are capable of remembering what has already been done and accomplished in earlier experiments and innovations made. In other words, such things have been retained in their minds because of their memory process and are recalled and reproduced at the time of need in subsequent activities. We also find that learning phenomenon depends upon the learner's capacity for memorizing.

All intellectual activities are made possible because of our memory. Though we use the term memory as a single mental process, it has different functions. These different functions are exercised by the process of memory. The functional processes covered under memory are the act of memorization (consolidation of information), and retention (memory) vis-a-vis loss in retention (forgetting). Therefore, memory has three primary functions of memorizing, retaining and remembering. Memorizing is the act of internalising or processing of information; retaining is the storage of information; and remembering is the storage of recalling, reproducing or recognizing the information stored in memory. Remembering is just the opposite of forgetting, referring to loss of information from memory. These processes by their nature are very inter-related. One of the major advances made in the arena of cognitive learning is the idea of representing the mind as an information processing system that determines the flow of information and how it is acquired, stored, represented, revised and accessed in the mind (Pelligrini, 2001).

Piaget's theory of cognitive development is recognised by some educational psychologists as the nearly complete systematization of how cognitive development takes place (Sternberg, 1984). However, some psychologists are of the view that his theory lacks in providing details of how individuals develop cognitively. It does not answer how the individuals think and learn. Information processing theory suggests the way to study cognitive development, how the brain deals with the information received by the sense organs.

Processing of information starts with their storing. Appropriate analyses of the stored information takes place in the cognitive system like the storage of information in a library. The items of information are stored in the form of cognitive units. Atkinson and Shiffrin (1968, 1971) are of the view that there are three forms of storage in terms of the duration of their lasting, method and process of retrieval and the reasons of failure of being stored for longer duration. Firstly, there is sensory registering of the cognitive units. There are as many sensory registers as there are types of sense perception. The information in the form of environmental stimuli enter the sensory storage system, but this information is stored for a very short duration may be for the part of a second after which they are lost. The second type of storage holds the information comparatively for a longer period, but not in its original form. This is also the short-term storage of information which is known as short term memory (STM) or working memory. This type of memory is needed for sorting out the cognitive units or items which are to be remembered from those which are not to be remembered. The items which are not to be remembered are forgotten. For example, in doing a multiplication in arithmetic we are required to multiply the integers. As soon as we get a multiplied value, we use it at that particular place as per the need of the process and then we forget it. Those bits of information are not kept in memory for subsequent

use. Immediately our attention goes to another item in the process. In this manner, we forget many units or items. The work of Ebbinghaus towards the end of 19th century pointed out a clear distinction between short term memory (STM) and long term memory (LTM) earlier used as primary and secondary memory respectively. The STM as proposed by him has the capacity of being retained for about seven units. At about the same time Wundt demonstrated that the storage load of STM is limited to six or seven units, which has also been later supported by Meller, who referred to that magic number of seven units. Meller has used the term 'chunks' for these units (Dobson *et al.*, 1981). The third type of memory, that is, the long term memory (LTM) has no such limit in terms of units and nothing is lost from it. But it so happens that at times we forget something that was in our LTM earlier, may be some years ago. Though we do not find the traceability of such information in our memory, it can be traced if we use a suitable searching strategy. For example, we might have forgotten certain specific events on our first day in college or how we enjoyed our visit to a place. But the total event can be traced back in our mind if we find certain related aspects connected with those events or occurrences. However, long-term memory (LTM) is very important for us. It contains two different types of information-semantic information referring to the information relating to the use of words, and the procedural information, referring to the information-related to the procedures and approaches of how the things are done.

In order to remember the information, facts, ideas and such other cognitive elements for a long-time and to be able to use at the time of need, the individual has to make a concerted effort. For example, the individual has to repeat or rehearse his learning from time to time to remember the content for a longer period. However, the short-term memory and long-term memory storage are processed by different mechanisms and strategies, which are mostly governed by the information processing theory, otherwise known as 'cybernetic' theory. Basically this approach to study memory involves (i) the process of storage in memory and (ii) the process of retrieval of the information from the memory at the time of need.

The entire process of memory from input phase to the output phase is divided into four stages, namely; acquisition, encoding, storage and retrieval. The first one deals with how the individual acquires information. It has been discussed earlier. The second one 'encoding', implies the transformation of the acquired information into a form, which can be processed in the memory system mostly in relation to the earlier learning experiences. Out of the acquired information if something is to be remembered then the storage must take place. For that purpose the encoded information is transferred to the memory system. The fourth and final stage, retrieval, involves the tracing out of the required information stored in the memory and relating it to the present situation for use as per need.

Earlier we have discussed about schema, one of the basic units of cognition which refers to the stored conceptualization of experience. It refers to a type of idea about the acquired information stored in the mind. It does not have any specific form. It may have a visual or verbal form or may be a combination of the two forms. The perceptual experiences of an individual are acquired in the form of schemata and subjected to the process of memory. The role of schema in the process of memory is widely recognised. When the individual is exposed to a new material, the idea about the material is incorporated in the existing structure of his/her knowledge. The schema of the new material interacts with the related schemata learnt earlier and stored in the mind. As a result of such interaction, there is the possibility of reconstructing of the old schemata in the memory leading to a new memory structure. It may be completely different from the old memory structure or may have some resemblance to it or exactly identical. The structural change in the new schemata, is due to some new information acquired through the present schema or schemas which were missing in the earlier ones.

Because of the importance of memory in cognitive learning there is need for enhancing memory skills. Memorization depends upon certain internal factors of the learners. The important ones are; the learners' age and maturation level, need, interest, motivation and the like. Unless the learner is intellectually mature for understanding and acquiring the desired cognitive learning experiences, he/she may not be able to memorise the contents of learning. Sustenance of the learner's interest and motivation in the learning process are affected by his/her needs of learning. Unless the needs of the learner are satisfied through the learning process, he/she lacks genuine interest in it. As a result, the entire process becomes almost futile and ineffective. In case of classroom learning the students' interest and motivation are also affected by certain external factors like, appraisal of students' performance by the teacher, the parents, the learning tasks and materials, the learning environment, the process of examination and evaluation. These factors affect the learners' achievement motivation, which directly or indirectly influences the process of memorisation of the learners. The learners' lack of interests in the learning contents will also affect the process of learning and memorising.

The teacher may use certain techniques for improving the memory of the learners. In this connection they should give importance to developing the learners' meta-memory skills. It relates to the learners' awareness of their own memory processes and capabilities. The learners' problem solving memorization skills can also be developed through enhancement of meta-memory skills.

Certain mnemonic devices are also used for enhancing memory. Mnemonic device or mnemonic is a term usually used to cover any technique for committing the learning material to memory or for improving one's memory. Let us discuss examples of such mnemonics.

Pairing or associating the new learning materials with something memorable to the learner is one way of remembering. For example, in order to remember a new telephone number, one may pair it with another figure like his/her date of birth which is usually in the individual's memory or in case of remembering a new name we may pair it with another familiar name of a friend or relative. Similarly, certain new information to be remembered can be paired with some familiar type of material, which is already in the individual's memory. There is no common formula for such pairing. It is to be devised and used by the individual himself/herself.

Another mnemonic device for remembering certain long term phrases, terminologies, or a list of some specific terms/words is to use acronyms. Acronym refers to a pronounceable abbreviation of a multi-word term composed with the first letters of each word. For example, in order to remember the colours of rainbow (violet, indigo, blue, green, yellow, orange and red) we try to memorise the term VIBGYOR, coined by using the first letters of the seven colours. Likewise the name Culture Fair Intelligence Test can be remembered by using the acronym CFIT and the basic formula for finding out the standard deviation of an ungrouped set of scores can be remembered by memorising the term 'RMSD' or simply RMS for Root Mean Squared Deviations (Root of the mean of the sum of the squared deviations). Similarly PQ4R is a mnemonic which can be used to organise classroom activities in sequence for improving students' retention. The mnemonic stands for Preview, Question, Read, Reflect, Recite and Review. Some other mnemonics are Acrostics, Link method, Loci method, Peg word technique and Keyword technique (Henson and Ellor, 1995).

Another important strategy for facilitating learners' understanding and remembering is the use of advance organizers containing new concepts prior to presenting the information to help the students organize new information into meaningful concepts. Advance organisers are related to what the students already know about the new information as well as the materials to be comprehended and memorised by students.

Quite similar to the use of advance organizers, another technique known as 'keyword organizer' is used for the purpose. In this technique the teachers emphasise the important concepts and words of the lesson to be learned, prior to and after the presentation of the lesson. Such technique is also used in developing the text books and other such learning materials by printing the key concepts and words in bold types so that the reader gives more emphasis to it.

The teachers as well as learners can devise other suitable techniques for improving their memory.

### Check Your Progress 5

- 1) Briefly explain the meaning of mnemonics and their uses, limit your answer to 150 words.

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- 2) Explain the following terms within 25 words each.

- a) Long-term Memory

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- b) Functions of Memory

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- c) Information Processing

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- d) Stages in Memory

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- 3) Fill in the blanks in the following sentences with the most suitable words or phrases from among the words given in the brackets.
- a) The individual's memory influences his/her ..... development.  
(Physical, cognitive, skill, emotions)
  - b) Memory is better tested by the process of .....  
(encoding, learning, forgetting, retrieving)
  - c) The process of ..... is not essential in the individuals learning.  
(forgetting, remembering, memorising, re-learning)
  - d) The mental function of information processing is very much similar to the process of .....  
(memory, cybernetics, analysis, comparison)

### 12.4.6 Organising Reasoning

Reasoning is the fourth cognitive process. It is almost a combination of the other three processes; perception, conceptualisation and memory. It is a higher mental ability through which generalizations are made on the basis of individual's earlier experiences, by establishing cause and effect relationship, formulating and solving hypotheses. It helps in solving various problems that the individual faces in his/her life situations. Reasoning is explained as a process of controlled thinking or association, which starts from certain problem that the individual intends to solve. Siann and Ugwuebu (1985) considered the process of reasoning as an activity in which the hypotheses relating to the problem are formulated and tested. As such, reasoning is an essential condition in problem solving activity.

In view of its nature, reasoning has significant role in cognitive learning. The cognitive learning enables the learner to adjust and adopt himself/herself effectively with the environment and to solve various problems that he/she comes across in life situation. As such, problem solving is considered as an essential aspect of cognitive learning. All the cognitive processes have the ultimate aim of assisting in solving problems in one way or other. The experiences gained through perception and concept formation cannot be of any use if they function in isolation of each other. For example, simple perception of an object or event without a subsequent action will yield no benefit to the learner. Perception helps and leads to concept formation; and the concepts are retained in mind through memory. The concepts so retained are to be retrieved and used by the individual, when needed. The simple retrieval of the concepts will have no meaning unless proper relationships are established among them. A number of isolated informations cannot help the learner in solving any problem. For solving any problem the learner needs to establish logical relationship among the informations relating to the problem, on the basis of which he/she can formulate hypotheses or tentative solutions to solve the problem. The reasoning process assists in establishing such relationship. In many instances of cognitive learning we have to depend upon the process of reasoning. The individual's reasoning ability develops with increase in age and maturation. It is caused mostly by the individual's environmental experiences. The reasoning ability of a child is not mature like an adult as the child lacks adequate experiences in comparison to the adult. According to Garrison (1967) although reasoning and problem-solving behaviour appear at an early age, the reasoning ability at early stage is confined to concrete and personal things in the child's immediate environment. As the child grows older, there is significant increase in his/her ability to state a problem in words and also to verbalize its solution. The children usually have poor reasoning ability because they lack experiences. As a

child grows up he/she gathers more and more experiences, and his/her ability to reason out the problems that he/she faces develops gradually. Therefore, the reasoning ability proceeds from simple to complex.

In order to improve the reasoning ability of young learners, the teachers in classroom situations are required to provide a variety experiences to them. Such experiences can be related to classroom and school situations and to outside school environment. The experiences relating to outside school environment like the various social and community experiences can also be provided to the learners through simulated programmes in the class and the school. By participating in such activities the learners can gain required experiences relating to different social events. The activities for providing such experiences can be integrated with the curricular as well as co-curricular programmes of the school. The participation of learners in such programmes and activities will help them to develop their reasoning ability.

The individual's reasoning ability may be of different types like verbal, numerical and spatial etc. These are required for solving the different types of problems befitting their nature. Most of such reasoning abilities are developed through various curricular programmes. The teachers organize different types of learning activities in different curricular subjects and arrange for participation of the learners in such activities to provide them ample scope for development of the relevant reasoning abilities. Besides, the curricular activities, the reasoning abilities can be developed through different co-curricular activities like quiz programmes, puzzles, debates, literary competitions, games etc. Such co-curricular programmes relating to different types of reasoning abilities need to be identified and organized keeping in view the scope and facilities available in the institutions. There is also need for taking into consideration the interest and requirement of the students so that their whole-hearted participation in such programmes can be ensured.

### Check Your Progress 6

- 1) Fill in the blanks in the following sentences with suitable words given in the brackets  
(imagination, situation, controlled thinking, analysis, problem, perception)
  - a) Reasoning is explained as a process of ..... , which originates from ..... that the individual intends to solve.
  - b) Cognitive learning enables the learner to ..... himself / herself successfully with the environment and to ..... in life situations.
  - c) The individual in order to solve a problem needs to establish ..... among the ..... related to the problem.
- 2) Mark each of the following statements true (T) or false (F).
  - a) Reasoning as well as problem-solving behaviour appear at the early stage of the individual's growth and development. ( T / F )
  - b) Social experiences cannot be provided to the learners through simulated situations. ( T / F )
  - c) Mnemonics help in correct perception. ( T / F )
  - d) A learner's metamemory skill is not related to the awareness of his/her own memory process and capabilities. ( T / F )

Cognitive learning plays a vital role in an individual's life by providing a direction to his/her mental and intellectual developments. It influences individual's behaviour. Cognitive learning is based on the process of cognition, a psychological construct. It comprises of four basic units such as schema, symbol, concept and rule.

Cognitive learning involves various mental processes of which perception, concept formation, memory and reasoning are the major ones. Perception involves the interpretation of an individual's sensory experiences, and it helps in acquiring knowledge about various objects, facts and concepts etc. with the assistance of other basic mental processes. Acquiring of knowledge about objects, facts and concepts etc. forms the basis of cognitive learning, on the foundation of which the individual gradually acquires higher mental abilities.

There is need for organising the processes of perceptual learning, concept learning, memory and reasoning for effective cognitive learning.

Perceptual learning takes place through sensory experiences gained by the individual through various sense organs. Therefore, in all the learning situations there is need to emphasise the acquiring of sensory experiences in as many ways as possible. Perceptual learning helps in acquiring higher mental abilities through the activities of adaptation, assimilation and accommodation. In the formal learning situation there is need for providing various sensory perceptions, understanding of the learner and the learning process, using concrete learning materials, emphasising learning by doing approach, and participatory learning for ensuring better cognitive learning.

Concept learning serves as the foundation of cognitive learning because concepts are the basis of cognition. Language facilitates concept learning. Meaningfulness of the concepts make the process of concept learning smooth and effective. The basic processes involved in concept learning are learning through association and generalization. New learning is to be associated with previous learning in meaningful ways. The generalizations in learning are based on principles, rules or laws. Both of these processes strengthen concept learning vis-a-vis cognitive learning. Generalization serves as the indicator of concept learning. It helps in problem-solving and vice-versa.

Organisation of memory is an essential aspect of cognitive learning. It serves as the key for the cognitive development of the individual. Progress of human civilization has been made possible due to human memory. Memory has three distinct functional aspects, namely; the acts of memorizing, retaining and remembering. The mind's act of information processing has a role in this. Memory depending upon the nature of retention may be of short-term or long-term. All the information that we acquire are not retained in our memory. Many informations are not required to be retained. We have to forget many things for our benefit. However, many essential informations are to be retained, and remembered when needed. Memory has four stages; acquisition, encoding, storage and retrieval. There are different strategies for enhancing memory. In classroom learning the teachers may use certain techniques, like improving the meta-memory skills of the learners by using mnemonic devices. The mnemonics refer to a technique used to facilitate the memorising of the terms, concepts, figures etc. There are various devices like pairing and use of acronyms, advance organisers, keyword organiser etc. The learner may think of such other mnemonic devices according to the situational and personal convenience.

Reasoning as a process of cognitive learning plays an important role in problem solving and in individual's adjustment. Suitable learning experiences through various curricular and co-curricular activities need to be provided to the learner for developing reasoning ability.

## 12.6 UNIT END EXERCISES

- 1) Make a list of five problems inherent in the process of cognitive development of the socially deprived learners.
- 2) Suggest ten strategies for improving sensory perceptions. Point out the strategies difficult to adopt in classroom teaching.
- 3) Discuss with your co-learners how the process of association of ideas influences cognitive learning.
- 4) Discuss the need of generalisations in cognitive learning and how this process is related to problem solving.
- 5) List five learning situations in which short term memory (STM) is required, and five situations in which long term memory (LTM) is required.
- 6) Cite any three examples of different learning situations in which the advance organizers have been used.

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## **UNIT 13      AFFECTIVE AND PSYCHOMOTOR LEARNING AND THEIR ORGANISATION**

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### **Structure**

- 13.1 Introduction
- 13.2 Objectives
- 13.3 Concept and Nature of Affective Development
- 13.4 Scope of Affective Development
  - 13.4.1 Levels of Affective Development
  - 13.4.2 Dimensions of Affective Development
- 13.5 Organisation of Curricula for Affective Education
  - 13.5.1 Approaches for Development of Affective Education Curriculum
  - 13.5.2 Selection and Arrangement of Content
  - 13.5.3 Transaction of Curriculum
- 13.6 The Concept of Psychomotor Learning
- 13.7 Organisation of Psychomotor Learning
- 13.8 Let Us Sum Up
- 13.9 Unit End Exercises
- 13.10 References and Suggested Readings

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### **13.1 INTRODUCTION**

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The goal of educational process is the total development of the learners irrespective of the level of education. Total development refers to the development in the three major dimensions- cognitive, psychomotor and affective. These are the three domains in which the development occurs as a result of the individual's learning. The learning outcomes in these domains have some distinctive features. As a result of cognitive learning the individual acquires knowledge resulting in the changes in the cognitive structure and style of the learner. Details of cognitive learning have been discussed earlier in this block. The learning process under the psycho-motor domain relates to the acquiring of various skills. This process of learning involves both the cognitive functioning as well as muscular coordination. Because of this combination the process is known as psycho-motor learning. The psychomotor learning enables the individual to acquire mastery over various manipulative skills relating to scientific, mechanical and manual tasks etc. Psychomotor learning is very important on the part of each individual for enabling him or her to earn the livelihood.

Apart from the learning taking place in the cognitive and psychomotor domains, the individual experiences changes in his or her feeling aspects. The experiences of the individual related to changes in the feeling tone also result due to the effect of learning. Such learning processes come under the purview of affective learning. As a result of affective learning there is change in the learners' level of awareness and feelings related to the subject of learning. Such changes in the learner's feeling tone are exhibited through the changes in the levels of interest, motivation, attitude etc..

It may be noted here that all the three types of learning experiences are not mutually exclusive. This proposition holds good because of the fact that through most of the school learning programmes we intend to develop cognitive skills related to the learning

content and also to bring in changes in the affective domain of the learner like interests, attitudes, values etc.. It is clear that cognitive as well as affective learning take place simultaneously and with the same content of learning. Similarly, there are several learning situations in which psychomotor learning occurs along with cognitive learning and/or affective learning.

Though the three types of learning are not mutually exclusive, the differentiation among them is warranted because of the nature of the behavioural outcomes.

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## **13.2 OBJECTIVES**

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After studying this unit, you should be able to:

- describe the concept and nature of affective learning;
- state the dimensions of affective learning and their components;
- suggest educational programmes and methods for the development of affective learning;
- discuss the concept of psychomotor learning; and
- appreciate the importance of affective and psychomotor learning in the life of the individual.

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## **13.3 CONCEPT AND NATURE OF AFFECTIVE DEVELOPMENT**

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As discussed earlier, all learning programs aim at the development of the learner in all domains such as cognitive, psychomotor and affective. The development in the affective domain helps the learner in empowering him/her with various attitudes and values. The affective domain of the individual refers to the behavior relating to the feelings, emotions and similar other qualities. Man's development in such areas makes him unique and different from all other creations on earth. Man is a rational animal being endowed with human qualities of love, sympathy, tolerance, co-operation, fellow-feeling and the like. All these relate to the attitudes and values that are useful in the individual's life. The development of all such qualities results from learning in various contexts. Such learning is not confined to the classroom or to any other specific learning situation. The behavioral changes in the learner's feeling domain may be possible outside the classroom situation beyond the scope of formal learning context. This is because the individual's personality development takes place during ones interaction in various in-school and out of school situations.

Though learning takes place through three different channels cognitive, psychomotor and affective, it takes place as one process. The outcomes of learning also relate to those three domains. In any learning situation the behavioural changes in the learner occur in some or all the three types. But the extent of such learning outcomes may differ in degrees. The learning outcomes in the psychomotor aspects are distinctive because they are mostly associated with skill development, while the learning outcomes relating to cognitive and affective aspects are found intermingled with each other.

The idea of affective education has remained unfocussed for long (Bills, 1976). It is conceived coincidental with cognitive learning, and is found difficult to deal separately in classroom learning. Many terms are associated with affective learning. Martin and Briggs (1986) listed as many as 21 different terms associated with affective aspects of personality including self-concept, mental health, morality, attitudes, values, ego development, feelings and motivation. The term 'affects' has a literary meaning of feeling, emotion and having preference for some object, issue, notion and the like. It refers to a type of mental state or disposition tinged with the feelings of love and fondness.

Affective education broadly deals with the students' experiences in school and out of school situations and is mainly concerned with the programmes of the social and personal development. According to Ackerson (1991) and Beane (1990), affective education refers to educational programme and activities pertaining to learners' personal-social development, feeling, emotions, morals, ethics. It is often isolated in the curriculum. But since the sole purpose of education is to develop the individual as human, it must be mostly about the affect; it cannot be otherwise and cannot be separated from other aspects of the curriculum (Beane, 1990).

### Check Your Progress 1

**Note:** Write your answers in the space given below.

1) What do the channels of learning refer to?

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2) What are the characteristic features of affective learning?

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3) Give any five examples of the themes of affective learning.

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Development of the affect has been considered either overtly or covertly as a part of schooling. It has taken different forms like humanistic education, moral development, value orientation etc.. The programmes on value education and/or moral education in some instances take the form of character education also. Affect is also treated as a response to different social, political and economic issues in the form of attitudes. The individual has to develop and nurture desirable positive attitudes and interests for his/her better adjustment in the society.

Effective monitoring of the educational process is needed for proper development of the affective domain of the learner. Presently, the emphasis in school curriculum is on academic subjects, which are usually mistaken to help the cognitive development of the learners only. But the hidden agenda of such academic programmes is to develop affect of the individual alongwith the cognitive aspects. Almost all the themes of the academic subjects have the potentiality for developing the affective domain in some form or the other. But the transactional modes followed in the curricular programmes do not usually favour such development. For example, in a language subject prescribed for any grade, there may be a number of themes in the form of prose or poetry lessons. Each of such lessons may be intended for inculcating, strengthening certain morals essential in the learner's life situation in the present as well as in future context along with the purpose of developing competencies in language and to acquire certain factual information. But in the classroom transaction of such themes as well as in the programmes of learner evaluation, the teachers usually place emphasis on the later two aspects almost completely neglecting the first one. This is the case not only with the language, but also in other curricular areas.

In the learning of the affect or any educational programme intended to achieve some affective objective, certain important issues need to be considered because of the philosophical and social nature of the learning outcomes. For example, the learning situations where the affective objectives are explicitly defined or not, stated or unstated, planned or unplanned raise issues like what to teach, what methods the teachers should follow to ensure the attainment of expected learning outcomes, and what is the reaction and level of acceptance of the contents and methods of affective education by the students, parents and the community or the society at large. The following issues may be considered relevant in this context.

- Affective education takes a long time to achieve its objectives. For example, any desirable change in the learner's affective behaviour cannot be accomplished through a singular learning situation. More specifically, a change in the learner's attitude towards certain social issues may occur only after his/her understanding and realization of the pros and cons after having adequate exposure to it over a long time.
- A change in the learner's affective behaviour can be possible in shorter duration through certain processes, like indoctrination or brain washing. But such methods are not usually adopted for ethical reasons.
- In some instances absence of certain unsocial behaviour in the individual is the indication of affective development. For example, absence of drug or alcoholic addiction, or habit of intoxication are the indicators of good affective behaviour. At times, confusion prevails about the affect as a means to cognitive ends. The processes of both classical and operant conditioning, and the approach of persuasive communication may prove to be powerful methods for inculcating some affective behaviour.

Golemann (1995), suggested that the individual's emotional and rational components of the brain are somewhat independent of each other and operate separately. But there are times when both the components work in harmony with each other. When the individual is faced with a problem or dilemma and is required to make a decision, the emotional center of the brain functions first while the rational brain is yet to start functioning. Therefore, the person in a dilemma situation is likely to take a decision more with emotional touch than with a rational consideration. This implies that the educational process should provide the individual with adequate knowledge about the situation to enable him/her to use reasoning to mould the emotional behaviour in a desirable form. Golemann (1995) calls this type of mental functioning 'Emotional Intelligence', which enables the individual to deal intelligently with various social problems that one faces in life situations.

From the above discussion one may conclude that individual's affective behaviour or learning is influenced by both emotional intelligence and cognitive learning. Therefore, the implication for the educational process is that cognitive learning and affective learning should be planned to go hand in hand.

### **Check Your Progress 2**

**Note:** Write your answers in the space given below.

- 1) How does affective learning facilitate social adjustment?

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2) What is the place of affective education in the present school curricula?

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3) What are the basic issues that affect affective education?

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4) What is emotional intelligence and how is it related to affective development?

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## 13.4 SCOPE OF AFFECTIVE DEVELOPMENT

In view of the above discussions, the need and importance of affective education in life cannot be under estimated. Its importance has to be recognised in the educational process. As observed earlier, the present educational system neglects the education of affect. Neither it finds a structured placement in the curricula at different levels of education, nor is this area recognised in the curriculum transaction and learner evaluation programmes. In case of the evaluation, it is very much neglected. Proper planning to redesign and restructure the curricular programmes is needed in our school education system to this end.

Restructuring of the curricula for including affective education is not an easy task as it may appear at the outset. This requires consideration of different facets of the affect in human personality. A brief mention of these facets of affective learning has been made earlier. We may further consider the facets of affective education by using the criteria of levels and dimensions.

### 13.4.1 Levels of Affective Development

A change in the learner's affect, since it is concerned with his/her feeling and emotional aspects, cannot be expected to occur in one shot. It may take place gradually in a phased manner. Krathwohl, Bloom and Masia (1964) had developed a taxonomy in affective domain, which indicate that affective learning results in changes in the learner's affective behaviour gradually from initial phase of receiving the formation of value complex through responding, valuing and organization.

The materialisation of affective development through the above levels in a hierarchical order is based upon the principle of internalisation (Martin and Reigeluth 1992), the process by which interests, attitudes and values etc. become parts of the individual behaviour. In other words, the more the affect is internalized, the more is the change in the individual's affective behaviour. The hierarchical order in affective development is receiving, responding, valuing, organization and characterization of a value or a value complex. Such a taxonomy of affective behaviour helps the teachers to formulate the objectives in these categories and also to help them in designing strategies for curriculum transaction.

The category of receiving relates to the learner's willingness to attend to the stimuli of affect. The stimuli may be in terms of some object, institution, activity, issue etc. In the teaching-learning situation this refers to a situation through which the learner's attention is drawn to the stimuli. The expected learning outcome may be in terms of generating awareness of the learner towards the stimuli. However, it is the lowest level of affective learning.

Responding relates to the learner's active participation in matters concerning the stimuli of affective learning. At this level, the learner, because of his/her awareness of the learning theme, tends to react to it in some form or other. The learner shows willingness to respond and react to the learning stimuli. The learner voluntarily participates, and engages in completing the given assignment. At this level of learning, the learners' response may be exhibited in the form of his/her interest in matters relating to the learning stimuli.

The category of valuing refers to the worth or value the learner attaches to the stimulus of learning. The behavioural changes may be in terms of the learner's belief, faith, appreciation, and commitment in matters related to learning stimulus. The instructional objectives related to attitudes and appreciation also come under this category of affective domain. The behavioural demonstration of affective development here may be in terms of appreciating some literary contribution, demonstrating commitment to some social reform measures, and belief in some political ideology etc.

The highest level of development in the affective domain relates to the formation of a value system or a value complex, which helps the person to take an appropriate decision regarding life style. As a result of such stabilization of values and development of a value system the person's behavioural patterns are influenced in situations of dilemma. It helps the person to be more self-reliant, and objective in solving problems as well as in adopting suitable measures in dilemma situations.

The taxonomy of affective learning helps the classroom teachers in adopting suitable method(s) for developing the learner's affect using a spiral approach as each level has a base of its development in the previous level.

### Check Your Progress 3

**Note:** Write your answers in the space given below.

- 1) What is the need for restructuring the school curricula for affective education?

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## 13.4.2 Dimensions of Affective Development

The affective taxonomy is criticized because of its general nature, abstractness and limited scope. Moreover, the nature of taxonomy shows that affective learning is more close to cognition. It needs to be pointed out that the rating of taxonomy of affective development suggested by Krathwohl et al. (1964) is in a spiral and hierarchical order. This levelwise taxonomical order is similar to the taxonomy of cognitive learning. The taxonomical order in cognitive development is related to various subjects and themes of learning. Likewise, the taxonomical order in the affective development may be related to its different aspects as suggested by a number of authors like Hoepfner (1972), Gephart and Ingle (1976), Brandhorst (1978), Foshey (1978) and Nunnally (1978). By way of reviewing all such taxonomies Martin and Briggs (1986) reported

that such taxonomies are of varied nature. Some of them cover certain physiological aspects, whereas some others are concerned with certain psycho-social aspects like self-concept, motivation, attitude, interest and the like. Foshey (1978) had suggested a taxonomy of learning having six objectives intellectual, emotional, social, physical, aesthetic and spiritual. The newness in the taxonomy was the inclusion of the last two aspects, that is, aesthetic and spiritual which were not part of the other taxonomies suggested earlier.

Briggs and Martin (1986) included social competence, values, morals and ethics, motivation, attitudes, interest, emotions and feelings as subcomponents of one affective construct of self-development.

An alternative way of considering the categorization of affective dimension may be in terms of goals or the outcomes cutting across different constructs. The affective goals in the educational process need be translated as positive attitudes, interest and motivation, related to various themes under different subject areas in the form of knowledge, understanding, skills which would help the learner in his/her life situation. The goals of affective education may be related to the development of a rational basis for attitudes and values. This means that the person is required to examine the qualifications for developing positive attitude towards certain issues or objects, and also to take the right decision in adapting to certain values, morals or such other ethical practice. Affective goals may be related to affective process indicating proper directional movement as perceived by the person. This may be in terms of the levels of affective development. The goals of affective education may also be defined in terms of developing the levels of interest and motivation in educational, vocational as well as personal pursuits.

Martin and Reigeluth (1992) through a cross cultural project on "Education for Affective Development" identified five aspects of it such as, intellectual, aesthetic, physical, spiritual and social. The social aspect was further subdivided into two categories: (a) emphasis: the moral, legal, political and conventional (for example; manners, etiquette, social protocol), and (b) perspective: the individual, family, school, community, society, nation and the world.

The above categorization of affective development indicates the difficulties inherent in the taxonomy of affective domain. The difficulties are not only due to the inter-relatedness of the major personality domains but also due to the overlapping nature of different aspects. Martin and Reigeluth (1992) presented another model for taxonomy of affective development. They suggested in this model six major dimensions of affective development. They are emotional, moral, social, spiritual, aesthetic and motivational. In respect of such dimensions the authors suggest three components having instructional significance. These components are knowledge, skill, and attitude. There may be other components also. But they like to restrict to three to avoid confusion.

#### Check Your Progress 4

**Note:** Write your answers in the space given below.

- 1) What are the dimensions of affective development as per the taxonomy suggested by Foshey?

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- 2) Justify 'self-development' as an aspect of affective construct.

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- 3) Discuss the aspects of affective development as suggested by Martin and Reigeluth.

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## 13.5 ORGANISATION OF CURRICULA FOR AFFECTIVE EDUCATION

In view of the importance of the development of affects in individual's life, there is need for giving due weight to various components of affective education in a structured manner in our educational process. Such education should start from the early years of child's life through various curricular and co-curricular programmes.

### 13.5.1 Approaches for Development of Affective Education Curriculum

As we have discussed earlier, the nature of affective development is such that it would be difficult to isolate affective education from learner's cognitive development. This is because of the fact that education of the affect, in many instances, largely depends upon cognitive education. For example, in education in different curricular areas like language, sciences and social sciences there is much scope for training the learners in development of their affects. Through different themes or contents of subjects the learners can be trained to acquire different components of affective development as required in their life situations, may be in the present or future context. The teachers need to be quite conscious of the instructional objectives in respect of such development. The most unfortunate thing in the current instructional system is that the majority of teachers emphasize such instructional objectives the least. While teaching, the teacher's foremost consideration is to impart instruction in the respective subjects and themes with emphasis on the instructional objectives related to the cognitive and psychomotor domains.

Organisation of curriculum is of vital consideration in the context of affective education. The infusion of the education of affect in the totality of school education programme should be carefully attempted. The nature of development of the affect is such that infusion of the affective education component can be placed in the curriculum primarily in two ways; such as, integrated approach and affect approach. In the integrated approach of curriculum development, curriculum relating to one aspect is integrated with the curricula aspect(s) or subject(s) of the school programme. The integrated approach of affective education curriculum entails its treatment in the planning, structuring and transaction of curriculum relating to various subjects as well as different co-curricular programmes and activities of the school. For example, in the structuring of language curriculum for a class, grade or level, the curriculum framers may consider the scope of integrating suitable components of affective education into the themes to be included in the language text. In such curricular planning to give scope for education of the affects, the most important consideration would be to identify the components

of affective development, which can be accommodated in a natural and normal way in the themes of proposed language text. The infusion of the affective components with the objective of inculcation and development of attitudes, interests, motivation and values, relating to the content specifications of the text should not be seen as imposed. It should be logical and natural. As discussed earlier, it is important to see that the organization and arrangement of the content should be treated by giving sufficient scope for affective aspect. For example, in the treatment of a topic on effects of environmental degradation in language, the contents are to be organized in a way so that there should be scope for learning activities in the related areas to bring in changes in learners' attitude.

A similar treatment is required for the infusion of affective components in other curricular subjects like science, social studies, mathematics etc. While integrating the affective components, the curriculum designers and the classroom teachers should keep in mind that too many affective ideas should not be clubbed in one content unit. Integration of affective aspects with the objective of content arrangement is not enough. Emphasis is to be given to the effective transaction of the affective component along with the cognitive aspects. In this context Martin and Reigeluth (1992) said, "The affective domain may be equally, if not more, important than the cognitive domain in promoting student learning, and the domain has overlapping dimensions of development that promote growth. These include emotional, moral, aesthetic, social, spiritual and motivational development".

Martin and Reigeluth (1992) suggested an application model for affective education curricula, which is theme specific. In their application model, the authors pointed out seven primary design issues for the curriculum designing in affective education. These are topics, orientation, breadth, integration, duration, personal focus and instructional methods for the curriculum. With regard to the topics for affective education the authors are of the opinion that the topics are primarily affective or cognitive. As both the domains are highly interrelated, almost any topic can be taken up from either of the domains, through this approach the authors show a supportive view for the integrated approach for curriculum planning. But according to them, there are certain affective aspects which can be directly taken as themes of affective learning. For example, love for democracy, human rights, social justice etc. are some of the specific themes through which learning and development of the affect(s) can be planned. In the affect specific approach, the curriculum designers and the classroom teachers may be first required to identify and select suitable affects for training the learners. Such selection of affects must be appropriate to the learners' level of education. Along with the selection of affects there is need for designing suitable learning activities, which may be mostly of extra-curricular nature for imparting training to the learners.

The curriculum for affective education should be planned for rightly infusing appropriate educational programmes into the schooling system. Such infusion may require the placement of such programmes in the school time table, organizing the learning activities, teachers' role in facilitating the students' participation in the training activities, and the process of development of the affect, and finally providing scope for learner evaluation. It may be marked here that the proposed scheme of action mainly concentrates on development of selected affects. Cognitive or any other learning becomes subsidiary in this context. Furthermore, in such affect specific educational programme, the themes or the affects identified can either be addressed separately or in combination of different aspects like moral and social, social and emotional, or emotional and moral etc., as discussed above.

Both the approaches of organization of affective curriculum have advantages and limitations. The integrated approach, facilitates transaction of the affective component of the curriculum with the same theme or content identified for cognitive development. Therefore, this approach has the advantage over the other strategy in terms of a reduced curriculum load for the learners. The teachers in this case have to relook at

the transactional mode of the affect laden content of the curriculum. They have to give due weight to realizing the affective part of the instructional objectives. They have to design appropriate learning activities for this purpose. However, integration of affective component in all the content units of all the curricular subjects with equal weight cannot be possible. The integrated approach of affective education does not need any new curricular subject to be added. It only needs to have more emphasis in the transaction of affective component for which the existing curriculum may be redesigned.

The affect specific approach of curriculum organization has the advantage of giving importance to development of specific affective aspects among the learners. In such a case affective education is likely to be taken up as a separate curricular subject. This would involve designing of separate curriculum and development of instructional materials and other things.

### **Check Your Progress 5**

**Note:** Write your answers in the space given below.

- 1) Write briefly (in about 150 words) the basic approaches for infusion of affective components in school curricula.

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- 2) Write (in about 100 words) the feasibility of affective development of learners through the specific educational programmes.

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- 3) What are the advantages and limitations of affect specific approach in organising school curriculum? Answer in about 100 words.

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### **13.5.2 Selection and Arrangement of Content**

All the teaching-learning programmes addressed for affective development have their focus on two aspects. These two aspects are development of the affects concerning the individual's own self (intrapersonal), and related to the other categorized as interpersonal or social programmes. The intrapersonal type of affective learning programmes are addressed to the development of the learner's self-concepts, attitudes, motivation, interest and the like. The reference to the learner's own self development contributes to shaping his/her personality. On the other hand, the interpersonal or social type of affective programmes are directed to enabling the learners to acquire and develop the affective characteristics, which would assist in establishing and strengthening healthy and desirable interpersonal or social relations. Such affective development is found to help the individual grow as a better social being. In a broader perspective, these also assist in achieving the values like national integration and universal brotherhood.

Keeping in view the above two broad areas of affective development, the curriculum designers should select appropriate contents for different curricular subjects, and also for various co-curricular programmes undertaken by the schools or the educational institutions concerned.

The term 'appropriate contents' refers to the affect(s) intended to be developed. It may be of interpersonal or intrapersonal nature. For example, we may consider the development of affect of self-esteem or the love for unity, assuming responsibility, self confidence among the learners. These are the examples of affects of intrapersonal type. The primary concern of development of such affects as already mentioned, is to shape the individual's personality to be able to function effectively in situations where such affective behaviour is desirable to meet the individual's personal needs. The affects like team spirit, teamwork, sense of social responsibility, social service, national integration, fellow-feeling, democratic behaviour, co-operation etc. come under the category of interpersonal type of affective development. The development of such affects enables the individual to behave effectively as a member of a social group and also as good responsible citizen of the nation.

As a first step in an affective education programme such affects should be identified according to the grades of the learners. There are several affects such as assuming responsibility, love for healthy and hygienic habits, personal and environmental cleanliness, honesty, truthfulness etc. the development of which need to be initiated at the lower grades and continued through subsequent stages. The teachers have the responsibility of infusing, arranging and organizing such affective education programmes in the structure of the curriculum prescribed for the learners. Such exercises can be taken up both through integrated approach as well as through affect specific approach.

The National Council of Educational Research and Training (NCERT) has made some attempt to impart value education at the school stage. These values form the major components of affective educational programme. They have identified as many as 83 values to be inculcated and strengthened among the children by the end of their schooling. It may be pointed out that all these values need not be attempted to be inculcated in children simultaneously. The easier ones and those having importance in the learner's current life situation should be attempted first, while the complex ones having significance in the context of learner's future adult life can be taken up gradually in the higher grades.

### Check Your Progress 6

**Note:** Write your answers in the space given below.

- 1) Differentiate between intrapersonal and interpersonal affective developments.

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- 2) How can the values to be reflected in the instructional materials be identified?

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The importance and difficulty in transaction of affective curricula can be realized by the purpose and nature of the education of the affects themselves. These have also been discussed earlier. A major consideration in affective education is the question of the internalization of the affects concerned (Hopkins and Stanley, 1981). This needs a complete transformation in the individual's feeling tone towards the theme or object concerning the affect(s) in question. The nature of learning outcomes in affective education is not the same as that of cognitive or psychomotor education. The affective learning outcomes are mostly value laden and relate to the modification of the emotional behaviour of learners. The teacher has a very crucial but delicate role in transacting the curriculum in affective education. Essentially the teacher has to have deep faith and belief in the affect(s) to be inculcated and strengthened among the learners. Such affective behaviour must have been internalized by the teacher. It has to be reflected in one's behaviour inside and outside the school and in the classroom or any other situation. Overall, teacher's behaviour with regard to affective education should be exemplary before the learners. It has often been argued that the values, which form a major component of affective education, are not to be taught but to be caught. Therefore, the teachers' behaviour should be of demonstrative nature in the most exemplary way so as to make it possible for the learners to learn and imbibe such behaviour by imitating the ways and dealings of the teacher. It is because of this requirement from teachers that most of them fail to inculcate the desired affects among the learners.

It follows from the discussion that the methods of transacting the curricula in affective education cannot be prescriptive. They should be mainly activity-based and demonstrative in nature. Emphasis is to be placed on project approach. Such projects cannot be suggestive, rather these should be in the form of co-curricular and extra-curricular activities/programmes to be innovatively designed by the teachers concerned.

It may be kept in mind that affective education, in most of our teaching-learning situations, is imparted through integrated approach. The education of affects is taken up along with the cognitive education programmes. In the treatment of cognitive content or themes, the affective learning objectives are integrated. The teacher has to identify such integrated situations while dealing with the content related to cognitive learning objectives and devise suitable learning situations for realizing the affective objectives.

Teachers' own exemplar behaviour as well as those of the parents are important for affective education. These are essential for training the child in desired affects during the early phase of his/her education. The teachers can narrate appropriate learning episodes for training their learners in desired affective behaviour through role play and dramatization methods in simulated learning situations. Such exercises should however, not be in isolation of the general curricular programmes of the school.

One of the characteristic features of affective learning is that the development of any affect is a time consuming process. It cannot be easily acquired by most of the learners as one or a few slots learning like cognitive learning in majority of cases. Because it deals with the learner's behavioural change (feelings and emotions) the teachers need to be careful and closely vigilant for the gradual change taking place in the concerned affective behaviour of the learners for necessary follow up action and for providing them feedback. There may even be need for regular recording of such behavioural changes, which would necessitate regular observation of the learner's affective behaviour to be incorporated as an essential component of instructional strategies.

Martin and Reigeluth (1992) have cited some models of affective education programme such as, 'celebration of learning' (Lambert and Hinsl 1993), 'Mentorship Model For students at Risk' (Sapone 1989), 'Paths Project' (Greenberg and Kusche 1993). Out of these the programmes which suit the parameters of affective education may be considered and tried out in the designing and transaction of affective education at elementary and secondary school stages in the Indian context.

### Check Your Progress 7

**Note:** Write your answers in the space given below.

- 1) Expand the idea 'values are to be caught, not taught'.  
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- 2) What is the integrated approach in affective education? Give an example to illustrate.  
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- 3) Why does affective education need longer intervention?  
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- 4) What is meant by affect specific approach?  
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- 5) Why do most of the teachers fail to inculcate the desired affects among the students?  
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- 6) Briefly indicate the needs of exemplary behaviour of teachers and parents in affective education.  
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## 13.6 THE CONCEPT OF PSYCHOMOTOR LEARNING

The third type of learning described by Bloom is the psychomotor learning. This kind of learning involves motor, muscular activities. Just as in cognitive and affective learning, psychomotor learning also occurs in combination with the other two types of learning. It is demonstrated by physical skills which are acquired through practice in response to cues and stimuli from the surroundings. Riding a bicycle, driving a car, playing tabla,

kicking a ball, hitting a ball with a bat, typing, and drawing the sketch of a building are some of the examples of psychomotor learning.

Harrow (1972) has developed a taxonomy for psychomotor domain with six levels. It is arranged in order of simple observable movements to the most complex.

### **Reflex Movements**

These actions occur in response to stimulus without conscious awareness (e.g., blinking).

### **Basic Fundamental Movements**

Movements that are due to a combination of reflex movements (e.g., walking, climbing).

### **Perceptual Abilities**

Following stimuli into appropriate action (e.g., following verbal instruction, dodging a ball).

### **Physical Abilities**

Movements and abilities required for highly skilled movements. These movements have characteristics like endurance, strength, flexibility, and agility (weight lifting, distance running, yoga, typing).

### **Skilled Movements**

Complex body movements with a degree of proficiency (e.g., performing a classical dance, playing tennis, aerial swing stunts performed in circus).

### **Nondiscursive Communication**

This level of movements involve communication through teachings, needs, or interests to another individual (facial expressions and dance movements).

Another version of psychomotor domain is proposed by R.H. Dave (1968).

### **Imitation**

This is the lowest level of the objectives in the psychomotor domain. When children are exposed to observable situations, they attempt to imitate the action.

### **Manipulation**

This is the ability to perform certain actions by following instructions and practising. At this level children are able to differentiate between different sets of act and are able to select the required act.

### **Precision**

At this level the proficiency of performance reaches a higher level of refinement in producing a given act. The act becomes refined and more exact. At this level children reproduce an act without instruction or a model. They are able to introduce variations according to the requirements of situations.

### **Articulation**

This is about coordinating a series of actions, accomplishing harmony and internal consistency among different acts.

### **Naturalization**

Complex performance becomes natural at this level without using much psychic energy. The act is done without much conscious thinking. The act gets automatised and is carried out unconsciously.

Gagne proposed motor skills parallel to Bloom's psychomotor domain. Motor skills are physical capabilities to do such things as riding a bicycle, typing or using a music organ keyboard. However, motor capabilities do not develop in isolation of other areas of learning.

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## 13.7 ORGANISATION OF PSYCHOMOTOR LEARNING

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One tends to associate psychomotor learning with physical activities. Such an idea is valid too. The problem with such a perception is that psychomotor learning seems to take place in isolation of cognitive or/and affective learning. In fact, the cognitive/affective processes of learning are always present in any kind of psychomotor learning. Owing to the common perception about psychomotor learning, physical education is instantly recognized as psychomotor learning by anyone concerned with children's education. But there are various other activities that take place in school which come under the purview of psychomotor learning. In this section, let us discuss the organization of different psychomotor learning experiences provided in school.

### Physical Education Activities

Physical development of children is a crucial aspect of their overall development. The physical well being of the child is important for the cognitive development too, as the saying goes, a sound mind in a sound body. Sports, games, and athletics are some of the common physical activities taken up in school. Why should we organize physical activities for children? Is it because, children enjoy playing, therefore, we should create opportunities for them? That could be one reason. However, there are other reasons for organizing physical activities for children. Some of the objectives for conducting physical activities are:

- for physical fitness;
- for developing mind, body coordination;
- for developing discipline;
- for developing values of cooperation, fairness, healthy competition, respect for rules etc.;
- for developing appropriate attitude for working in team; and
- for developing leadership qualities.

While organizing physical activities teachers have to keep in mind some important considerations. Physical activity has to be selected according to the age group and physical development of the children. It is important to ensure that before taking up certain physical activities children have attained certain level of physical development. Otherwise such activities can be detrimental to the child's harmonious future development. For example, whether very small children should be allowed to run long distance that will tire and harm their muscles. Another point for consideration in selecting physical activities is that it should match with the cognitive development of the child. For example, to play football, throw ball, basket ball or cricket, children should have developed a sense of speed, time, direction and space. In unit 2, you have learnt that cognitive development is a process, and age maturation is a crucial factor. Therefore, if children who are not cognitively developed to handle the concepts of speed, time, direction and space are mixed with an older group of children who have attained those cognitive development, the younger children would not only find the game frustrating as they are unable to cope with but also may physically harm themselves as they would be unable to judge the nature of the ball and act accordingly (dodge the ball in order not to get hurt or hit or kick the ball with appropriate estimation). Another key

factor that teachers should keep in mind while organizing physical activities is the interest of the children. For various affect reasons, the child may prefer a particular sport/game to the other. Therefore, it is important to know the interest of the children and include different activities to involve all children. In brief, we can say that it is imperative to organize physical activities that are physically, cognitively and affectively appropriate. So, let us say, the following points should be kept in mind while organizing the physical activities:

- age appropriateness
- physical development
- cognitive development
- interest

### **Co-curricular Activities**

Earlier, any activity other than the textbook related activities was known as extra-curricular activity. Such activities included physical education as well as literary and cultural activities. Now, sports, games and athletics are described under physical education. And literary and cultural activities are by and large referred to as co-curricular activities. Many of the literary and cultural activities can be categorized under the domain of psychomotor learning. Here, too, often the three domains of learning are interwoven.

Literary activities are those activities that are related to literature. For example, debate, elocution, recitation, writing poetry/essay/plays/stories, study circle, film club and many such other activities come in the category of literary activities. Cultural activities include, music, drama, dance, folk songs, painting, religious, social and national festivals and many such activities. Cultural activities are based on our social and cultural traditions.

Before discussing the issue of organizing these activities in school, let us examine some of the objectives for conducting these activities in school.

- To develop interest in the past and contemporary world of literature.
- To understand and empathize with others feelings and emotions.
- To develop critical thinking.
- To develop the skill of collecting data or gathering information.
- To express one's feeling and emotions through different literary and art forms.
- To develop the skill of communication.
- To develop the skill of working in team.
- To develop the skill of planning and organizing.
- To develop values of empathy, cooperation, and appreciation for art, literature, tradition and culture.

The objectives stated here are not conclusive in nature. Knowledge of the objectives of conducting literary and cultural activities would help the teachers in organizing them. The following points may be considered for better planning and organization of these activities.

- Activities should be age appropriate.
- Activities should be planned taking into account the cognitive and affective development of the child. For example, to write a critical appreciation essay on a literary work, the child should have attained the cognitive development of critical thinking.

- Activities should be selected keeping in mind the varied interests of children.
- Some of the activities can be organized to enhance the curricular learning. For example, if a particular play is a curricular topic, activities along the line of staging the play can be organized. This will help in achieving objectives that are not directly addressed in the curriculum.
- Group as well as individual oriented activities should be organized.
- Activities should not only be organized inside school but also outside school to provide field experiences to students. Such field trips can be related to curricular subjects. For example, field trip/excursion may be organized to gain first hand experience of classroom learning, like collecting or observing artifacts presented in science or social science curriculum.
- Activities should be planned and organized in such a way that children are given responsibility and they participate in decision making activities.

In most schools, cognitive learning is the major focus of the school activities. However, you might have noticed during the discussion in this section that a lot of psychomotor learning occurs during the regular school activities and some planned activities. Teachers only need to revisit and reorganize the various activities in the school to interweave the three domains of learning in day to day school activities.

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### 13.8 LET US SUM UP

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The change in learner's behaviour related to the feelings like, love, sympathy, tolerance, co-operation, fellow feeling etc. refer to the affective development. Development in the affective domain of the individual accelerates his/her personal-social development. Change in the learner's affective behaviour is a very slow process. It needs prolonged well planned educational activities. In this context, the processes of both classical and operant conditioning and the approach using persuasive communication prove to be powerful methods. The change takes place gradually, proceeds from the initial phase of receiving to the formation of value complex through responding, valuing and organization. Various components of affective education can be included in the curriculum through integrated and affect specific approaches. Martin and Reigeluth considered seven primary issues like topics, orientation, breadth, integration, duration, personal focus, and instructional methods for affective curriculum. The teaching-learning programmes for affective education focuses on intrapersonal and interpersonal development. The teacher is supposed to help the students in the internalization of affects, the appropriate strategy for which needs long term intervention. Psychomotor learning is demonstrated by physical skills. It ranges from simple observable movements to the most complex. The cognitive/affective processes of learning are always present in any kind of psychomotor learning.

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### 13.9 UNIT END EXERCISES

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- 1) Suggest from your experience a graphical presentation to illustrate the hierarchical order in the development of affects.
- 2) Make a critical analysis of a curricular subject of your choice from any level of school education regarding the scope of affective and psychomotor education through the subject.
- 3) Plan out a scheme for affective education for the elementary level education in your state.
- 4) Make an analysis of the course content with regard to provision of affective education as prescribed in the subjects of language and social sciences for the secondary level education in your state, and make necessary suggestions for improvement.

- 5) Examine the issues concerning teacher education programme for preparing effective teachers for efficient transaction of affective education.
- 6) Prepare twenty items for an attitude scale to measure attitude of students in secondary grades towards transaction of affective curriculum.
- 7) Identify the cognitive and affective processes of learning involved in any kind of psychomotor learning you have organised for your students.

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## **UNIT 14 ASSESSMENT OF LEARNING**

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### **Structure**

- 14.1 Introduction
- 14.2 Objectives
- 14.3 Curriculum-Experience-Outcome Relationships
- 14.4 The Learning Outcomes
- 14.5 Approaches to Assessment of Learning
  - 14.5.1 Classroom Assessment
  - 14.5.2 Assessment of Concept
  - 14.5.3 Assessment of Generalisation
  - 14.5.4 Assessment of Attitudes
  - 14.5.5 Assessment of Values
  - 14.5.6 Assessment of Habits and Hobbies
- 14.6 Some Principles of Assessment
- 14.7 Integrating Approaches for Assessing Curriculum Based Learning
- 14.8 Let Us Sum Up
- 14.9 Unit End Exercises
- 14.10 References and Suggested Readings

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### **14.1 INTRODUCTION**

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As you know by now, learning in school is influenced by a number of factors and is of various types. If some learning is caused by teaching, since these are outcomes of planned interventions, there are also learnings, which are unplanned and incidental by nature. You know how essential it is to assess the planned learning outcomes, since improvement in teaching learning process depends to a great extent on the feedback received from assessment. When the outcomes of learning are of different types, their assessment also needs to be different from one another. This unit would help you to understand the nature and types of assessment of learning of different kinds.

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### **14.2 OBJECTIVES**

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After studying this unit, you should be able to:

- know the relationship between curriculum experience and learning outcomes;
- understand the varieties of learning outcomes;
- discuss the different approaches to assessment of learning;
- understand that different learning outcomes need to be assessed differently;
- explain the approaches to the assessment of learning of concepts, generalisations, attitude, value and habit;
- state the principles of assessment; and
- justify why curriculum based learning requires an integration of approaches to assessment.

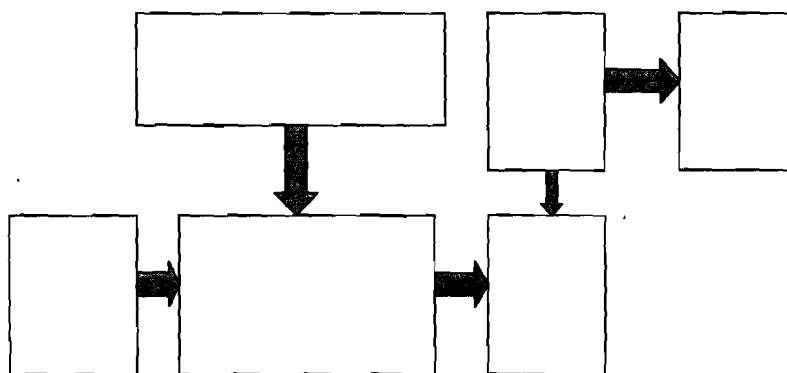
## 14.3 CURRICULUM-EXPERIENCE-OUTCOME RELATIONSHIPS

Though the primary purpose of this unit is to explore the ways and means of assessing learning in the context of a school, it would be appropriate to review our understanding of the related terms and concepts. The instructional activities of a school emerge from the *curriculum*. Stated broadly, curriculum is the *sum total of experiences to be provided by the school*. In other words, curriculum directs the nature and scope of *experiences* to be provided to the learners. The *learning experiences*, hence, are designed based on the curriculum with a view to achieve set curricular aims and objectives.

As you know assessment refers to a *measurement process* of the accrued learning. Assessment in the school context is undertaken in reference to the stated learning outcomes. Every learner enters a situation of learning with certain competencies and skills. Viewed from the perspective of instruction, *entry behaviour* of learners in an instructional situation refers to the specified competencies and skills necessary for him/her to profit from instruction. A teacher plans the learning experiences with a view to help the student achieve the instructional objectives and reach the terminal behaviour. The *terminal behaviour*, you may be aware, refers to the behaviour expected to be demonstrated by a learner after receiving a learning experience. Assessment then is necessary for a teacher and a learner to know whether the terminal behaviours, which are the outcomes of learning, are achieved or not. Since assessment is closely related to evaluation, it is better that we revisit our understanding of these two terms in order to achieve clarity. If assessment is the process of measurement of learning, evaluation is the process of making judgment about the value of the information/data collected through assessment. According to Gage and Berliner (1991), evaluation is "*the process of collecting, interpreting, and synthesizing information in order to make decisions*".

### In Text Activity 1

In this section, you have studied about a few terms and their relationship with each other. Given below is a diagram with blank boxes to be filled by you by selecting the appropriate terms. Use the above discussion to fill-in the boxes with suitable terms. A correctly filled-in diagram is given at the end of this unit.



**Note:** Terms to be used: Learning Experience, Evaluation, Entry Behaviour, Assessment, Curriculum, and Learning Outcomes.

### Check Your Progress 1

**Note:** Write your answers in the space given below.

- 1) What is the meaning of assessment?

.....

.....

.....

- 2) What is the relationship between curriculum and learning experiences?

.....

.....

.....

.....

- 3) What is the relationship between learning experiences and learning outcomes?

.....

.....

.....

.....

## 14.4 THE LEARNING OUTCOMES

As stated earlier, learning takes place in a variety of ways and in a variety of areas in a school. In this section, we will attempt to know the various types of learning that occur in school. You would agree that instruction is the antecedent condition for expected learning to occur in a school. Instructional objectives are common to all learners in a class. Hence, the teacher would expect certain common learning outcomes from instruction. While acknowledging that some amount of unanticipated learning occurs in school, the learning to be assessed by the teacher would have resulted from the planned instructional inputs provided in the school. Educationists use the term *achievement* to connote what a learner knows and what s/he can do after instruction.

Assessment, then is made of those behaviours that a learner is expected to exhibit after undergoing instruction. In other words, formal assessment in a school aims at measuring the extent to which the learners attain the instructional objectives. The teacher undertakes assessment to collect information *and performance evidence to prove that* a learner has actually achieved an instructional objective. You know that the information and performance evidence needed by a teacher are different for different kinds of learning, and these need to be gathered in different ways for assessing different types of learning. As mentioned earlier, this unit aims at discussing the ways of assessing different kinds of learning. As a pre-requisite let us now try to know the learning outcomes that need to be assessed in a school.

For a long time, schooling has been associated with the learning of three 'R's - Reading, Writing and Arithmetic. In other words, learning has been viewed as a process of acquiring these specific skills. Even though educationists do not hold this view any more, the belief prevails that schooling should aim at developing certain basic skills. A list of the basic skills to be learnt and what they probably would contain may read as follows.

**Reading:** *Identify relevant details, facts and specification; locate information in books/manuals and graphs; find meaning of unknown words; judge accuracy of reports; use computer to find information.*

**Writing:** *Write ideas completely and accurately in letters and reports with proper grammar, spelling, and punctuation; check, edit, and revise for accuracy and emphasis, use computer to communicate information.*

**Mathematics:** Use numbers, fractions, and percentages to solve problems; use tables, graphs, diagrams and charts; use computer to enter, retrieve, change, and communicate numerical information.

**Speaking:** Organize and communicate ideas clearly; speak clearly; select language, tone of voice, and gestures appropriate to audience.

**Listening:** Listen carefully to what person says, noting tone of voice, and other body language; respond in a way that shows understanding of what is said.

According to Benjamin Bloom, the learning outcomes are classified under three domains viz., cognitive, affective and psychomotor. Also, learning under each of the three domains is viewed as hierarchical in nature.

The word cognitive is derived from the Latin term '*cogito*', which means 'I think'. It refers to the intellectual functioning of an individual. As you know, the human brain is capable of structuring, perceiving patterns, recalling associations, creating patterns, etc. Cognition involves mental processes of perception, memory, judgment, and reasoning.

Specifically stated, the cognitive domain involves working with and processing facts, procedures, concepts, generalisations and other universals that are used in the intellectual functioning of an individual. The affective domain is concerned with the manner in which we deal with things emotionally - our feelings, appreciation, enthusiasm, motivations, beliefs, attitudes and values. Whereas, the psychomotor domain deals with physical movement, coordination, and use of motor skills necessary in performing an activity, task or job.

### ***In Text Activity 2***

You know the different levels at which learning can take place in the cognitive, affective and psychomotor domains. Recall and list them in the table given below:

| <i>Cognitive Domain</i> | <i>Affective Domain</i> | <i>Psychomotor Domain</i> |
|-------------------------|-------------------------|---------------------------|
|                         |                         |                           |
|                         |                         |                           |
|                         |                         |                           |
|                         |                         |                           |
|                         |                         |                           |
|                         |                         |                           |

### **Check Your Progress 2**

**Note:** Write your answers in the space given below.

- 1) Fill-in the blanks with suitable words/terms
  - a) ..... are common to all learners.
  - b) Learning outcome to be ..... occurs due to planned instructional inputs provided by the teacher.

- 2) What is the purpose of assessment?

.....

.....

.....

- 3) Classify the following learning outcomes into cognitive, affective and psychomotor domains by writing "C", "A" or "P" in the space provided:

- Liking for learning of mathematics .....
- Remembering the historical events .....
- Writing the procedure of an experiment .....
- Verifying the property of a substance in the laboratory .....
- Completing an assigned task on time .....
- Drawing an equilateral triangle .....
- Drawing inference from an observation .....
- Preparing an exhibit .....

## 14.5 APPROACHES TO ASSESSMENT OF LEARNING

We have discussed so far that various types of learning take place in the school and the teacher undertakes the assessment to know the extent of learning occurring as a result of instruction. Since there are different types of learning, the same approach can not suit the assessment of all types of learning. In this section, we shall explore how a teacher assesses learning of facts, concepts, associations, generalisations, habits and attitudes. Each of them is discussed under separate sub-sections. But before doing so, let us review our understanding of a few related concepts and ideas.

### 14.5.1 Classroom Assessment

Broadly speaking, three issues are important for assessment, or data collection with regard to student learning in the classroom.

- I) The issue concerned with *the data* we will use for making judgments, which is the area of assessment and measurement.
- II) The issues concerned with *the reference* to be used for making evaluations based on the assessment, and
- III) The issues connected with the *tools and techniques* used for assessment.

#### The Data

The issue of data is closely linked to the process you will adopt for assessing the learning of your students. The data indicate whether learning has occurred or not. These may occur in terms of changes in quantity or quality. If these consist of the marks obtained on an achievement test these are quantitative, while the observations and records of behaviours of a learner are qualitative. The assessment involves three steps.

- i) Identifying and defining the quality or attribute that is to be measured.
- ii) Determining the set of operations that may represent the attribute in manifest and perceivable form.
- iii) Establishing the procedures for assessing the attribute.

### The Reference

An assessment requires a reference that is used for comparison. An assessment can take two forms based on the reference used for it. For example, the statements "X is taller than Y" and "X is tall enough", references are not the same. In the first statement, assessment is made with reference to the height of another person. In the second statement, the reference is to an external criterion. The first statement uses the height of someone else as the "norm". It is known as "normative assessment". If a teacher states that Raju is the brightest child in the class, it is a normative statement in which the standard being referred to is the ability of the class. The height mentioned in the second instance is a general reference for comparison. This kind of assessment is "criterion-based". Criterion-referenced testing is done when we want to know how much a student has learnt vis-à-vis a given standard, while norm-referenced testing is done when we want to know how one student or group of students compares with other students in terms of the content being tested. If the purpose of criterion referenced assessment is to find out how much students know before and after the instruction, the purpose of the normative assessment is to rank each student with respect to the achievement of others in broad areas of knowledge or to discriminate between high and low achievers.

### Tools and Techniques

Assessment data are generally collected by using one or more of the following tools/techniques:

- 1) *Paper/pencil Tests*: These include self-reports, interviews, questionnaires, tests or other instruments used in the collection of data.
- 2) *Systematic observation*: In this technique the teacher looks for specific actions or activities, but is not involved in the actions being observed.
- 3) *Participant observation*: Here the teacher is actively involved in the process being described and writes up her observations at a later time.
- 4) *Clinical Tools*: Data are collected here in a clinical, one-to-one situation and unlike the above may require the teacher to have some special training.

### 14.5.2 Assessment of Concept

You have studied earlier the meaning of a concept and the way in which a concept is learnt. Let us recall what is meant by a concept. From the list below, tick mark those items that pertain to the meaning of concept.

- It is a general idea. ....
- It is either true or false. ....
- It represents a class or group of instances. ....
- It may or may not have a definition. ....
- Instances given have at least one common characteristic. ....
- It needs to be verified through experimentation. ....

Since you are already aware of the meaning of a concept, you would have ticked the responses correctly. If you are not sure, you may verify the correctness of your response in the light of the information given below.

- Concepts are the means by which we organise information in our minds.
- Concepts may be viewed as categories in which we group phenomena within our experience.
- A concept is a general idea, usually expressed by words, which represents a category, class or group of people, things, actions or relationships having certain common characteristics called attributes.
- Every concept has five elements: name, definition or rule, examples or instances, attributes, and attribute value.

In the context of a school and the classroom, students learn several types of concepts. One way in which the concepts are learnt in school can be grouped as follows:

- Concepts that a student learns incidentally with minimal help from others,
- Concepts which are not discipline based, but, teachers feel they have to develop, and
- Concepts that are derived from disciplines of knowledge.

Out of the three groups of concepts learnt by students in the context of a school, can you identify the group, which is the focus of teacher assessment? You may be right in identifying that the teacher assesses the second and the third group of concepts. Let us discuss how these concepts are assessed.

You would agree that the assessment of concepts learnt by students must be based on the way they have learnt them. Since students learn the concepts by studying the examples and non-examples, identifying attributes, arriving at a definition by using the essential attributes and giving a name, the assessment of a concept could be done by:

- 1) Seeking examples through the process of recall or recognition;
- 2) Asking students to identify a non-example from a given list;
- 3) Seeking the characteristics/attributes of a concept;
- 4) Asking students to identify similarities and differences between two related/unrelated concepts;
- 5) Asking them to supply either part or full definition of a concept.

In other words, concepts can be assessed by paper and pencil tests consisting of different types of items depending on the aspect of concept learning that is being tested.

### Check Your Progress 3

**Note:** Write your answers in the space given below.

Given below are a few items. Identify the items that test any of the five types of responses mentioned above. Place a 'v' mark in the space provided if you consider that it tests the learning of a concept. Also, write the type of response elicited by the item in front of it.

- |                                                                |                          |       |
|----------------------------------------------------------------|--------------------------|-------|
| a) Differentiate between weight and mass of a substance.       | <input type="checkbox"/> | ..... |
| b) Describe the process of preparing oxygen in the laboratory. | <input type="checkbox"/> | ..... |
| c) State the meaning of an 'adjective'.                        | <input type="checkbox"/> | ..... |

|                                                                    |                      |       |
|--------------------------------------------------------------------|----------------------|-------|
| d) Give any three examples for "Mountain range".                   | <input type="text"/> | ..... |
| e) State how would you prove that hydrogen is lighter than air.    | <input type="text"/> | ..... |
| f) Mark 'Delhi' on the map of India.                               | <input type="text"/> | ..... |
| g) What is the similarity between a rectangle and a parallelogram? | <input type="text"/> | ..... |
| h) List the properties of a metal.                                 | <input type="text"/> | ..... |

### 14.5.3 Assessment of Generalisation

As you know that much of the learning at school takes place in the form of concept learning and generalisations, it is important to know a little about generalisations too. *Generalisations* refer to relationships between two or more concepts or statements about a concept.

#### *In Text Activity 3*

Identify and place a tick mark '✓' against those statements below that are generalisations:

- 1) Sun rises in the east. ....
- 2) Temperature rises with increase in pressure. ....
- 3) Sum of the three angles of a triangle is  $180^\circ$ . ....
- 4) I like flowers. ....
- 5) A rectangle has four sides. ....
- 6) It is better to be late than never. ....
- 7) Sam is shorter than John. ....
- 8) Delhi is the capital of India. ....
- 9) Exploitation is the main cause of revolution. ....
- 10) Increased human activity leads to environmental degradation. ....

As you are aware, generalisations are made based on a set of observations, evidences, events, and examples. A learner can find certain common feature/s in them and make a general statement. When observations and evidences are limited, the generalisation made is tentative, but subsequently available evidence can be used to help the learner to validate the generalisation drawn. In other words, generalisations are abstractions made from concrete experiences. Since these are abstract, generalisations are assessed through paper/pencil test. In such a test, you could either ask for the generalisation directly as in the case of the statement of a law or principle, or it could be tested indirectly by asking for instances, reasons and applications.

### 14.5.4 Assessment of Attitudes

As stated earlier, learning in the school is influenced by various factors and is of various types. If some learning is caused by teaching, these are outcomes of planned

interventions, the others may be unplanned and incidental by nature. Children acquire attitudes towards various 'psychological objects' in the environment of a school. Their attitude towards what they learn and how they learn, towards teachers and peers, and towards the school and schooling are acquired in the school environment. Teachers do aim at developing certain attitudes through 'planned curricular experiences'. For instance, a science teacher may aim at developing a scientific attitude in her students whereas a language teacher may aim at literary attitude. Students learn some other attitudes informally and through 'unplanned experiences'. Attitude towards peers, particularly those belonging to a different gender, language, class or caste group than that of a learner, are acquired and/or strengthened in the environment of a school.

Did you have the same attitude towards all subjects you studied in the school? This is not likely because you would not have shown the same keenness or preference for studying all subjects. Similarly, did you have the same attitude towards all your teachers? It may not be true again, since a student shows normally differential preferences towards different teachers. You would agree that one's attitude is an outcome of one's experiences and hence, differences in experiences lead to differences in attitudes.

Attitudes, as you know, are usually defined as a disposition or tendency to respond positively or negatively towards a certain psychological object (idea, object, person, situation). They encompass, or are closely related to, our opinions and beliefs and as stated above, are based on our experiences.

It is generally held that attitudes are composed of affective, cognitive and behavioral components. Hence, measurement of attitude could be done through one or more types of such components. Also, the presence of these components poses some problems in understanding and hence measurement of attitudes. And, of course, we can't directly observe them – we can only ask people or infer their attitudes from what they do.

Since attitudes refer to the degree of one's feeling, the measurement of attitudes is done by using rating scales. An attitude scale is constructed following one of the two techniques, namely, the Likert's technique or the Thurstone's technique. The Likert technique requires the presenting of a set of attitude statements to the subject/s along with a response format- usually five points. Subjects are asked to express agreement or disagreement to a statement on a five-point scale. Each point representing the degree of agreement is given a numerical value from one to five (in an ascending/descending order)). Thus a total numerical value can be calculated by adding up all the responses.

Both of these techniques require you to write statements that indicate degree of your feeling towards the psychological object represented. It is necessary to remember that the statements should not be mere facts. Say, if you are constructing an attitude scale for measuring attitude of students towards school, some of the statements that may measure this attitude could be:

- 1) My school is one of the best in the town.
- 2) I wish I had attended some other school than this.
- 3) My school is just as good as any other school.
- 4) I feel that the life of the students can be made better in this school.

Having a large number of such statements, the students are provided with a five-point scale to indicate their agreement. Given below is an example of what an attitude scale would look like.

For each of the statements below, please indicate the extent of your agreement or disagreement by placing a tick '✓' in the appropriate column.

|                                                                     | Strongly Agree | Agree | Neither Agree nor Disagree | Disagree | Strongly Disagree |
|---------------------------------------------------------------------|----------------|-------|----------------------------|----------|-------------------|
| 1) Criminals convicted for murder should be hanged.                 |                |       |                            |          |                   |
| 2) There should be a scope for reformation of the convicted person. |                |       |                            |          |                   |

It's generally a good idea to run a pilot survey so as to eliminate any ambiguous statements, negative statements or statements which might seem unduly 'leading' in a particular direction, such as the use of the word 'criminals' in the example above. In principle, it may be a good idea to run the test on a group whose attitudes are known. For example, you would expect the students who are performing well and participate in other activities in their school to have a positive attitude towards the school. If they do not show positive attitude, there may be something unexpected/incorrect in your survey. If they do, then your test is appropriate. In practice, though, it is not always possible to find such a group. You may also like to ensure that an expert in the field you are dealing can check out the content validity of your questionnaire. This would help in establishing that the content of the scale is measuring what you are trying to measure (attitudes).

#### 14.5.5 Assessment of Values

As told earlier, the learning outcomes in the cognitive domain focus on the intellectual development related goals of the school, while those related to the development of students' feelings, attitudes, values and emotions are in the *affective domain*. Lorin Anderson and Jo Anderson (1982) described some of the affective goals and the affective measurement techniques in the classroom. They pointed out that attributes like honesty and truthfulness are ends in themselves, whereas goals like positive attitude towards mathematics or science instruction may be viewed as means toward an end.

You know that values, as educational outcomes, are classified under the affective domain. You can recall from earlier discussion that *Receiving (attending), Responding, Valuing, Organisation, and Characterisation by a Value or Value Complex* are the five major categories in this domain. If taken through each category of the taxonomy, the learner would begin by willing to receive a particular attitudinal or value position and would conclude by incorporating or internalising this position into his her life style.

Some examples, cited in Orlich and others (1985), of the learning outcomes under these categories are given below.

##### Receiving or Attending

- Students will listen to and not have any ill feelings towards other students who disagree with their own point of view.
- Students will be willing to learn about the teachings of the religions other than their own.

##### Responding

- Students will develop an appreciation for poetry, so that during a free reading period they will select a book of poetry as one of their choices.

**Valuing**

- Social studies students will learn to value the democratic process, so that in a school election they will not only vote but will also urge others to do the same.

**Organisation**

- Students will learn the importance of good study habits and will demonstrate this by organising their free time, both in school and out of it, so as to complete their assignments.

**Characterisation of a value or value complex**

- Students will learn to value honesty and will show this by monitoring their own behaviour on tests and assignments and by discouraging others from cheating.
- Students will value the importance of free speech in a society and will demonstrate this by protecting the rights of others-including those they disagree with.

**Check Your Progress 4**

**Note:** Write your answers in the space given below.

- 1) Getting a student to listen to a value is the first step to getting her or him to act on that value. (True / False)
- 2) Categorise the following statements as cognitive or affective by inserting C or A as the case may be.
  - a) Given a list of ten words, the student will identify all ..... of the five that are nouns.
  - b) The student will follow classroom rules as ..... prescribed by the teacher.
  - c) The student will recite the preamble to ..... the Constitution of India.
  - d) In an unsupervised classroom setting, the student ..... will use objectives to plan for instruction at least three times per week.
  - e) The student will listen to others and use their ideas ..... in her/his comments during a discussion.

Now that we have reviewed the learning outcomes in the affective domain, you would agree that the assessment of values learnt by the students is done differently from the learning outcomes in the cognitive domain. Whereas the cognitive outcomes are assessed using written tests, the assessment of a value requires observation of behaviours of students in situations where a value manifestation is possible. Hence, techniques such as "rating scale" are more appropriate for assessment of values. A teacher could also create "life-like situations" for students to participate and undertake an analysis and assessment of behaviours indicating values held by the students. Since creating life-like situations or undertaking anecdotal observation is difficult, if not impossible, paper-pencil instruments called "inventories" are frequently used for assessing values. A value inventory may either present statements to students for showing their agreement or disagreement or may present a written situation or episode and ask students to respond to them by indicating *what they would do* or *what should be done* in those situations. Assuming that the respondent does the same thing even in real life situations, the values held by them are inferred. You might be thinking whether a respondent would always state the true response or whether they would fake their responses on such instruments. It is true that the assessment of values based on inventories, unlike direct observation, suffers from faking or response in the direction

of those that are socially desirable. However, the likelihood of faking of responses can be somewhat controlled if the tool is subjected to standardisation.

### 14.5.6 Assessment of Habits and Hobbies

A habit, as you know, refers to that behaviour which one acquires through repetitive practice. Though one would be aware and analytical at the time of its acquisition, upon becoming a habit, one tends to perform it mechanically. For example, the fact that most of us use our right hand for certain activities such as writing is habitual. The ways in which we talk, walk, stand or sit are all habitual. In other words, most of our psychomotor behaviours are acquired through repetitive practice and have become habits. Similarly, the fact that we do certain things at certain times and in certain ways is due to our cultural habits.

#### *In Text Activity 4*

Write any three habits which are acquired by students in the school environment.

- 1) .....
- 2) .....
- 3) .....

You would have identified correctly the habits such as standing while answering to a question in the classroom or social habit such as wishing a teacher who is passing by as the habits acquired in the school environment.

Apart from certain habits that are either acquired or fostered by a school, most schools aim at nurturing or developing hobbies among students. A hobby, unlike a habit, refers to an activity which one enjoys doing and often finds time to undertake. They are, in a way, the avocation of an individual. A school plans and provides for the learning of several academic, subject centric or personal avocations. Photography, painting, writing poetry or stories, bird watching, stargazing are some of the hobbies which a school may seek to develop in the students.

A teacher, who attempts at developing a set of habits and hobbies in students, needs to assess them to know whether the students have acquired them. In the lower classes, for example, a teacher may have to assess 'regularity in work' or 'cleanliness' as a habit. Study habits related to time and place of study, preparedness for study are important for benefiting from what one studies. A teacher may wish to know and correct them as well.

Habits and hobbies are usually assessed either by *observation* or by administering a *questionnaire* or *checklist*. Habitual behaviours in areas such as regularity, punctuality, cleanliness, interpersonal and social skills can be observed over a period of time or periodically by the teacher and rated. Whereas those that may not be accessible for observation such as study habits and hobbies are assessed using questionnaire or checklist. Given below are a few items that measure study habits of students.

#### *Study Habits Checklist (sample)*

For each of the following questions, read them carefully and put a tick mark (✓) if it applies to you. If not, put a cross mark (×)

- Do you study outside of class every day? .....
- Do you complete your assignments on the day they are assigned? .....
- Do you review regularly what is taught in each class? .....
- Do you survey a lesson or chapter before reading it in detail? .....

As you read a lesson, do you have questions in mind that you are actually trying to answer? .....

Do you keep a calendar for listing the due dates for submitting assignments? .....

Do you try to learn what you get wrong on a test? .....

**Study Habits Questionnaire (sample)**

|    |                                                                             | Always | Sometime | Never |
|----|-----------------------------------------------------------------------------|--------|----------|-------|
| 1) | Are you distracted by phone, computer, or TV, in the place where you study? |        |          |       |
| 2) | Do you get up in between your study?                                        |        |          |       |
| 3) | Do you have the habit of eating snack during study?                         |        |          |       |
| 4) | Do you take breaks when you study?                                          |        |          |       |
| 5) | Do you study while lying on the bed?                                        |        |          |       |
| 6) | Do you need music when you study?                                           |        |          |       |
| 7) | Do you keep all study related things ready for study?                       |        |          |       |

**In Text Activity 5**

Write three questions, the responses to which would indicate a habit learnt in the school environment.

- 1) .....
- 2) .....
- 3) .....

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## 14.6 SOME PRINCIPLES OF ASSESSMENT

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A teacher needs to undertake assessment during as well as at the end of instruction as part of formative and summative evaluation. While doing so, one needs to keep in mind the following principles of assessment discussed by James H. McMillan (2000).

**Assessment is a process of making judgment**

A teacher needs to make interpretations and decisions in the construction of test questions, scoring responses, grading participation and interpreting of the behaviors.

**Assessment is based on principles of measurement and evaluation**

For effective assessment, you need to know the difference between evidence and measurement i.e. differentiating degrees of a trait by description or by assigning scores and evaluation, which involves interpreting the description or scores. Moreover, you may also need a conceptual understanding of the statistical techniques for such tasks as interpreting student strengths and weaknesses. Schafer (1991) states that these concepts and techniques comprise part of an essential language for educators. They also provide a common basis for communication of results, interpretation of evidence, and appropriate use of data.

**Assessment can influence student learning**

You would agree that the nature of assessment would influence what is learned and also the degree to which they are meaningfully engaged in the learning process. Assessments should not be limited to finding out the extent to which learning has occurred. It should also provide feedback to the students and opportunities for improvement. While using a particular type of assessment, a teacher may confront questions such as, "Will students be more interested if assessment is problem-based?", "How do students study when they know the test consists of a certain type of items such as multiple-choice items or short answer-type?", "How and in which form should feedback be given?" and "In what way does assessment affect student effort?"

**Assessment may be erroneous**

Teachers need to know that there is error in all classroom assessments. It is possible that the specific type of assessment used may under or over estimate the learning.

**Good assessment enhances instruction**

It has been stated above that the assessment affects student learning. It also has an influence on the nature of instruction in the classroom. When assessment is integrated with instruction, it informs teachers about the nature of activities and assignments that may prove to be useful, the level at which teaching is needed, and the areas of instruction that have not resulted in the requisite learning. During instruction, informal, formative assessment helps teachers to know when to proceed, when to ask more questions, when to give more examples, and how to respond to student questions.

**Good assessment requires multiple methods**

Assessment that is fair, leading to valid inferences with a minimum of error, is a series of measures that show student learning through multiple methods. Experts emphasise that important decisions should not be made on the basis of a single test score. A teacher should understand the entire range of assessment techniques and methods and their limitations.

To summarize, what is most essential about assessment is an understanding of how assessment principles and ideas can be used to enhance the student learning and teacher effectiveness. This will be achieved if teachers learn about conceptual and technical aspects of assessment for both large-scale and classroom assessments.

**Check Your Progress 5**

**Note:** Write your answers in the space given below.

Fill in the blanks, to state the principles of assessment.

- 1) Assessment is a ..... of making judgment.
- 2) Assessment is based on principles of .....and .....
- 3) Assessment can influence .....
- 4) Assessment may be .....
- 5) Good assessment ..... instruction.
- 6) Good assessment requires .....

## 14.7 INTEGRATING APPROACHES FOR ASSESSING CURRICULUM BASED LEARNING

A fundamental change in thinking about the nature of instruction was initiated in 1963 when John B. Carroll argued for the idea of mastery learning. Mastery learning suggests

that the focus of instruction should be the time required for different students to learn the same material. This contrasts with the classic model in which all students are given the same amount of time to learn with a view to identify the differences in ability. Carroll even redefined aptitude as primarily a measure of time required to learn.

The key elements in mastery learning are: (1) clearly specifying what is to be learned and how it will be evaluated, (2) allowing students to learn at their own pace, (3) assessing student progress and providing appropriate feedback or remediation, and; (4) testing that learning has been achieved.

You have studied in this unit that several learning outcomes are to be achieved by a school directly or indirectly. You also know by now that there are several types of learning and hence what needs to be assessed is different. Looking at this from the perspective of mastery learning, a teacher needs to undertake assessment both at the formative as well as at the summative stage of instruction. Therefore, one needs more than one test or more than one way of testing to ensure that the validity of assessment is not affected. In other words, a teacher should be able to integrate the approaches used for assessing the learning that accrues from implementing a curriculum. This is possible only when a teacher has a definite plan or assessment or when he/she has a blue print of it. This would not only take away the chance factor in assessment but would also ensure that the assessment is comprehensive. Such a plan would also specify the way out of the several that could be employed for assessing a particular type of learning. Observation, checklist, anecdotal notes, teacher/student conference notes, rating scales and achievement tests are the main ways through which a teacher assesses the learning outcomes. Lastly, the plan must consist of guidelines for what to observe and evaluate.

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## 14.8 LET US SUM UP

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Assessment refers to *the measurement process* of the accrued learning. It is necessary for a teacher and a learner as it helps to know whether the terminal behaviors, which are the outcomes of learning, are achieved or not. Since instructional objectives are common to all learners in a class, the teacher would expect certain common learning outcomes from instruction. A teacher undertakes assessment to collect *knowledge and performance evidence* that a learner has actually achieved an instructional objective. As you are aware, learning outcomes are classified under three domains viz., cognitive, affective and psychomotor. The cognitive domain involves working with and processing facts, procedures, concepts, generalizations and other universals that serve in intellectual functioning of an individual. The affective domain is concerned with the manner in which we deal with things emotionally - our feelings, appreciation, enthusiasms, motivations, beliefs, attitudes and values. The psychomotor domain deals with physical movement, coordination, and use of motor skills necessary in performing an activity, task or job.

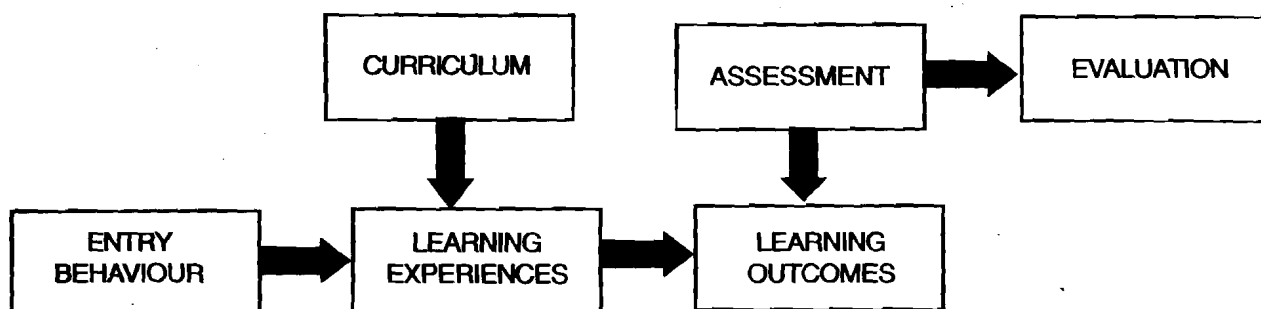
The *data*, the *reference* and the *tools and techniques* are the three important issues in assessment. Assessment of concepts learnt by students is required to be based on the way they have learnt them. Hence, the assessment of a concept could be done by: seeking examples through the process of recall or recognition; asking them to identify a non-example in a given list; seeking the characteristics/attributes of a concept; asking students to identify similarities and differences between two related/unrelated concepts; asking them to supply either the part or full definition of a concept. *Generalizations* are relationships between two or more concepts or statements about a concept. Generalizations are assessed through paper/pencil test, by asking for the generalization directly as in the case of the statement of a law or principle, or it could be tested indirectly by asking for instances, reasons and applications. Attitudes are usually defined as a *disposition or tendency* to respond positively or negatively towards a certain *psychological object*. We can not directly observe them. We can only ask people, or

infer their attitudes from, what they do. Since attitude refers to one's degree of feeling, the measurement of attitude is done on a rating scale. A habit refers to that behavior which one acquires through repetitive practice. Habits and hobbies are usually assessed either by *observation* or by administering a *questionnaire* or *checklist*. Some of the principles of assessment are: assessment is a process of making judgment, assessment is based on principles of measurement and evaluation, assessment can influence student learning, assessment may be erroneous, good assessment enhances instruction, and good assessment requires multiple methods.

### Responses to in Text Activity

#### In Text Activity 1

In this section, you have studied about a few terms and their relationship with each other. Given below is a diagram with blank boxes to be filled by you by selecting the appropriate terms. Use the above discussion to fill-in the boxes with suitable terms. A correctly filled-in diagram is given at the end of this unit.



#### In Text Activity 2

You would have filled the table as shown below.

| <i>Cognitive Domain</i> | <i>Affective Domain</i> | <i>Psychomotor Domain</i> |
|-------------------------|-------------------------|---------------------------|
| Knowledge               |                         |                           |
| Comprehension           |                         |                           |
| Application             |                         |                           |
| Analysis                |                         |                           |
| Synthesis               |                         |                           |
| Evaluation              |                         |                           |

#### In Text Activity 3

- 1) Sun rises in the east. ....
- 2) Temperature rises with increase in pressure. .... ✓
- 3) Sum of three angles of a triangle is  $180^\circ$ . .... ✓
- 4) I like flowers. ....
- 5) A rectangle has four sides. .... ✓
- 6) It is better to be late than never. ....
- 7) Sam is shorter than John. ....
- 8) Delhi is the capital of India. ....
- 9) Exploitation is the main cause of revolution. .... ✓
- 10) Increased human activity leads to environmental degradation. .... ✓

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## 14.9 UNIT END EXERCISES

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- 1) Select a grade & subject of your choice and make a list of all learning outcomes to be attained in the course of its teaching.
  - 2) Select a topic of your choice and prepare a test to measure the concepts contained in it.
  - 3) Select a question paper of your choice and identify what learning is assessed by each of the items contained in it.
  - 4) Prepare a tool and survey the study habits of students of a class.
- 

## 14.10 REFERENCES AND SUGGESTED READINGS

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## UNIT 15 CURRICULUM BASED LEARNING

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### Structure

- 15.1 Introduction
- 15.2 Objectives
- 15.3 School Curriculum
  - 15.3.1 School Subjects in Curriculum
  - 15.3.2 Level Specific Curricula
- 15.4 Learning Languages
  - 15.4.1 Primary Stage Language Learning
  - 15.4.2 Upper Primary Stage Language Learning
  - 15.4.3 Secondary Stage Language Learning
  - 15.4.4 Methodology and Instructional Strategies
- 15.5 Learning Mathematics
  - 15.5.1 Primary Stage Math Learning
  - 15.5.2 Upper Primary Stage Math Learning
  - 15.5.3 Secondary Stage Math Learning
  - 15.5.4 Values in Learning Mathematics
  - 15.5.5 Teaching-Learning Strategies for Mathematics
- 15.6 Learning Science and Technology
  - 15.6.1 Primary Stage Science Learning
  - 15.6.2 Upper Primary Stage Science Learning
  - 15.6.3 Secondary Stage Science Learning
  - 15.6.4 Teaching-Learning Strategies for Science and Technology
  - 15.6.5 Process and Skills Based Science Curricula
  - 15.6.6 Attitudes and Values through Learning Science
- 15.7 Learning Social Sciences
  - 15.7.1 Primary Stage Social Science Learning
  - 15.7.2 Upper Primary Stage Social Science Learning
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  - 15.7.4 Values and Attitudes through Learning Social Sciences
- 15.8 Art Education
  - 15.8.1 Art Education at Primary Stage
  - 15.8.2 Art Education at Upper Primary Stage
  - 15.8.3 Art Education at Secondary Stage
  - 15.8.4 Values and Attitudes through Art Education
- 15.9 Learning for Mastery
- 15.10 Let Us Sum Up
- 15.11 Unit End Exercises
- 15.12 References and Suggested Readings

## 15.1 INTRODUCTION

School education is a formally organized, planned and sequential exercise. It is based on school curriculum. As you will learn later, curriculum is a formal means of providing planned learning experiences to students enabling them to acquire knowledge of various school subjects. The study of subjects helps learners in understanding their physical and social environment and the operating processes. You will also learn that the process of education starts with the set of objectives that educationists consider worth learning. These objectives define and describe curriculum-based learning.

This Unit will help you to understand the concept of curriculum and subjects included in school curriculum in most parts of the world. The entire school education has been viewed as a set of three stages viz., primary, upper-primary and secondary, the last one including secondary and senior secondary. Each of these stages lays foundations for curriculum-based learning at the next higher stage. Thus the stages represent the major divisions of what otherwise is essentially continuous school education (classes I-X / XII). Many educationists these days refer to the first two stages (viz., the primary and the upper-primary) as elementary stage. We have used the names of the stages as given in the National Curriculum Framework for School Education (2000), commonly referred to as NCFSE. The Unit ends with a description of what is learning for mastery and how it can be promoted.

## 15.2 OBJECTIVES

After studying this unit, you should be able to:

- describe the concept of school curriculum and its determinants;
- list various subjects that children study at various stages of school education;
- describe the nature and importance of various subjects in school curriculum;
- describe the difference in focus related to various stage-specific objectives of subjects in school curriculum;
- explain the attitudes and values specific to various subjects in school-curriculum based learning;
- describe stage-specific methodologies and techniques of teaching various subjects; and
- explain learning for mastery and how to promote it.

## 15.3 SCHOOL CURRICULUM

The literal meaning of 'curriculum' has been derived from the Latin word for 'a racetrack or a course to be run' as "a course of study". The concept of school curriculum can be best described as "the set of all activities designed within the school to promote the intellectual, emotional, social and physical development of the pupils". The school curriculum includes the formal and informal activities and also the features of the school programme that reflect its 'ethos'. All teaching and learning activities including teaching styles influence the transaction of curriculum; hence these also form part of the concept of curriculum and its practice. The various components and activities that constitute the school curriculum support and strengthen the attainment of its objectives.

According to Stenhouse (1972), a school curriculum consists of knowledge, techniques (including 'skills') and values that are considered relatively more desirable for children to learn. Since the entire corpus of knowledge, all techniques and all values cannot be put in a single curriculum, every curriculum is selective in terms of what is to be

included/excluded in it? "How should this selection be made? What to include and exclude in the curriculum?-these have become controversial aspects of curriculum construction. Questions like "Who would decide what knowledge should be included in a social curriculum? What considerations lie behind these decisions? Which values should be selected and included in a school curriculum?" are not easy to answer. Incidentally, the debate about the opposing views on school curriculum, and for that matter any educational curriculum is as old as Aristotle. In Chapter II of Book VIII of The Politics, it has been mentioned that " .... there are no generally accepted assumptions about what the young should learn, either for their virtue or for the best life; nor yet is it clear whether their education ought to be conducted with more concern for the intellect or for the character of the soul ... It is by no means certain whether training should be directed at things useful in life, or at those most conducive to virtue, or at exceptional accomplishment". The debate continues and the issues have multiplied and the differences have become now wider than ever.

Further, irrespective of the curriculum and the process of developing it, there is always a "hidden curriculum". The "hidden curriculum" refers to what has not been explicitly stated, and yet gets passed on to children through the processes of education. For example, a variety of gender biases, gender stereotypes, social class specific biases illustrate what a hidden curriculum can support and promote.

What considerations determine the shape and direction of the curriculum? This is an important question. First, it is the society as it exists and how it can be maintained at its present level of development. The second factor relates to the vision of good society towards which the society is moving and trying to evolve itself. The third factor relates to the needs and aspirations of the individuals for whom the curriculum is meant. Since human beings are not just objects but beings with free will, likes and dislikes, their career goals and life aspirations should be facilitated by the curriculum. The fourth factor relates to preserving and further defining the identity of the nation, whose people would be educated through the curriculum. Such a curriculum is known as "the national curriculum". The fifth factor includes the philosophical considerations related to the goal of human life, the nature of 'what constitutes good life; and values that are abiding and eternal or utilitarian. The sixth factor is related to the psychological views about the process of learning and what children can learn easily depending upon their developmental stage. This factor determines 'what' can and should be taught to children of a particular age group and how. These six factors together determine the shape and the thrust of curriculum. These factors have been shown in the form of a diagram in Fig. 15.1.

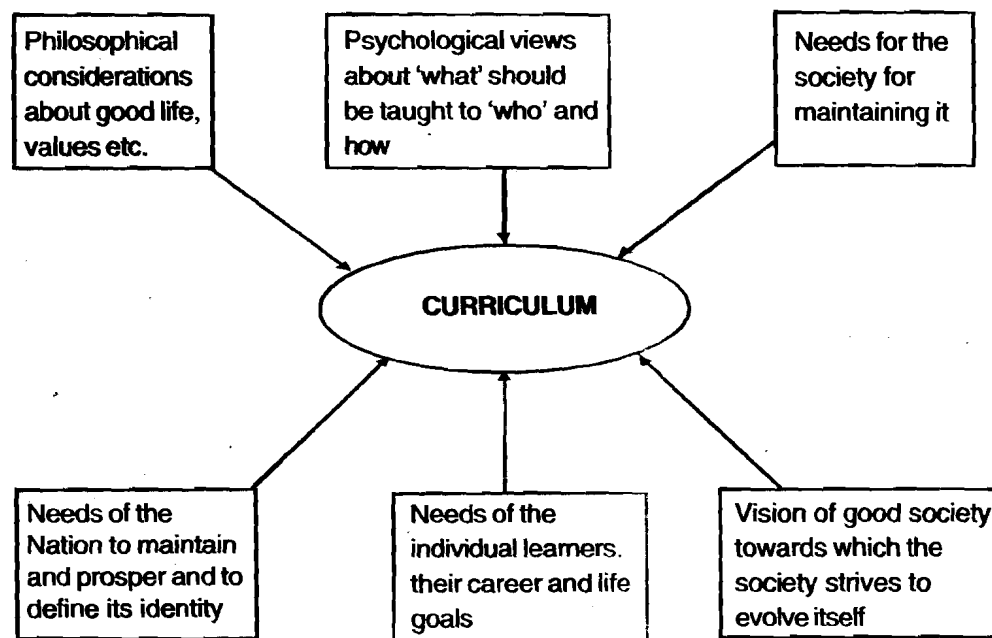


Fig.15.1: Factors that determine the curriculum

According to Goodlad and Richter (1977), a curriculum is based essentially on a rational means-ends argument and it can be taken to exist at three levels, (a) the instructional level: this is the level closest to the learner and the process of classroom instruction; (b) the institutional level: where the curriculum is for the school and it describes educational objectives and learning experiences for attaining those objectives for the school, and (c) the societal level: the highest level at which the curriculum exists. The concept of society can vary from 'the local community' to 'the nation' and therefore curriculum can be for the local community or at the national level. The latter will be "national curriculum".

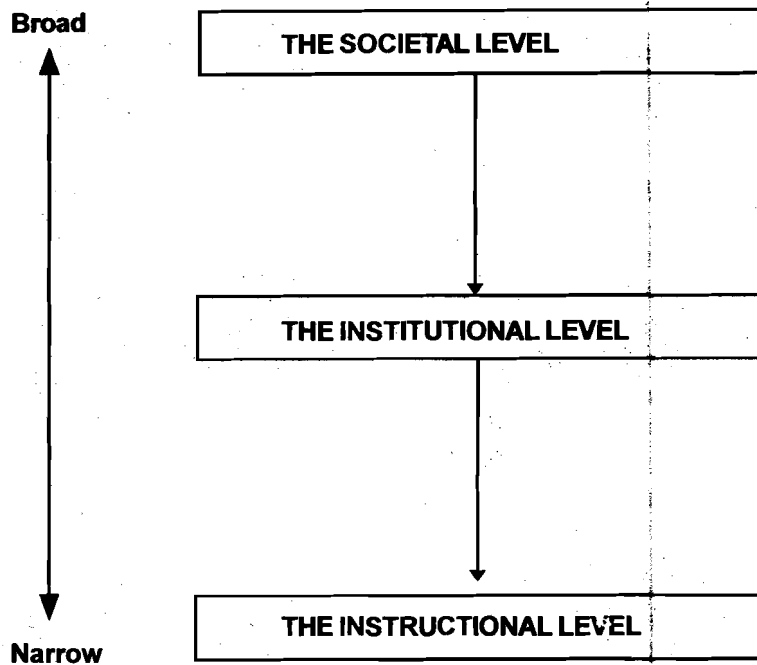


Fig. 15.2: Levels of Curriculum

In a multicultural society like India, developing a curriculum for the entire country (viz., the National Curriculum) is not easy. Children come from diverse cultural backgrounds, with different ethnic roots, different faiths, different beliefs and attitudes about schooling, gender, social class, and the nature of work. The more extensive the scope of the curriculum, the greater is the element of contentiousness. Consequently, for developing a National Curriculum, some authority has to define which cultural artifacts should be preferred over the rest and adjudged worthy of inclusion and passed on to the future generations.

A curriculum may have its dominant focus on content i.e. subject matter, because of the intrinsic value that a subject has for shaping up human personality. Such a curriculum is called **content-driven curriculum**, and it usually includes the study of at least one classical language. On the other hand, a curriculum may be based on considerations of practical use expressed in terms of skills and competence. Such a curriculum is known as **objectives-driven curriculum**. There is a third possibility too. In curriculum based on progressive education, the emphasis would be on enabling the learner to understand the world in own terms, through own enquiries. Therefore this curriculum would focus on processes that enable the learner to construct his/her understandings about the world. Such a curriculum is called **process-driven curriculum**.

It must be clearly understood that any curriculum would necessarily have content, objectives, and processes. We should first understand which one on these three elements gets the major focus and this in turn will reveal its type.

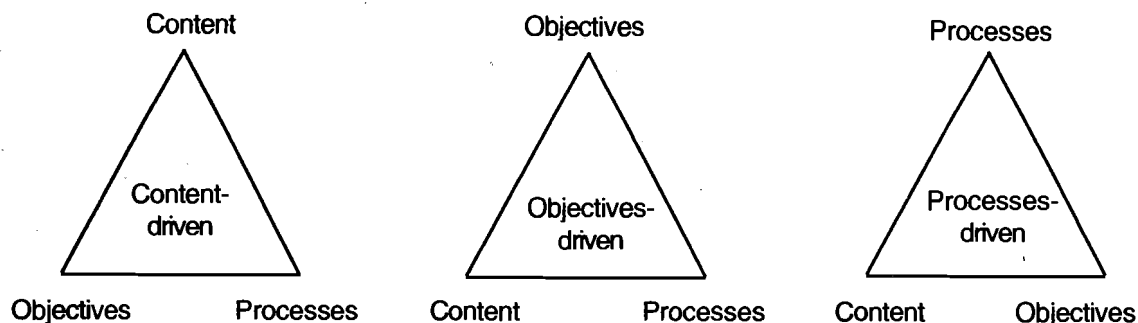


Fig. 15.3: Types of curriculum

### 15.3.1 School Subjects in Curriculum

If you look at the factors that determine the curriculum, the school curricula should differ from one country to another, and from one society to another. Yet school curricula are strikingly similar across the world. Meyer and his team (1992) carried out a survey of school curricula in 76 countries and found that due to the pressure to achieve international standards, school curricula in almost all countries are developed in a professional manner. They discovered that the general education curricula which are meant to provide common education to children (e.g. Grade I - X in India) have five major components. All general education curricula include one or more national languages, mathematics, science, a combination of social sciences, and some aesthetic education. In terms of the total time assigned to the teaching of various subjects, Meyer's team found that languages get the lion's portion (i.e. 34%), with mathematics coming next with 18% time. This team further discovered that:

- 1) Teaching of classical languages is no longer considered necessary for developing the individual's personality and the insistence on teaching of national language(s) has resulted in downgrading of the local and the regional languages;
- 2) Mathematics has become a universally accepted subject in school curricula due to its critical importance in the rationalistic modern world. Learning mathematics is expected of all children; there isn't much disagreement about grade-specific mathematics content. However, there is no agreement on techniques and methods to be used for effective teaching-learning of mathematics;
- 3) All children are required to learn science to enable them to develop an understanding that "the world is empirical and lawful, governed by natural forces which can be scrutinized through rigorous investigations";
- 4) Social sciences, a combination of history, civics, geography and economics, is a common feature of school curricula. Sometimes these are taught as separate subjects and in some countries these are taught in an integrated manner. The purpose behind teaching social science is to enable the learners to appreciate that in spite of the visible differences, human beings have a great deal in common and various social processes are found in all societies. In other words, the social world in which we find ourselves has factual and law-like properties;
- 5) Aesthetic Education is found in some form in almost all curricula; it helps children develop an eye and an ear for rhythm and beauty and discover and cultivate their special talents in this area.

### 15.3.2 Level Specific Curricula

Psychologists have established that human beings develop in a predetermined sequence, from infancy through childhood, and adolescence to youth. Each of these developmental stages builds up on the preceding stage. Thus children at a particular stage of development have their peculiar strengths and limitations. For example, young children learn better and enjoy learning through activities. Piaget and his associates have described each stage of children's cognitive development in terms of its typical

characteristics. It is because of this that school curricula are level-specific and within each level, grade-specific and for every grade, there are subject-specific curricula e.g. the English language curriculum, the math curriculum and so on.

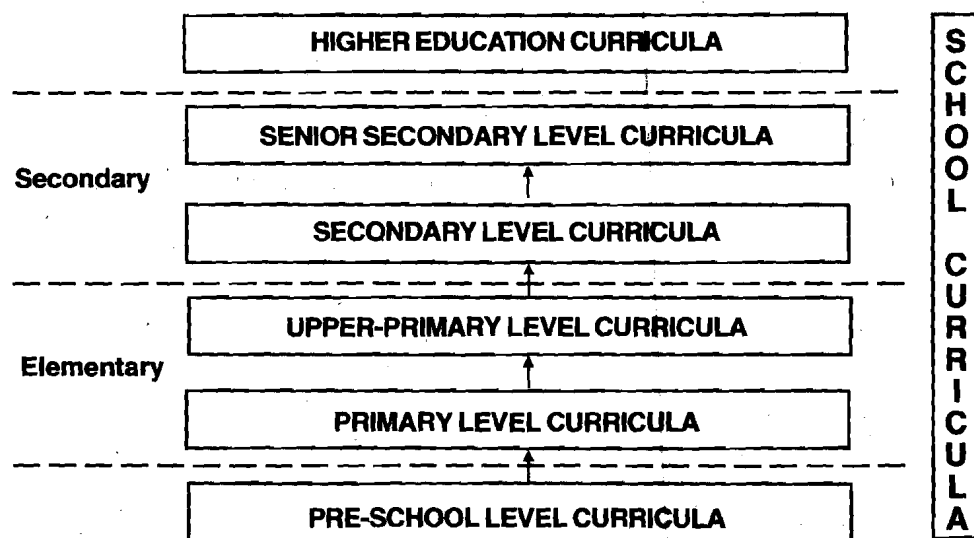


Fig. 15.4: Hierarchical Sequencing of Educational Curricula

The National Curriculum Framework for School Education (2000) provides a systematic overview of school education and the curriculum subjects at various stages/levels of schools education. (see Fig. 15.5 and 15.6)

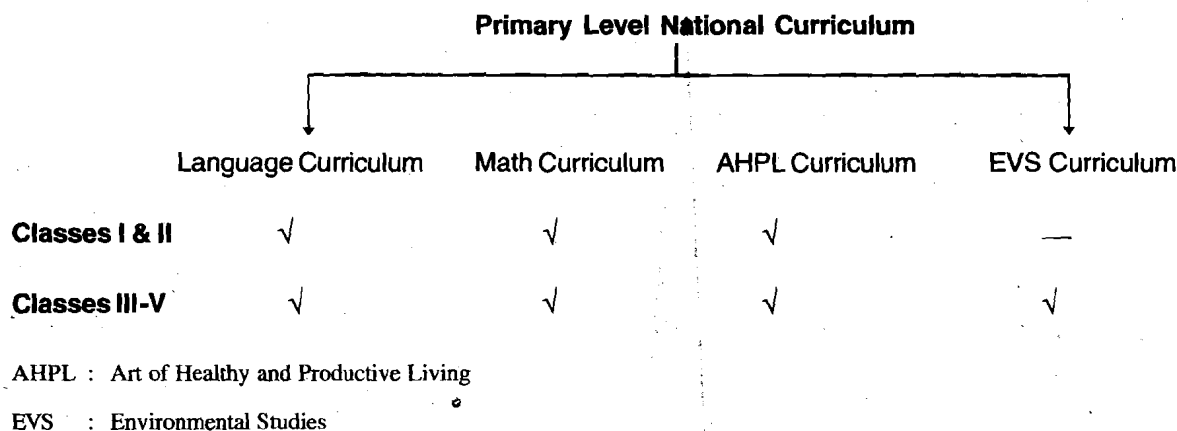


Fig. 15.5: Break-up of Elementary Level National Curriculum

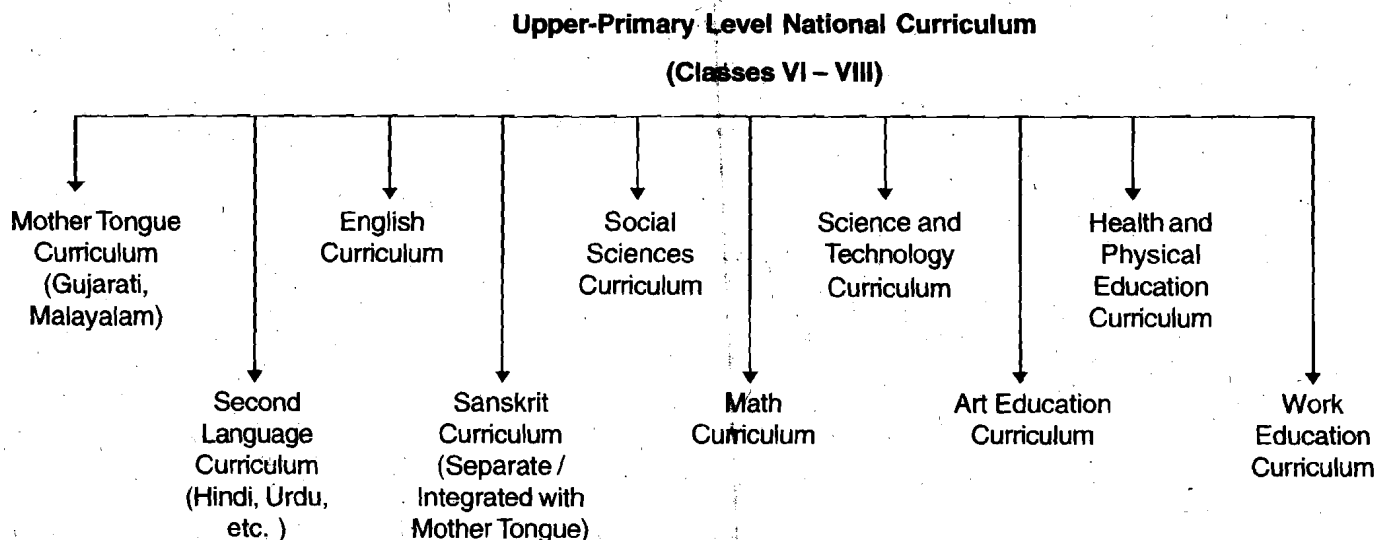


Fig. 15.6: Break-up of Elementary Level National Curriculum

In Fig. 15.5 and 15.6 we can see that for classes I & II only three subjects are to be taught; this is so because of the developmental stage of children between 6 - 7 years. As learners grow up and enter the 9<sup>th</sup> year of their life, another subject viz., EVS is added to their curriculum. Similarly, at the upper-primary stage, the curriculum consists of as many as eight or nine subjects. Thus we find that not only does the number of subjects increase as student matures, but also the content for each subject increases and become richer and more complex.

### Check Your Progress 1

**Note:** Write your answers in the space given below.

- 1) What are the controversial aspects of a school curriculum?

.....

.....

.....

.....

- 2) Explain the concept of "hidden curriculum".

.....

.....

.....

- 3) Why must some authority develop the national curriculum?

.....

.....

.....

- 4) Answer the following statements by writing True (T) or False (F) against each:

- a) Content-driven curriculum has its focus only on the subject matter. ( )
- b) Most school curricula, whatever the society or the country, have amazingly a lot in common. ( )
- c) There is more disagreement about what content math curricula should contain than about how math should be best taught. ( )
- d) Ideally, social sciences curricula in different countries should highlight the essential oneness of human beings. ( )

## 15.4 LEARNING LANGUAGES

The ability to use language for initiating and maintaining social interaction is a peculiar characteristic of human beings. No doubt, members of lower species also use some language but their language is learnt instinctively while human beings acquire it as a result of growing up in a particular community. This explains how children from the same family if brought up in different communities grow and learn the language of those communities. Secondly, human language is a very complex system, while the 'pseudo language' of other species consists at best of only a limited number of

utterances, each with a unique meaning. Language is often described as a system of sound symbols with arbitrary meanings that human beings use for expressing themselves and communicating with others. To some linguists, language is a patterned system of arbitrary sound signals characterized by structure dependence, creativity and displacement (Aitchison, 1983).

In relation to the school curriculum, a language may have the status of the first language, the second language or the foreign language. The first language is usually the vernacular language or the mother tongue. The second language is a language of communication, trade, business and education in society. Thus Hindi, Urdu and other Indian language in their standard literary form are taught as the first or the second language in our schools. English has the status of the second language and in many schools, it is the medium of instruction as well. Sanskrit or any other Indian language may be taught and learnt as the third language. All modern European languages other than English (viz., French, German, Italian, Russian etc.) also have the status of the third language in our school curriculum.

The mother tongue plays a crucial role in the cognitive and social development of the child. Mother tongue is usually described as "the language that the child already possesses before joining the school and commencement of formal education". It has been estimated that by the time the child joins school, he/she has a functional vocabulary of between 1200 and 1500 words through which the child interacts with others and constructs knowledge of the world.

The National Curriculum Framework for School Education (NCFSE, 2000) emphasizes that the mother tongue should be the medium of instruction at the primary stage because the child would then have minimum difficulty in understanding whatever is taught to him/her. In India, each state has its language spoken by the majority of its citizens, and this should be the medium of instruction at the primary stage. In fact, whatever knowledge a child has of his/her mother tongue is refined and further developed at the school. It is quite possible that the language of the home and the language of the school may differ in some respects even when both (i.e. the school and the home) claim to use the same mother tongue. This is because the language in the school has to serve as the medium of formal instruction, for teaching various subjects. Thus the language used in school is more standardized as it has to serve effectively as a medium of formal education.

#### 15.4.1 Primary Stage Language Learning

The general objectives of teaching the mother tongue at the primary stage are to enable the child:

- to listen with understanding and to comprehend ideas through listening;
- to speak effectively in both formal and informal transactions;
- to read with comprehension and enjoy reading various kinds of instructional materials;
- to write neatly, grammatically, logically and creatively;
- to think independently and to differentiate between fact and opinion. (Guidelines and Syllabi for Primary Stage, 2001, 4)

Since the language spoken by the majority is considered to be the state language, schools in India are expected to teach one of the eighteen national languages. The primary schools in a state may teach Hindi, Urdu, Bangla, Marathi, Gujrati or some other national language. Instructional objectives for teaching Hindi as a mother tongue are given below as an illustrative example.

**Class I & II**

- to develop the ability of understanding and carrying out oral instructions;
- to develop the ability to differentiate among different articulated sounds;
- to develop the ability to listen attentively for knowledge and entertainment;
- to enable learners to speak without inhibition and to converse normally with teachers;
- to develop their oral expression through story, poetry and group songs;
- to enable learners to approximate their pronunciation progressively to standard Hindi;
- to teach them to speak normally with civility;
- to enable learners to read and understand familiar words based on consonants using 'devnagari' script and its various symbols (vowels, consonants, matras, and compound letters);
- to develop the ability to read and comprehend simple ideas and to arouse their interest to read;
- to develop their interest in reading materials other than the prescribed textbooks;
- to increase students' active vocabulary;
- to encourage their tendency to learn by themselves;
- to inform them about central issues, fundamental duties and human rights;
- to develop their ability to take pride in their region and nation and be patriotic;
- to develop their awareness about healthy and productive life style;
- to develop the qualities of secularism and respect for all religions and the feeling of "all world one human family";
- to develop respect for our national symbols e.g. our national flag and the national anthem;
- to enable them to enjoy poems, stories, cartoons and other programmes presented on radio and T.V.; and
- to develop their vocabulary of about 1500 words.

**Classes III - V**

- to develop the learners' ability to listen attentively in a tolerant and civil manner;
- to develop their ability to listen and comprehend others' ideas;
- to enable them to develop the standard pronunciation;
- to develop their oral expression skills;
- to develop their ability to read and comprehend others' views;
- to enable them to identify main genres of Hindi literature through literary works;
- to enable them to read for enjoyment and for increasing their knowledge;
- to develop their ability to appreciate the beauty of language;
- to develop their ability to express their ideas through writing;

- to enable them to use grammatically appropriate language;
- to familiarize them with main elements of language;
- to develop their ability to reflect; and to use language for effective study of other subjects;
- to develop their study skills and their ability to participate in various language related activities;
- to enable learners to develop their social adjustment through language;
- to make them aware of the art of healthy and productive living; and
- to develop the skills for learning to learn.

Parents want their children to learn English from the beginning as they believe that if children do not start learning English in class I, it may result into a near permanent handicap in their career. Teaching of English at the primary stage is found faulty and inconsistent across cities and regions, as there is acute shortage of competent teachers of English at the primary stage in most cities. The NCFSE (2000) has made provisions for three-language formula at the primary stage. Under the three-language formula, English can be taught as the second or the third language. NCFSE (2000) recommends though that English may be taught in primary schools if necessary resources are available for teaching it effectively. Under Guidelines and Syllabi for Primary Stage (2001), six areas have been highlighted as of concern for teaching and learning of English. These relate to-

- a) the need to develop the learners' capacity to use English in speech and writing with ease;
- b) greater emphasis on oral-aural approach in classes I & II with much less stress on reading and writing;
- c) linking teaching-learning of English with the learners' life and environment;
- d) presenting English language items in the local indigenous contexts, free from cultural bias;
- e) greater teacher participation in developing instructional materials; and,
- f) integrating of EVS-related themes with English language teaching in order to reduce curriculum load on young learners.

The general objectives of teaching English at primary stage aim at enabling the child to:

- develop the abilities of listening, speaking, reading and writing English;
- communicate in English with appropriateness and right pronunciation;
- think independently to differentiate between fact and opinion and to use language intelligently and creatively (understand emotion/intention behind words); and,
- appreciate the melody of the spoken word and to enjoy learning English.

Of these, the last but one objective is considered impractical and rather unattainable for primary stage learners in the context of English.

By the end of Class II, the learners are expected to develop an active vocabulary of 250-300 words which should be expanded to 500 words by the end of Class III, to 750-800 words by the end of Class IV, and to 800-1100 words by the end of Class V. Moreover, by the end of the primary stage, the learner should be able to respond to instructions, talk about oneself and one's surroundings, express one's feelings and

emotions, exchange greetings, seek and supply information within the limits of one's expected active vocabulary.

### 15.4.2 Upper Primary Stage Language Learning

In the context of teaching Hindi as first language, the major emphasis is on teaching of language items, different genres of literature and providing content knowledge. For the development of language skills viz., listening, speaking, reading, and writing, the students are expected to consolidate whatever they have learnt so far and develop these skills further. The students are expected to read a variety of texts and express their ideas independently, coherently and creatively.

So far as teaching of English as a second language at the upper primary stage is concerned, understanding spoken English, participating in conversation on a topic of interest and within the range of one's experience, reading semi-authentic texts both prescribed as well as others, and expansion of reading-comprehension related skills including interpretation of tables, charts and diagrams, graphs and maps; and expressing oneself with ease and facility within one's active vocabulary are the major expected learning outcomes. The learners are expected to expand their active vocabulary by another 1500 words and use their proficiency in English as a springboard to explore and study other areas of knowledge.

The learners study the curriculum content that consists of (a) linguistic content and (b) thematic content. The linguistic content comprises of grammar and usage, and vocabulary. Under grammar and usage, learners study:

- word classes e.g. noun, verb, adjective, adverb;
- modal auxiliaries;
- concord i.e. agreement;
- tense forms;
- sentence types;
- reported speech; and,
- passive expressions.

Under thematic content, the students study eleven sub-themes, namely;

- the personal relationships,
- the neighbourhood,
- the larger community i.e. my country and my people, geography and natural resources, sustainable development, history and legends,
- the nation,
- the world beyond,
- the world of adventure, travel, exploration and tales of courage, bravery and endurance,
- the world of sports and health education,
- the world of nature,
- the world of science and technology, and
- the world of imagination i.e. the supernatural, ghost stories and fantasies.

The sub-themes are to be presented through stories, descriptions, letters, dialogues and conversation, diary entries, biographies/autobiographies, travelogues, play lets and poems.

At the upper-primary stage, children are expected to learn another language as their third language. NCFSE (2000) has laid special emphasis on teaching of Sanskrit, because it has been used consistently for thousands of years and it has been the language of our ancient heritage, the great storehouse of our ancient knowledge and wisdom. It is considered as the most scientifically structured language and is now viewed as the most suitable language for computer use. NCFSE (2000) recommends that Sanskrit needs to be taught as a living language because of world-wide interest in yoga, Vedic mathematics, astronomy and ayurveda.

### 15.4.3 Secondary Stage Language Learning

Secondary stage language curricula enable learners to learn Hindi, Urdu and other regional language as mother tongue or as a second language. English is also taught as a second language and Sanskrit as an optional language. We shall consider only two curricula viz., Hindi as the mother tongue and English as the second language.

The NCFSE (2000) provides an integrated and balanced curriculum for Hindi as mother tongue; its main purpose being to enable the learner to comprehend and practice all aspects of the mother tongue so that the learner is able to understand his/her self, and the society as well as the cultural world in which one finds oneself. It proposes a mix of literature (60%) and functional language (40%). It assumes that the learner will be enabled to assimilate the literature and further develop one's understanding of the mother tongue, which will be reflected in one's use of language in formal and informal contexts.

Literature related objectives of the secondary stage Hindi curriculum are:

- to develop the learners' ability to study Hindi literature;
- to recognize and enjoy sensitive portions of Hindi literature;
- to develop knowledge about contemporary culture, and imbibe moral values and healthy attitudes; and
- to develop respect for Indian culture and civilization and pride in it.

General objectives for Hindi as a functional language are :

- to develop the ability of comprehending and analyzing the structure of Hindi;
- to acquire knowledge of language elements and develop linguistic skills in Hindi;
- to develop and refine one's oral expression;
- to develop the ability to study other subjects through Hindi; and
- to develop one's ability to use it as appropriate functional language in various contexts.

While the specific objectives of the Hindi curriculum are skill based, the focus is on the use of Hindi in various contexts and situations, especially in literature related situations and the ability to reflect on what is read and the writing skill. Under functional Hindi, the focus is three-pronged viz., language analysis, composition and purposiveness. Under composition, learners are exposed to a variety of language experiences ranging from applications, letters of thanks, congratulations, condolence etc; to money order, admission, rail reservation forms, writing telegraphs and essay. Further, the Hindi curriculum seeks to promote good citizenship and various values ranging from honesty, cleanliness, courtesy, punctuality, gratitude, to generosity, love, ahimsa, tolerance, faith, patriotism and secularism.

Language learning at the senior secondary stage caters to two groups of learners: (a) those who are to enter the world of work and for whom formal education at the senior secondary stage would be more or less the terminal stage; and, (b) those keen to pursue their studies at the tertiary level of education. The core language curriculum caters the former and the elective language curriculum the latter group. The Guidelines and Syllabi (2001) provide for core as well as optional language courses in Hindi, Sanskrit, Urdu and English. We should remember that the senior secondary stage provides for options in one's choice of curricula. Unlike the common single track (i.e. undifferentiated) curricula available from Classes I - XII, (the primary to senior secondary stage) offer differentiated curricula.

Language has a number of functions in human life e.g. (a) it enables us to fulfill our needs; (b) it helps to regulate human behaviour; (c) it is a means of initiating and maintaining social interactions; (d) it helps mould our personality; (e) it is a means of acquiring knowledge and of reflection; (f) it fosters creativity and imagination; and (g) it enables us to represent reality, the world inside as well as outside us. By the time, the learner completes his/her senior secondary education, he/she is almost 18 years old and has the right to vote. Irrespective of whether the learner continues his/her education, he/she should be able to use language whether mother tongue or a second language to fulfill his/her needs and express himself/herself using these listed seven functions. Language learning at this stage has thus to provide for all these functions. In other words, functions should receive high emphasis in language curriculum.

The Hindi (core) curriculum at this stage has a number of specific objectives; some of these are listed below:

- to acquaint the learner with different vocabulary, registers, styles etc; of language as used in various social contexts and to provide practice in these;
- to develop language skills especially writing skills for writing features, summarizing, narrative, descriptive and expository writing etc;
- to provide knowledge and practice in respect of functional aspects of Hindi grammar; to acquaint learners with the discipline and vocation related vocabulary and styles in Hindi e.g. social sciences, science, and technology, commerce and trade, agriculture and rural development, health and environment;
- to provide learners with practical uses of language in their future working life;
- to enable learners to pursue further education through Hindi as a medium of instruction;
- to acquaint them with various genres of Hindi literature so that they are able to understand the author's message and enjoy themselves;

The Hindi Elective curriculum, on the other hand, focuses on exposing students to various dimensions of Hindi literature. This is vividly reflected in the general objectives of the elective curriculum; some of these are:

- to increase learners' knowledge of Hindi literature;
- to acquaint them with various genres of Hindi literature (viz., poetry, short story, essay, sketch, memoir, one-act play etc.); major writers, major movements and styles associated with these;
- to apprise them of aesthetic elements and appreciation;
- to acquaint learners with rasa, chhand, alankar etc; in the context of Hindi literature;
- to familiarize them with the general history of Hindi literature;

- to acquaint them with the Indian languages literature translated in Hindi;
- to develop their knowledge and sense of pride in contemporary culture, moral values and traditions of our country;
- to familiarize them with the role of Hindi as the common thread for national integration; and,
- to develop their knowledge about commonly used expressions in functional Hindi (office work, media, information technology related etc;) and their capacity to use it in social communication.

It is obvious from these that the focus of elective Hindi curriculum at this stage is entirely on literature and its various aspects. The focus on literature is however, not at the cost of developing the characteristics of effective citizen, national pride and national integration. Various democratic values, our composite cultural heritage and sensitivity to environment are no less important and should be served by all curricula irrespective of the subjects.

The English language curricula are also for Core English as well as Elective English. In addition to their usual emphasis on listening and speaking, these curricula have a special focus on reading comprehension and writing skills. The core English curriculum, for example, lists the following learning outcomes under “intensive reading” i.e. reading with an eye for details (Guidelines and Syllabi, 2001, 25-26)

- reading and comprehending unsimplified texts of 500-750 words and guessing contextual meanings of unfamiliar words;
- perceiving the overall meaning and organization of the text;
- identifying the central/main idea and supporting details;
- locating specific items of information;
- making predictions about future events, developments etc; in the text.

Under ‘extensive reading’ i.e. reading with speed and grasping the meaning, the learners are expected to read and comprehend extended texts (of at least 20 pages) related to fiction, science fiction, drama, poetry, biography, autobiography, travel and sports in abridged or original form.

So far as development of the writing skills is concerned, the learners are to develop their competencies in relation to:

- text-based writing i.e. responding in writing to questions and tasks in prescribed or unseen texts;
- expository/argumentative essays of 250-500 words explaining or developing a topic, arguing a case etc;
- formal/informal letters and applications for different purposes; and
- writing related to workplace (i.e. minutes, memos, notices, summaries, reports, filling up of forms, preparing bio-data, CVs, e-mail messages etc;)

The English (Core) curriculum also lays stress on development of reference material related skills including making and taking notes.

The themes around which learners are provided experiences related to English (Core) are an extension of the eleven themes chosen under the secondary stage English language curriculum.

The English (Elective) curriculum is geared to further development of the competencies listed under the English (Core) curriculum through language experiences related to

the above described eleven themes. The English (Elective) curriculum provides for the learner's attainment of an active vocabulary of at least 4000-5000 words and functional mastery of the basic grammatical patterns of the English language. Moreover, the new NCFSE curriculum requires the learners to develop their mother tongue to English translation skills for passages (of about 500 words) that are factual and/or literary taken from texts and/or from newspapers etc;

Thus we find a marked difference between the overall thrust of the Hindi (Elective) and the English (Elective) curricula. This is primarily because of the status of Hindi and English in the life of the learner and the society. While Hindi has the status of a mother tongue, English is a second language. Hence the thrust of the Hindi curricula is in favour of literature related to functional performance in various contexts of everyday social and work life.

#### 15.4.4 Methodology and Instructional Strategies

Whatever the status of languages (viz., the first, the second, or the third language), language teaching at the primary stage emphasizes the primacy of the spoken language and the development of speech related skills viz., listening comprehension and speaking needed for interaction and communication. Instructional strategies at this stage emphasize the use of situational and activity-based language teaching. This is especially appropriate in view of the developmental stage at which learners find themselves. Language teaching should therefore be as joyful and appealing as possible. It is only during Class III that written language is to be introduced. Reading lessons should be preceded by a variety of reading readiness exercises, so that the process of reading becomes manageable and as interesting as elements and the appeal of a game.

At the upper-primary stage, the students are to work on contrived texts that are controlled in terms of sentence patterns, vocabulary, tense form of verbs, length of sentences and density of new vocabulary and structural items. However, during Class VII, the learner's should be presented semi-authentic texts that are a mix of partly contrived and partly natural use of language. At this stage, the teaching and learning of languages becomes more formal with teaching of grammar if necessary, though the overall approach remains interactive throughout.

At the secondary stage, the English language curriculum is designed to support further development of learners' English language proficiency. It has two-pronged thrust: (a) to equip learners with communicative skills to enable them to perform various language functions, and, (b) to help develop their cognitive and affective faculties. At this stage, the learner develops a vocabulary of 2000 words related to various disciplines e.g. information technology, environment, natural, sciences and social sciences. The learner also develops skills of forming new words with the help of prefixes and suffixes, making compound words, collocations, phrasal verbs and idiomatic expressions. Personal relationships, neighbourhood, the larger community, the nation, the world beyond, the world of adventure, health including reproductive health, the world of nature, science and technology, the world of imagination, are some of the themes around which the learner learns to communicate through English.

The variety of classroom activities through which the learner is able to communicate in English also increases. This may include role-play, simulating real-life situations, dramatizing and miming, problem solving and decision making, interpreting information in table form and schedules, using newspaper clippings, using language games, riddles, puzzles and jokes, interpreting pictures, sketches and cartoons, debating and discussing, narrating stories and anecdotes etc; reciting poems, working in pairs and groups; and using media inputs like computer. Television, tapes, video-cassettes and software packages are some of the activities recommended in the Guidelines and Syllabi (2001, 39).

The secondary stage English language curricula in planning all these activities emphasizes that the learner should be enabled to become an effective citizen, law-abiding, conscious of one's duties as described in our constitution, and proud to be an Indian and a responsible member of the human family.

### Check Your Progress 2

**Note:** Write your answers in the space given below.

- 1) List any two important characteristics of human languages.  
 .....  
 .....  
 .....
- 2) Explain the concept of the mother tongue.  
 .....  
 .....  
 .....
- 3) What is the major focus of teaching a language at the primary stage?  
 .....  
 .....  
 .....
- 4) At what stage the focus of teaching Hindi shifts from the language to literature?  
 .....  
 .....  
 .....
- 5) Answer each of the following by writing T (true) or F (false) against them:
  - a) Contrived texts in English are meant for classes VIII and IX. ( )
  - b) At the senior secondary stage, students get more learning experiences for developing their writing skills in English. ( )
  - c) Ability to read and comprehend unsimplified English texts of about 500-750 words developed in Classes IX and X. ( )

## 15.5 LEARNING MATHEMATICS

Mathematics is essentially like a language and in some respects more than a language. Usually, a language is a means of expression and communication using written or spoken symbols, and by this criterion mathematics is a language, in fact "a language of complete abstraction". But unlike ordinary language, mathematics comprises "chains of logical reasoning" (Phenix, 1967, 73). Mathematical meaning can be communicated only to those who are familiar with its symbolic constructions. Mathematics through its symbolic systems strives to achieve complete precision in meaning and rigour in

reasoning. Typically in math, one really knows the subject only if one knows about the subject, i.e. if one examines and justifies each step in one's reasoning, according to the canons of rigorous proof. This is because of the fact that logical consistency is the supreme principle in mathematical reasoning.

So far as inclusion of mathematics in school curriculum is concerned, it is primarily because of its utility value for young learners. Study of mathematics helps in developing the skill of quantification of experiences in real life. It promotes reasoning, abstract thinking and problem-solving. There is hardly any other school subject that does not have some relationship with mathematics. It is closest to physics and is helpful in understanding music and dance. According to National Curriculum Framework for School Education, "Mathematics helps in the process of decision-making through its application to real life situations in familiar as well as non-familiar situations, it contributes in the development of precision, rational and analytical thinking, reasoning, positive attitude and aesthetic sense" (2000, p. 55).

According to Curriculum and Evaluation Standards for School Mathematics, a document published by the National Council of Teachers of Mathematics (NCTM) in 1989, while learning mathematics at school, students should try to attain the following five goals:

- 1) Learn to value mathematics;
- 2) Become confident in their ability to do mathematics;
- 3) Become mathematical problem solvers;
- 4) Learn to communicate mathematically; and
- 5) Learn to reason mathematically.

In order to achieve these goals, students must be exposed to numerous and varied experiences that may enable them to value mathematics and develop mathematical bend of mind.

### **15.5.1 Primary Stage Math Learning**

Through level-specific mathematics curriculum, we need to emphasize "the abilities to reason mathematically, communicate mathematically in a range of representative modes, make connections using mathematical concepts, and use mathematical applications or tools" (Adams & Ham, 1994, 185). The objectives and learning areas or content for primary stage math curricula as listed in Guidelines and Syllabi, (2002) are:

To enable the learner to:

- develop an understanding of the number concepts;
- develop understanding of four fundamental operations of addition, subtraction, multiplication and division and perform them with speed and accuracy in solving problems of day-to-day life;
- develop an understanding of various kinds of measures such as length, mass, capacity, time, money, temperature, area and volume and use these measures in situations arising in the learner's immediate environment;
- develop an understanding and appreciation of geometrical shapes and their characteristics, and discuss and draw two/three dimensional shapes; and
- develop the power of interpretation and representation of given information.

The five learning areas in mathematics at the primary stage are:

- a) Number and numeration;

- b) Four fundamental operations;
- c) Measurement : length, mass, capacity, time and money;
- d) Geometrical shapes; and
- e) Pictorial representation of data.

### 15.5.2 Upper Primary Stage Math Learning

The objectives of Math learning at this stage are to enable the learner to:

- consolidate his/her mathematical knowledge acquired at the primary stage;
- acquire knowledge and understanding of concepts, facts, principles etc. related to commercial mathematics, mensuration, elementary statistics;
- acquire knowledge and understanding of properties of geometrical figures through activities, experimentation, verification etc. in mathematical contexts;
- develop abilities to solve geometrical problems by identifying relationships between different parts of the problem and applying logical reasoning;
- acquire knowledge and understanding of the fundamentals of elementary algebra;
- develop drawing, model making and measuring skills;
- develop abilities to read and interpret data from statistical graphs; and
- appreciate the contributions made by ancient mathematicians particularly the Indian mathematicians.

The content of the math curriculum at this stage is related to five major areas viz., the number system, commercial mathematics, algebra, geometry and mensuration. The overall approach is to enable learners to understand the structure of math by dealing first with what needs to be understood. For example, under the number system, students of class VI learn about natural numbers and whole numbers, prime and composite numbers, factorization, LCM and HCF, integers, representation of integers on the number line, the basic operations etc. Class VII students begin learning rational numbers, equality and order relations, decimals, exponents and their laws. Thus the approach is to learn the basics, the first things first, so that more complex learning in math can be built upon it. Along with the teaching of concepts, the focus is on procedures and their application in simple problems.

### 15.5.3 Secondary Stage Math Learning

The learners at the secondary stage should be able to:

- consolidate the mathematical knowledge and skills acquired at the upper-primary stage;
- acquire knowledge and understanding of the terms, symbols, concepts, principles, process, proof etc.;
- develop mastery of basic algebraic skills;
- develop drawing skills;
- apply mathematical knowledge and skills to solve real mathematical problems by developing abilities to analyze, to see interrelationships involved, to think and reason;
- develop the ability to articulate logically;

- develop necessary skills to work with modern technological devices such as calculators, computers etc.;
- develop interest in mathematics and participate in mathematical competitions and other mathematical activities in the school;
- develop appreciation for mathematics as a problem-solving tool in various fields for its beautiful structures and patterns etc.; and
- develop reverence and respect towards great mathematicians, particularly towards the Indian mathematicians for their contributions in the field of mathematics.

At the senior/higher secondary stage, the pupil:

- acquires knowledge and critical understanding of basic concepts, facts, principles, terms, symbols and mastery of processes and skills;
- applies mathematical knowledge and skills to solve problems within mathematics and problems from other subject areas;
- develops positive attitude to think, reason, analyze and articulate logically;
- develops appreciation for the beauty and logic of mathematics for its applications in sciences, social science, information technology and arts;
- develops interest in mathematics by participating in mathematical competitions, engaging himself/herself in self-learning;
- develops necessary skills to work with modern technological devices, such as calculators, computers etc; and develops understanding of cause-effect relationships and interplay of variables; and
- develops reverence and respect towards the Indian mathematicians for their contribution in the field of mathematics.

We find that these objectives are hierarchical. The objectives at the lower level pave way for attainment of objectives at the higher levels of school education.

The content for the math curriculum at the secondary stage (Class IX) includes irrational numbers, factorization of polynomials, ratio and proportion, linear equations in two variables, percentage, profit and loss, discount, compound interest, cost of living index, sales tax, banking, geometry-lines and angles, congruence of triangle, parallelogram, areas and constructions, trigonometric ratios, area of plane figures, volume and surface area of right triangular prisms, tetrahedrons and octahedrons, and elementary statistics, including graphical representation of data and measures of central tendency.

It may be noted that math curriculum for Class IX denotes a transition. It introduces trigonometry and statistics for the first time; this applies to income tax and banking as well. The new elements introduced at this stage get strengthened in class X. The class X curriculum includes linear equations in two variables, polynomials (HCF & LCM), quadratic equations, arithmetic progression, installments, income tax, similar triangles and circles and their constructions, trigonometric identities, trigonometric ratios of complementary angles, heights and distances, volumes and surface areas, statistics (mean, probability).

The senior secondary stage prepares students for university and professional courses; the math curriculum provides what many students describe as 'a stiff dose'. The Class XI course starts with sets, relations and functions, mathematical induction, complex numbers, linear equations, sequences and series, Cartesian system of rectangular coordinates, circles, conic sections, binomial theorem, exponential and

logarithmic series, mathematical logic, three-dimensional geometry, vectors, and ends with stocks and debentures and index numbers.

The class XII course starts with matrices, Boolean algebra, probability, functions and limits, continues through vectors, partnership, bill of exchange, linear programming and ends with indefinite and definite integrals, differential equations, elementary static and dynamics and applications of calculus.

#### 15.5.4 Values in Learning Mathematics

The learning of mathematics has two kinds of values: (i) those inherent in teaching-learning of mathematics, and (ii) contribution of mathematics in facilitating the learning of other school subjects. The latter are called 'instrumental' values of mathematics, while the former are known as 'inherent values' in learning mathematics.

Inherent values of teaching and learning mathematics are three viz., utilitarian, disciplinary and cultural values.

- a) **Utilitarian Value:** Every person irrespective of her/his status and vocation utilizes the knowledge of mathematics in one-way or the other. A housewife managing the family budget, the milkman who delivers milk and collects his dues after a month, the newspaperman who supplies the morning copy from door to door, the shopkeeper, the banker, the engineer, the farmer, even the labourer use some knowledge of math in their professional and personal lives. The health of national economy touches every citizen's life directly or indirectly. Illiteracy in mathematics can be a tremendous handicap in effective management of money, as well as property. One has also to plan for tax savings and post-retirement life. Improved knowledge of mathematics contributes to the economy and prosperity of the country. The shape and structure of various objects, natural or man-made, adheres to and illustrates the principles of geometry. Patterns of change in natural phenomena e.g. seasons, rotation and revolution of planets etc. also illustrate mathematical principles.
- b) **Disciplinary Value:** To do mathematics is to reason logically. Teaching and learning of mathematics disciplines the mind. Knowledge of mathematics improves one's capacity to think and reason. Deriving of conclusions in mathematics is logical reasoning and it necessarily involves postulation thinking.

Another disciplinary value of learning mathematics is concerned with the ability to make valid generalizations. This ability is indeed hard to attain, and the ability to reason logically is a pre-requisite for it. Repetitive practice in mathematics can facilitate the development of the ability to generalize through induction and applying of a given generalization through deduction to a specific situation.

The learning of mathematics also facilitates the ability to transfer one's knowledge in mathematics for use in another situation, or in another discipline. However, the teacher needs to emphasize this during teaching and provide practice for it.

- c) **Cultural Value:** Human culture and civilization at any time reflect the use of mathematics. The entire design of the great pyramids rests on mathematics. The concept of zero was formulated by ancient Indian mathematicians and it led to place-value based number system. The famous Brihadshwara Temple of Tanjor and the placement of its 'kalash' would not have been possible without knowledge of mathematics. Cultural value of learning mathematics enables us to appreciate the achievements of mankind across the globe. The leaning tower of Pisa in Italy stands even today because of its mathematical design. Art, music, games and sports, poetry, painting, architecture, town planning etc; use mathematics in different cultural settings and enhance its quality.

So far as the instrumental value of mathematics in facilitating the learning of other subjects is concerned, the understanding of almost every subject in school curriculum can be improved/enhanced to some extent, if assisted by our knowledge of mathematics.

Physics comes closest to math and good knowledge of math is a real asset in learning physics. All chemical reactions and combinations involve the use of mathematics. Map-making, preparing population charts, studies of density of population in geography and study of astronomy involve the use of mathematics. At first sight biology may not appear to be related to math, but it in fact involves a fascinating use of math. Volume of human body and of the blood in it, weight, size amount of oxygen we breathe in, and the carbon dioxide that we breathe out - all these involve the use of our knowledge of math. Mathematics can help us in understanding why there are no small animals in arctic regions; even the size of penguin increases as one reaches the Pole. A polar bear if twice as large as a normal bear would consume eight times as much food and generate eight times more heat but its skin will be larger only four times, and therefore it can keep itself warm in the harsh cold of the arctic region.

### 15.5.5 Teaching-Learning Strategies for Mathematics

The teaching-learning strategies for mathematics should be in line with student's interests and level of cognitive development peculiar to their developmental stages. Young learners cannot carry out abstract thinking; therefore activity-based teaching-learning strategies are found more effective for them. National Curriculum Framework for School Education (NCFSE) suggests that at the primary stage, the teacher must ensure that students are ready for learning mathematics and the learning experiences for them are planned and sequenced in advance. These experiences should be related to learners' daily life, inside as well as outside school. Peer group, collaborative learning and use of learner-centered activities are particularly useful with these learners. Active learning of mathematics should be used through observation, comparing, asking questions, looking at patterns, classifying, generalizing, framing problems and solving them in groups. As far as possible, learning of mathematics should be made a joyful activity for young learners.

At the upper-primary stage, the learners should be taught elementary mathematical concepts; both from arithmetic and geometry. Strategies of teaching-learning mathematics should be such as to promote oral learning, experimental verification with the help of various models and instruments, and interpretation of data from graphs, charts and diagrams, model making, and the skill of drawing figures to scale. It is important to strive for mastery level learning at this stage, and remedial instruction should also be carried out to ensure that students attain the stage-specific objectives of teaching-learning of mathematics. At the secondary and the senior secondary stage, teaching of mathematics as a discipline should be taken up, and teaching-learning strategies used at these stages should enable learners in laying firm foundations for higher studies in mathematics. Mathematical reasoning should be promoted and the students should be enabled to use logical reasoning for proof through deductive reasoning. Wider applications of mathematics in various organized activities, industries and study of other disciplines e.g. physics, chemistry, biology etc; should be emphasized.

#### Check Your Progress 3

- 1) Answer by writing T (True) and F (False) for each of the following statements:
  - a) Concrete experiences should be used for teaching math to students of classes I & II. (     )
  - b) Students learn about algebraic expressions for the first time in class VII. (     )
  - c) Math students are introduced to cube roots of perfect cubes by factorization in class VII. (     )
  - d) Matrices are taught to students of class XI. (     )

- 2) Why is it said that math curriculum for class IX denotes a shift in its focus?

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- 3) Describe the disciplinary value of learning math.

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## 15.6 LEARNING SCIENCE AND TECHNOLOGY

You may be surprised to find 'science' and 'technology' occurring together in the heading. NCFSE (2000) uses this expression because science should not be taught in schools without its application aspects. Thus while 'science' connotes 'theory', 'technology' underlines its practical use in today's world.

It is not hard to make a case for teaching science and technology as part of school education. If we were to make a list of the reasons why it should be taught in schools, we'll easily be able to prepare quite a long list. Today's world is indeed the success story of science. Science has not only deepened our insights into the physical world in which we spend our lives, it has literally transformed the way in which we live. For this reason alone, science and technology must be included as a key area in school curriculum. Theory of evolution changed our views about origin of life in general and origin of human beings in particular. Science can help students appreciate the common heritage of different ethnic groups, and treat differences of colour and gender as superficial. In fact, if taught properly, science can enhance our respect for all forms of life and improve natural and social harmony, and overall develop a concern for the health of this planet, our only home.

To the question "What is science?", one could respond in various ways, such as (a) 'it is a body of knowledge'; (b) 'it is systematic empirical inquiry into our physical environment'; (c) 'it is the set of various activities that scientists carry out; and (d) 'it is a philosophy of life, a perspective on what we find around ourselves'. According to Phenix (1967), science is systematic empirical inquiry concerned with matters of fact and resulting in abstract descriptions. Physical science describes the world through physical measurement i.e. quantitative assessment of material objects and processes using agreed upon standards of 'mass', 'length' and 'time'. However it should be remembered that physical science does not provide a complete description of the world or the whole truth about it. For example, colours as perceived by us in life have no meaning to the scientists, unless they are taken as measurable wavelengths of light. This process of physical measurement helps scientists infer and make precise formulations of scientific ideas. The goal of science is the creation of validated knowledge about our physical world in the form of theories and mathematical propositions. Theories are conceptual structures that explain phenomena, enable us to make predictions and to exercise control. A theory can be compared to a map, a formal representation of an area, which helps us to understand it, and explore it in detail without losing our way. We must remember that science is essentially 'provisional', i.e. true until proved wrong. Scientific findings are never final and true for all time to come. Scientific knowledge is accepted as good only within the limits established by prior tests and always subject to revision in the light of new evidence.

Science in the school curriculum consists of integrated study of physical environment, which includes the study of matter, life, and cosmos. Thus its curriculum would consist of physics, chemistry and biology as an integrated area of study.

In the context of learning science, we often come across the concept of 'scientific literacy'. American Association for the Advancement of Science describes scientific literacy in terms of the following six characteristics:

- Being familiar with the natural world and recognizing its unity and diversity;
- Understanding important concepts and principles of science;
- Understanding some of the important ways science, mathematics and technology depend on each other;
- Knowing that science, mathematics, and technology are human enterprises, and what this implies about their strengths and weaknesses;
- Having a capacity (ability) for scientific ways of thinking; and,
- Applying scientific knowledge and ways of thinking to achieve personal and social purposes.

Teaching scientific literacy means organizing science-based learning experiences around real-life issues.

### **15.6.1 Primary Stage Science Learning**

According to Association for Science Education (ASE), teaching science in school should enable the learner to:

- appreciate science as a human activity;
- understand how science operates;
- know and understand scientific concepts and principles;
- be scientific; and
- relate scientific enquiry and action to other modes of human behaviour. (ASE, 1992,6)

NCFSE (2000) recommends that keeping in view the developmental characteristics and needs of primary stage learners, Environmental Studies should be taught as an independent curricular area in classes III - V. In classes I & II, environmental concerns should be taken up through language, mathematics and Art of Healthy and Productive Living (AHPL). Environment Studies (EVS) should focus on developing habits, attitudes and skills in the child for being a healthy and active member of the community.

The objectives of teaching EVS at the primary stage should help the learner to:

- become healthy-physically, emotionally, socially and mentally;
- be able to function effectively as a member of the social groups that he/she belongs to;
- develop skills, attitudes and values for improving the quality of life of self and that of community; and
- appreciate the need to live in harmony with nature.

According to Guidelines and Syllabi for Primary Stage (2001), teaching EVS at this stage should help learners achieve Learning to know, Learning to Do, Learning to Live Together and Learning to Be, the four pillars of learning advocated in Delors' Commission Report (UNESCO, 1996).

### 15.6.2 Upper Primary Stage Science Learning

The objectives of teaching Science and Technology at the upper-primary stage are to:

- expose the children to basic processes of science;
- understand the processes that underlie simple scientific and technological activities;
- develop an understanding of some basic principles and laws of science;
- make the children understand applications of basic scientific principles to solve problems related to daily life;
- develop the ability to apply appropriate concepts of science to technology;
- develop measurement and manipulative skills and to encourage the use of locally available resources;
- familiarize the children with life processes, health, nutrition and human diseases;
- acquaint the children with the technology that abounds in immediate surroundings;
- create an awareness of the immediate environment and a need for its protection;
- make the children recognize the relation to science, technology and society;
- inculcate in children some of science and technology related values; and
- to provide scientific and technological literacy to the learners.

### 15.6.3 Secondary Stage Science Learning

The objectives of teaching science and technology at the secondary stage (classes IX and X), which is also the last stage of general education, are to enable the learner to:

- understand the nature of science and technology;
- understand the basic concepts, principles and laws of science;
- apply basic scientific principles in finding solutions to problems related to agriculture, energy, health, nutrition etc;
- develop problem-solving and decision-making skills;
- inculcate values that underlie science and technology;
- develop an understanding of the various processes of environment and concern for its conservation and preservation;
- understand and appreciate the joint enterprise of science, technology and society;
- develop rich and satisfying views of the universe;
- develop an attitude which would equip them to continue science and technology education throughout life;
- acquire process skills which form part of the attitude for developing a scientific temper; and,
- develop certain manipulative skills which are required in day-to-day life situations.

At the higher/senior secondary level, science is taught as separate disciplines viz., physics, chemistry and biology and each of these has its discipline-specific objectives.

These are given below:

**Physics:** Teaching of physics at the senior secondary level should:

- strengthen the concepts developed at the secondary stage to provide firm ground work and foundations for learning at the tertiary level and learning the relationship with daily life situations;
- develop conceptual competence in the learners so that they can cope up with professional courses in future career;
- expose the learners to different processes used in physics-related industrial and technological applications;
- develop process-skills and experimental, observational, manipulative, decision-making and investigative skills in the learners;
- promote problem-solving abilities and creative thinking to develop interest in the learners in the study of physics as a discipline; understand the relationship between nature and matter on scientific basis, develop positive scientific attitude and appreciate the contribution of physics towards the improvement of quality of life and human welfare.

**Chemistry:** In teaching chemistry as an area of school curriculum, the objectives are to:

- promote understanding of basic facts and concepts in chemistry while retaining the excitement of chemistry;
- make students capable of studying chemistry in academic and professional courses (e.g. medicine, engineering, technology) at tertiary level;
- expose students to various emerging new areas of chemistry and apprise them of their relevance in their future studies and their application in various spheres of chemical sciences and technology;
- equip students to face various challenges related to health, nutrition, environment, population, weather, industries and agriculture;
- develop problem-solving skills in students; expose the students to different processes used in industries and their technological applications;
- apprise students of interface of chemistry with other disciplines of science, such as physics, biology, geology, engineering etc;
- acquaint students with different aspects of chemistry used in daily life;
- develop an interest in students to study chemistry as a discipline.

**Biology:** Teaching of biology at the senior secondary level should

- promote understanding of basic principles of biology;
- expose learners to emerging knowledge in biology and its relevance to individuals and society;
- acquaint students with benefits of knowledge about issues related to nutrition, health, population, environment and development;
- encourage specific attitude to issues related to population, environment and development;

- develop skills to study and understand complexities of living world and harmonious co-existence;
- enhance awareness about environmental issues, problems, and appropriate solutions; develop appropriate environmental ethics, values;
- enable students to appreciate the complexity of living world and the role of biology vis-a-vis other disciplines; and,
- enable students to appreciate the role of biology in dispelling myths, misconceptions and misbeliefs.

#### 15.6.4 Teaching-Learning Strategies for Science and Technology

At the primary stage, instead of science and technology, we teach Environmental Studies (EVS). Teaching of EVS can take three forms :

- a) Learning about the environment which should be concerned with developing knowledge about the content and processes of the environment through systematic exploration by means of a variety of activities;
- b) Learning in the environment that should promote learning science outside the classroom and the laboratory, in the real context of life to develop understanding. Field trips, real-life projects, guided field experiments etc; can be the teaching-learning strategies for this; and
- c) Learning for the environment which can enable students to develop opinions and make decisions about the connections between human activities and the environment. This indeed constitutes a very challenging part of EVS.

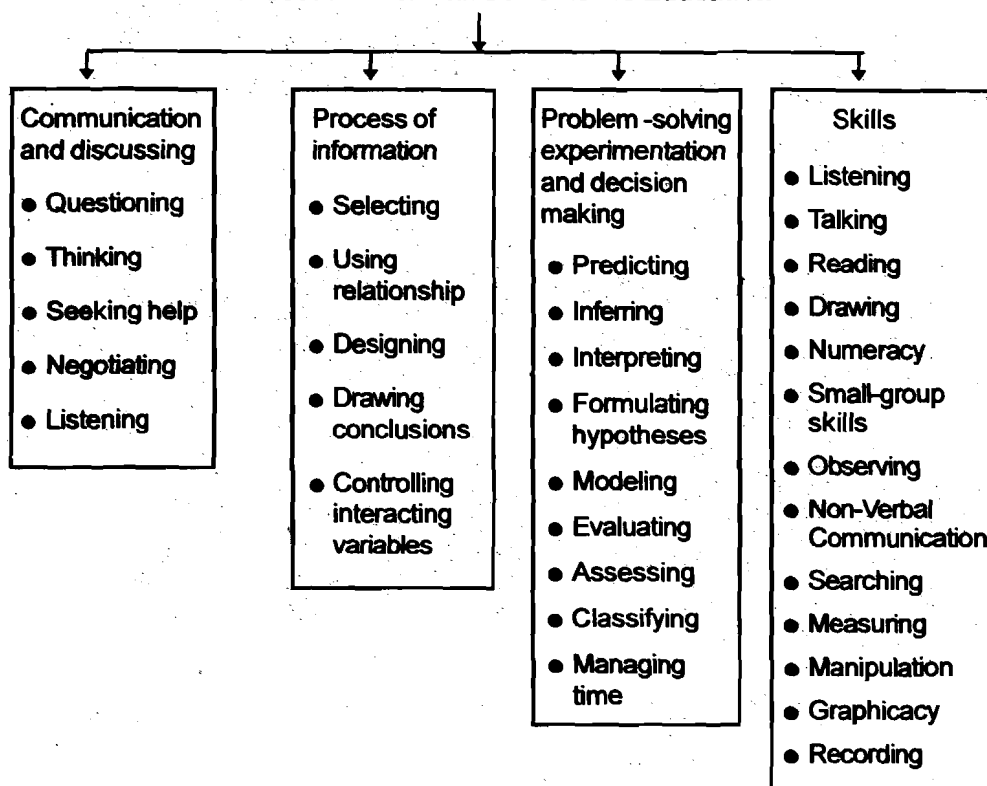
At the upper-primary and the secondary stages, a thematic approach for teaching science and technology has been recommended in the Guidelines (2001). These themes continue throughout this stage and even at the secondary stage but every time they recur, the content becomes richer and more detailed. In order to attain the objectives of teaching science and technology the teacher should use a variety of techniques based on process skills in science. These could include demonstration in laboratory, problem solving through modeling, experiments, projects, quiz sessions, making functional models. Collaborative work techniques can be particularly useful in teaching science and technology. Visits to a variety of industrial plants, extramural talks by experts from industry etc; can also be used to advantage.

#### 15.6.5 Process and Skills Based Science Curricula

During the 1960s and 1970s, the debate about the objectives of science education treated the science process skills and science concepts as if these were independent and separable. For example, Elementary Science Study (1966) was considered primarily process skill based, while COPES (Conceptually Oriented Program in Elementary Science) developed in 1971 was predominantly based on science concepts. During the 1980s, it was realized that the concepts and process skills in science education could not be treated as isolated because they are interdependent. However, science process skills can be relatively more emphasized at the elementary stage of schooling if the curriculum is largely activity-based. The notion of 'process skills' in science needs to be examined a little closely. In teaching science and technology we cannot accept that a 'skill' is simply the ability to perform some manipulative task. Science process skill involves perception, decision-making, knowledge, judgments and understanding in addition to some meaningful coordinated overt activity by hands, of speech etc.

Watts and Michell (1987) have listed various skills and processes related to science education that have been shown in Fig. 15.7.

## Processes and Skills in Science Education



**Fig. 15.7: Processes and Skills in Science Education**  
(Source: Watts and Michael, 1987)

Process and skills based science curriculum has special relevance for enabling the students to understand what science is all about. If science is what scientists do, then process and skills based science curricula can help the students to learn science by doing, through a variety of activities, peer discussion and using science related processes and skills. This approach to science education can promote interest in science and help in developing positive attitude towards science, and assimilate the values it stands for.

### 15.6.6 Attitudes and Values through Learning Science

Attitudes and values promoted through teaching-learning science include the following:

- curiosity
- respect for evidence
- willingness to tolerate and live with uncertainty
- critical reflection
- perseverance
- open-mindedness
- respect for analysis and synthesis; and
- creativity and inventiveness.

According to NCFSE (2000), "learning of science in schools augments the spirit of enquiry, creativity and objectivity alongwith aesthetic sensibility. It also nurtures the ability to explore and seek solution of the problems related to environment and daily life situations and to question the existing beliefs, prejudices and practices in society" (p. 58).

**Check Your Progress 4**

**Note:** Write your answers in the space given below.

- 1) Explain why scientific knowledge is always taken as provisional and not final.

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- 2) Explain "learning in the environment" as part of learning science.

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- 3) How is science taught in classes I and II?

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- 4) List any four values that can be learnt through science and technology.

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## 15.7 LEARNING SOCIAL SCIENCES

The area of school curriculum now called "social sciences" was earlier known as "social studies" which consisted of subjects directly related to the organization and development of human society, and to man as a member of social groups. Under its new name, social sciences curriculum enables learners to understand the human environment in its totality and in the process develop a broad perspective and an empirical, reasonable and humane outlook. Man's struggle with environment in the past and even today, the use of his powers and resources for his development and the essential unity of human civilization constitute the main themes of social science curriculum.

The well-organized democratic societies of today hinge on harnessing the developments of science and technology for the benefit of people. Their maintenance and progress can be ensured only through education, enabling the young learners in our schools grow up as mature, well-informed, responsible citizens of tomorrow, capable of managing, maintaining and further improving the society. Thus, the proper transaction of the social sciences curriculum becomes of critical importance. The social science curriculum draws its content mainly from four social sciences viz., geography, history, civics and economics and some parts of sociology. The elements drawn from these five disciplines help learners understand various dimensions of their social environment. Social Sciences provide a socio-spatial- temporal view of the development of human society, and thereby help the learner to understand the inner working of human society in totality; the pressures and the forces that operate on it, and the various processes that serve as checks and balances to maintain it. In order to enable the learners to

understand human society in a holistic manner, it is essential that the social sciences curriculum be transacted in an integrated manner and not as a mixture of discrete disciplines.

The modern world is shrinking fast. Globalization, open market economy, liberalization and terrorism have brought societies the world over closer to each other. The social sciences curriculum should enable learners to understand the processes of social change working in society, and the process of development and its effect on the system of governance at all levels-local, state and national, and how they can strengthen it. The curriculum should enable students to think globally and act locally.

### **15.7.1 Primary Stage Social Science Learning**

At the primary stage, social sciences are part of Environment Studies (EVS) but for classes I & II, the basic lessons are taught through a newly introduced paper 'The Art of Health and Productive Living' (AHPL). The AHPL curriculum focuses on the development of skills, habits, and attitudes towards (a) health care of self, and; (b) social values and skills. The learning experiences provided for the inculcation of social values and skills include participation in group songs, helping friends, taking interest in group work of various school and social activities and staying and working with friends, insistence on punctuality and regularity, honesty and truthfulness, showing concern for others and appreciating the good qualities of others. Besides, familiarizing oneself about the availability of various facilities like office, primary health center and making use of these, visiting of local historical places are included in the social sciences component of the AHPL curriculum.

The EVS curriculum for classes III - V is built around four themes viz., Learning to Know, Learning to Do, Learning to Live Together and Learning to Be. The social science component in the EVS curriculum is meant to enable the learners to:

- develop an understanding of social, cultural, natural and man-made environment and their interdependence;
- develop healthy attitude towards dignity of labour;
- develop skills of reading a map, locating places in the map and using the globe;
- develop social skills and values e.g. caring, sharing, cooperation, tolerance, working for common good etc;
- learn to live in harmony with environment and people of different communities and faiths;
- recognize and appreciate contributions made by people in the past and now for the community welfare;
- respect rules made by the community for people's welfare;
- understand and play one's appropriate role as an individual in home, school and community;
- practice positive values specific to their context e.g. truthfulness, honesty, brotherhood, patriotism etc;
- show and promote concern for others and environment; and
- appreciate culture and traditions and take pride in being an Indian.

It is to note that this curriculum lays the foundations for responsible citizenship of young learners.

At the upper primary stage students learn in detail about the country i.e. India and the world. The interaction among various components of environment is presented to them through processes and patterns e.g. patterns of rainfall in different regions and of urban and agricultural land uses. They learn about India's past through study of selected events and developments- social, cultural and scientific. They learn about our ancient cultural heritage and also about other civilizations and the contribution of Indian civilization to the common human heritage. Study of contemporary society, its set-up, its social, political, economic and cultural institutions, its administration and governance deepens learners' understanding about it and the country. Through the social sciences curriculum at the upper primary stage, learners become familiar with social skills as well as civic competencies.

The evolution of human society is a dynamic process and modern societies are continuously changing because of internal pressures and processes and external factors. At the upper primary stage, the students learn that the present is just a small segment of a much longer continuum of development and evolution of society. They also learn that just as the past of a society determines to a great extent its present, the present in turn will contribute to its future shape.

The major objectives of the social sciences curriculum at this stage are to enable the learners to

- develop an understanding about the earth as the human habitat;
- develop an understanding of the evolution of human societies and civilization in India and elsewhere in the world with their interconnections;
- develop an appreciation of the contributions made by different societies and civilizations to the progress of human-kind as a whole and India's contribution to the world civilization and vice versa;
- develop an appreciation of the growth of various components of the Indian culture and take legitimate pride in India's achievements in different periods and in different parts of India and the world;
- understand and appreciate the diversities in lands and people of India and the world and their interdependence;
- understand contemporary India and the world and become aware of the current processes of change and related issues and challenges;
- develop an understanding of natural and human resources and their potentialities for a better tomorrow;
- develop an understanding of the structure and functioning of civic, political, and economic institutions;
- develop an awareness of the various social and economic challenges facing the country;
- acquire the necessary skills and abilities, both academic and social to differentiate between fact and opinion, and think critically and creatively, communicate effectively and cooperate with others and respond to their needs; and
- develop a scientific temper and pro-active attitude to face challenges and unfamiliar situations with confidence.

The students through the prescribed social sciences curriculum learn substantially about the Earth, our habitat, people and society during the ancient the medieval and the modern period, community and its development, our environment, people and

government, resources and development in India and the world, and the major issues and challenges.

### 15.7.3 Secondary Stage Social Science Learning

The social science curriculum at the secondary stage has its focus on contemporary India, the processes and patterns of man-environment interaction and issues related to environment, its resources and developments in country's past e.g. struggle for independence, the contributions of various sectors of society, especially the women; social, economic and political developments in free India. The students also learn about the various challenges that we face as a nation (e.g. poverty, illiteracy, corruption, anti-social practices), and about the citizen's fundamental rights and duties. They also learn about India's role in the world peace, international cooperation and decolonisation. The major objectives of the social sciences curriculum at this stage are to enable the learners to:

- develop an understanding of change and development as processes in time and space that enable societies to evolve;
- develop an understanding of contemporary India in its historical perspective, of the basic framework of the goals and policies of national development in independent India, and of the process of change with appropriate connections with world development;
- deepen their knowledge and understanding of India's freedom struggle and its values and ideals and contribution of various sections of society;
- understand the values enshrined in the Indian Constitution and prepare for their roles and responsibilities as effective citizens of a democratic society;
- deepen their knowledge of India's environment in its totality, the interactive processes and effects on future quality of life of our people;
- understand the diversity in the land and people of India and appreciate its underlying unity;
- appreciate the richness and variety of India's heritage, both natural and cultural, and the need for its preservation;
- understand the issues and challenges of contemporary India-environmental, economic and social, as part of the development process;
- learn to live in a confident, stress free and responsible manner and participate effectively in the community;
- develop scientific temper, spirit of inquiry and follow rational and objective approach in analyzing, interpreting and evaluating data; and
- develop academic and social skills e.g. critical thinking, communicating effectively both in visual and verbal forms, cooperating with others, taking initiative and providing leadership for solving problems.

The social science curriculum at the secondary stage is built around six themes viz., India in the twentieth century world, making of a modern nation, land and the people, heritage of India, resources and their utilization, and economic and social development. The first three themes are for class IX and the rest are for class X.

At the senior secondary stage, there is no composite social sciences curriculum. Various social sciences e.g. History, Geography, Economics, Political Science and Sociology are chosen by students according to their preferences, and they take the CBSE examination for these. Each of these social sciences has a distinct set of objectives based on the nature of the discipline and carefully chosen subject matter.

Learning social sciences promotes various values and helps to develop positive attitude towards various aspects of our social and political life. Chief among the values promoted through learning of social sciences are the following:

- 1) Secularism and respect for all religions, sects and faiths. These are very important values in the composite culture because followers of nine religions live amicably in our country. Besides, secularism is a basic value emphasized by our Constitution. Secularism is the essential characteristic of our multicultural society.
- 2) Tolerance for others' faith and viewpoint. This is an essential value of democratic way of life. Without tolerance for each other's faith and views, our society cannot exist.
- 3) Respect for the Constitution and faith in the supremacy of law. Through social sciences, students learn about the supremacy of the Constitution and the law of the land. This promotes the hope that when these learners grow up, they would become law abiding citizens.
- 4) Legitimate pride in India, her people, heritage and national symbols. Through learning social sciences, students can learn that legitimate pride in one's country, its people and traditions does not mean hatred for others.
- 5) Responsibility for one's community and nation and concern for their people.

Social sciences help the learners to develop positive attitudes towards participation in political processes, social and economic life, democratic way of social life, cooperation with others, mutual concern for each other's welfare and the desirability of negotiation and consensus building.

In fact, social sciences curriculum, if properly transacted through collaborative groups and projects can more than any other curriculum lead to inculcation of values and attitudes and social skills without which our collective welfare may remain considerably unrealized.

### Check Your Progress 5

**Note:** Write your answers in the space given below.

- 1) Why must the social sciences curriculum be transacted in an integrated manner?

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- 2) What do students of classes I & II learn through The Art of Healthy and Productive Living?

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- 3) Around what themes is the EVS curriculum for classes III - V built?

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- 4) List three main topics learnt by students of upper-primary stage in social sciences curriculum.
  - a) .....
  - b) .....
  - c) .....
- 5) Answer by writing T (True) or F (False) against each of the following statements.
  - a) Students at the secondary stage learn primarily about the contemporary world. ( )
  - b) Students learn about the challenges modern India faces in class VIII. ( )
  - c) Students of secondary stage learn about India in the twentieth century world. ( )
  - d) Collaborative work and group projects can help the students to assimilate inherent values in social sciences curricula at the school. ( )

## 15.8 ART EDUCATION

Art Education has been a significant curricular area of school education. Its purpose is to 'develop aesthetic sensibility among learners so as to enable them to appreciate the beauty in nature, line, colour, form, movement, sound, rhythm, harmony and balance' (Guidelines and Syllabi for Upper Primary Stage, 2001, 71). Art education promotes creative expression and helps to develop appreciation of the oneness of human family and of human heritage. The rock paintings at Bhimbetka, near Bhopal, provide us an amazing insight into various modes of creative expression of the primitive man.

Art education as a curricular area cuts across national boundaries, political ideologies and school systems. It figures in almost all school education curricula of general (i.e. undifferentiated) education. The urge to express oneself creatively and aesthetically has been a typical characteristic of humankind. Human beings have always tried to express beauty in nature through various modes of creative, aesthetic expressions and derive joy as well as experience a sense of fulfillment and enrichment from it. However, as a curricular area of school education, Art Education has respected children's characteristics peculiar to their various developmental stages. This is best reflected by stage-specific curricula in Art Education.

### 15.8.1 Art Education at Primary Stage

NCFSE (2000) takes a broader and more realistic view of art education at the primary level and calls it The Art of Healthy and Productive Living (AHPL). It represents a merger of what earlier existed as three distinct areas viz., Art Education, Work Experience, and Health and Physical Education. Through this seamless merger, AHPL seeks to provide meaningful learning experiences that would support all round development of the child's personality. NCFSE (2000) recommends that learning experiences in the context of AHPL should be "organized keeping the child in central focus involving students in activities commensurate with their developmental stage. Activities related to health will get a prominent place so that children acquire necessary skills, attitudes and habits to keep themselves healthy ... Children will be initiated into preliminary yogic exercises and will be exposed to various soothing experiences in the field of music, drama, drawing and painting and clay-modeling ... All these activities need to be presented in an integrated manner for which themes will be identified

and teachers will make use of available resources and harness community support...”  
(p. 47)

Learning experiences relating to AHPL should enable the learners to:

- develop regular habits and attitude to meet the natural needs of the body;
- understand the functions of different parts/organs of the body and develop habits to keep them clean and healthy;
- develop sensitivity towards their immediate environment and understand the interdependence between humans and the environment;
- develop values such as cooperation, tolerance, caring and sharing;
- develop physical, mental and emotional well-being through yoga and games;
- nurture self-expression and creativity through visual and performing arts;
- develop human values like honesty, truthfulness, respect for others, punctuality, regularity and appreciate these in others;
- appreciate the local as well as national cultural heritage;
- develop feelings of patriotism, nationalism and take pride in being an Indian; and
- develop awareness to protect and conserve India's historical and cultural heritages.

These objectives constitute the relatively more important learning outcomes of teaching AHPL.

The Guidelines and Syllabi (2001) recommend that teaching-learning strategies for AHPL should be based on activities that are perceived as interesting and joyful by learners, are related to children's background and immediate environment and provide scope for children's creative expression through various art forms. The Guidelines and Syllabi (2001) make it explicit that instead of formal evaluation of AHPL — related learning, children should be assessed informally and on a continuous basis. If necessary, remedial instruction may be provided to children who need it.

### 15.8.2 Art Education at Upper Primary Stage

At the upper primary stage, AHPL becomes more focused and it is called 'Art Education'. Its major objectives at the upper primary stage are:

- to enable the children to identify feelings, thoughts, emotions and fantasies in interactions with environment;
- to help learners organize thought processes and experiences and express these through a variety of media viz., body movements, sound, graphics, painting etc;
- to help children discover and identify their potentials, experience their individual self and relate it to their surroundings through different modes of expression;
- to help develop self-dignity, originality, self-expression, individuality and initiative through creative experiences;
- to help develop a sense of expression, organization and a sense of design;
- to inculcate liking for order in art activities and personal life;
- to develop team spirit through group activities; and
- to develop understanding and appreciation of one another's cultural heritage.

The Art Education syllabus at this stage consists of three areas viz., visual arts, performing arts and creative drama. Under visual arts, two dimensional pictorial experiences are to be provided through drawing and painting, printing and designing, collage making and applied designing including free handwriting and calligraphy. Experiences and activities related to three dimensional objects and sculpture include making shapes and forms with clay, making 3-D objects with waste material and preparing masks and puppets. Group activities in this context would include study trips to botanical and zoological parks, art exhibitions and work places of craftsman and artists, chorus singing, community singing and organized visits to art galleries and museums.

Syllabus for performing arts include theory of music (basic concepts e.g. sangeet, nad, shrut, swar, saptak etc;), and life sketch of a reputed musician of India; knowledge of ragas (e.g. Rag Bhupati, Rag Yaman and Rag Bilawal etc;) and rhythm, knowledge of songs (e.g. Teen Tal, Kaharva, Dadra, Jhaptal), including patriotic and devotional songs, National Anthem and Vandematram, flag songs and welcome songs.

The syllabus in respect of creative drama includes activities that can be enacted through rhythmic movement, and mime with speech, music and rhythm. Various activities under this can include recitation of poetry, acting, characterization, improvisation and group work e.g. producing and staging a play.

### **15.8.3 Art Education at Secondary Stage**

At the secondary stage, art education explores various means of communication viz; verbal as well as non-verbal. Awareness of various art forms, use of various art materials, tools and instruments, developing a sense of space organization, design and order, as well as aesthetic sensibilities are the major concerns in art education at this stage. The objectives of art education at the secondary stage are to:

- help students to consolidate earlier experiences and knowledge related to art education;
- enable learners to become aware of new media and techniques and use these for creative expression;
- help students become aware of folk arts, local specific arts and other cultural components of our national heritage;
- enable students to use artistic and aesthetic sensibility in everyday life;
- develop as a balanced social being through projects on national and cultural heritage;
- develop acquaintance with the life and work of local artists;
- develop creative expression through locally available material; and
- refine one's sense of appreciation of the beauty of nature and the basic elements of art forms.

The syllabus for art education at the secondary stage has three components viz., visual arts, performing arts, and creative writing and poetry. Under visual arts, the learners are expected to work on two-dimensional as well as three-dimensional objects. These include learning experiences of various types e.g. drawing and painting, collage making, print making, photography, computer graphics (wherever necessary resources are available), clay modeling, pottery, carving and sculpture and construction of objects. Under performing arts, learning experiences are to be related to vocal and instrumental music, movement and dance, creative drama and puppetry.

### 15.8.4 Values and Attitudes through Art Education

Art Education promotes values that are not easily fostered through other subjects; chief among these are the following:

- **Creativity:** Through art education children learn to perceive the common and the routine in new perspectives. They learn to do so by extending their unique or alternative perceptions so that a new holistic experience takes shape. This capacity to perceive things in alternative perspectives and arrive at a different yet valid re-arrangement of parts is the hallmark of a creative mind. All too often, routine and pedestrian classroom teaching dulls children's creativity and compels them to think convergently instead of divergently.
- **Imagery and Intuition:** Art education promotes imagery and intuition in children. Art education can support the development of children's imagery in a special way. Adams and Ham (1994, 271-273) describe various activities that not only enable children to develop imagery and intuition but also determine what would come next using their mental pictures.
- **Non-Verbal Communication:** Art education encourages learners to develop their non-verbal communication. Whatever form art education may take, it will surely promote the child's capacity to communicate complete meaning. Besides, it can equip learners with skills to understand and respond to non-verbal communication from others. After all, reading an artist's symbols is as much a skill as reading print or video images.
- **Aesthetic Sensibility:** It is through art education that learners can be enabled to develop and use aesthetic sensibility. A work of art, whatever the medium, is characterized by form, order, harmony, beauty, meaning, mystery and quality. Through art education, these aspects of aesthetic sensibility can be promoted among learners.
- **Complete Attention to the Task:** Art education provides invaluable practice and opportunity to learners to devote complete attention to the task, to immerse themselves totally in the job, to identify themselves completely with the role/character being played by them. This ability to devote one's complete attention to the task in hand has immense transfer value for learning other subjects.
- **Appreciation:** Art education can promote the skill of appreciating the work of others on the basis of accepted criteria. Learners can also appreciate the labour and the devotion that goes into the making of a work of art. Art education can also make learners aware about the possible flaws that can mar the effect of a work of art.

Art education can introduce students to that sense of wonder and awe which is embodied in a real work of art. This sense of wonder and awe can enable students to engage in shared search for meaning and interpretation of their experiences.

In the end, we would do well to remember the words of Voltaire who was convinced that without knowledge of arts children would remain as ignorant as without knowledge of literature or mathematics.

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## 15.9 LEARNING FOR MASTERY

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It is expected that so far as the basic elements of curriculum-based learning are concerned, these should be mastered by all learners. Learning for mastery leads to **mastery learning**. It is normally denoted by the expression 100/100. The first number represents the percentage of competencies to be achieved while the second denotes the percentage of students who actually achieve the competencies represented by the first number. Ideally, the learners should achieve 100/100 (or 100 ' 100) learning, but

too often it does not happen because of various reasons e.g. individual differences related to intelligence, motivation, available academic and emotional support at home, level of learner's reading and listening comprehension, learning deficiencies related to previous learning and allied academic areas etc. Normally mastery learning is assumed to have taken place if students are able to achieve 90 % 90 (in subjects like math) or even 70 % 70 (in languages). Learning for mastery is a key concept for Minimum Levels of Learning (MLLs) especially at the primary stage. The progress of the entire class cannot be slowed down just because a few students are not able to perform like others. The teachers have no other option except to redefine mastery learning at a little lower level; instead of waiting endlessly for 100/100, they may feel that 80/80 would be acceptable for a specific group of learners in their specific subjects.

### How to Promote Learning for Mastery

Learning for Mastery, like learning, does not happen somehow and by itself; it has to be planned for. At the primary stage, the teacher can use child-centered pedagogy and activity-based learning. Teaching should be at the learner's level of understanding and if possible through a style that is closest to the learner's preferred style of learning. It is better to aim at a little over learning instead of under-learning. And through repeated use of questions, the teacher should obtain feedback whether (s) he is teaching effectively and to what extent.

At upper primary and secondary stages, the teacher should provide for individualized learning through programmed self-learning materials and Personalised System of Instruction (PSI). Besides, teachers can use individualized assignments suitable for learner's ability level and provide more practice, and also use collaborative techniques of teaching-learning. These measures will increase learners' interactions and peer learning.

### Check Your Progress 6

**Note:** Write your answers in the space given below.

- 1) Briefly describe why art education should be a part of general education.

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- 2) What do students learn about visual arts at the upper primary stage?

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- 3) Explain 'aesthetic sensibility' as a value promoted by Art Education.

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- 4) Describe why the target of 100/100 learning for mastery is normally hard to achieve.

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## 15.10 LET US SUM UP

Through this Unit on Curriculum Based Learning, you have learnt a good deal about the nature of school curriculum, their types and the controversial aspects of any school curriculum especially the National School Education Curriculum and the hidden curriculum.

In terms of its content, it is a rather heavy unit because the subject curricula have been dealt with in terms of three stages of school education viz., the primary, the upper primary and the secondary, which also includes the senior secondary. Under subject curricula, we have learnt in detail about the objectives, the content and the methodologies of teaching and learning of (a) languages - Hindi and English, though at some places Sanskrit was also discussed, (b) Mathematics, (c) Science and Technology, (d) Social Sciences and (e) Art Education. The recently developed National Curriculum Framework for School Education (2000) and the four-volume Guidelines and Syllabi (2001) provide a contemporary focus and futuristic orientation to our school curricula. In addition to the aforementioned aspects of subject curricula, we have studied about the values and attitudes that can be promoted through these curricula. The objectives and the content of each subject curriculum define and describe 'what' student learn, while the methodologies of teaching-learning describe 'how' this learning is expected to be promoted. You will find it necessary to often revisit this Unit because much of it is directly concerned with what happens in the classroom to promote student learning.

## 15.11 UNIT END EXERCISES

- 1) Choose a curriculum subject (primary/secondary/senior secondary) according to your academic expertise and analyse the content of the textbooks with reference to the objectives of teaching the subject at that level. Do the contents and objectives match? Is the content difficulty level according to the cognitive ability of children of that particular age group?
- 2) Does the curriculum content you have chosen include local knowledge? If not, how will you include some local knowledge into your school curriculum framework?

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