UNIT 18 DEVELOPING COGNITIVE ABILITIES AND UNDERSTANDING CONCEPTS

Structure

18.1 Introduction
18.2 Symbolic Thought and Fantasy
18.3 Some Cognitive Abilities
  18.3.1 Taking Another Person’s Perspective
  18.3.2 Matching
  18.3.3 Identifying Common Relations
  18.3.4 Conservation
  18.3.5 Classification/Grouping
  18.3.6 Seriation
  18.3.7 Understanding Cause and Effect Relationships
18.4 Animism
18.5 Acquiring Concepts
  18.5.1 Concept of Number
  18.5.2 Other Concepts
18.6 The Emerging Reasoning Skills
18.7 Summing Up
18.8 Answers to Check Your Progress Exercises

18.1 INTRODUCTION

In Blocks 2 and 3 you have read about the development of thought in the first three years of life. As you know, according to Piaget, the development of thinking abilities progresses through four stages — the sensori-motor stage, the pre-operational stage, the concrete-operational stage and the stage of formal operations. In the last Block when considering the years of toddlerhood, we had mentioned the pre-operational period, which lasts from the second birthday to the sixth or seventh birthday. In this Block we shall read in detail about the characteristics of thinking in the pre-operational period.

The description of the emerging thinking abilities of the preschooler makes for some of the most fascinating and interesting reading in the area of Child Development. This is the time when imagination becomes possible. The preschool child is forming her ideas about the things she sees around her — the people, the home, the street, the trees, the sun, the moon, the stars, the clouds, water and familiar objects. Everything interests her. She wants to find out the cause of events. Along with this, she has her own logic about things and some of her explanations and her reasoning are likely to leave you quite surprised, as happened with Kavita’s father in the following anecdote.

Five year old Kavita was digging in the soft earth just outside her house with a sharp stick. She had been at this for about fifteen minutes when her father, wondering what she was doing, asked her, "What are you doing"? Expecting a common place reply, he was left speechless when she said in all seriousness, "I am seeing till where the earth is. I’ll dig and come to the bottom".

Preschoolers are very serious about their reasoning and believe in their explanations though these may seem amusing to adults, who look at the world differently. When they ask the adult, "Why does it rain?", they are not asking for the laws of science. They probably want the adult to say what they believe and that may be, "It rains because God got tired of holding the water on his shoulders." Preschoolers have worked out their own answers about many things and they state these explanations with such an air of assurance that you are often left wondering how they thought of it and who told them so. Nobody told them so — they thought it out themselves. To understand children of the preschool years, we will have to look into development of their thinking abilities. This is the aspect we shall focus upon in this Unit.
Objectives

After studying this Unit, you should be able to:

- understand the characteristics of thinking of the preschool child
- realize how the preschooler is different from the toddler and an older child
- explain how the ability for symbolic thought and fantasy makes a difference to the child’s thinking
- describe some cognitive abilities that the child develops during the preschool years
- list some concepts that preschoolers acquire and understand that the child’s environment influences, to a great extent, the concepts she acquires
- provide examples which reflect preschoolers’ reasoning abilities
- relate the discussion in the Unit to your everyday experiences with preschoolers and use this understanding to plan appropriate play activities for them

18.2 SYMBOLIC THOUGHT AND FANTASY

All of you must have talked to and played with children of preschool age some time or the other. These interactions would have given you an idea about what preschoolers are like. Before you go on to reading about the characteristics of preschoolers’ thinking, it would be useful if you pause for ten minutes, recollect some of your interactions with them and list down their cognitive abilities. What can preschoolers do? Can they give you six pencils when you ask for them? Can they remember a rhyme and sing with you? Can they remember and follow instructions? Do they know some colours? Can they match similar colours? Do they have an idea about familiar objects so that if you show them the picture of a cycle without a handle, they can spot what is missing? Do they recognize some common animals? What else do they know about them?

Write down these aspects in the space provided below. As you do so, you must remember that while children between two and six years of age are all called preschoolers, there are differences in the thinking of children within this age group. When you ask a five year old to give you six pencils, she is most likely to give you the correct number, but most three year olds will not be able to do so. They will probably gather a bunch of pencils and give them to you, saying that they are six in number. They may know the number six, but they do not know what it means. So, as you note down the cognitive abilities of preschoolers, you must also write their age, as the abilities will differ from one year to the next. You may also like to note down an anecdote which reflects the preschooler’s reasoning.

Let us first discuss the major characteristic of pre-operational thinking that sets it apart from the sensori-motor thought of the infant. This, as you know, is the ability to think symbolically. How does being able to think symbolically make a difference?
Once a child can think symbolically, she can also hold mental representations of objects and events, and picture these to herself even when they are not present. She can now imagine what may exist, instead of knowing only about those things which she can see and hear. This enables her to know more. When, for example, on seeing a plant which is drooping, the four year old says, "It hasn't got water", it is clear that she has inferred the cause of the drooping. You would remember that the ability to infer a cause begins to emerge in the sixth substage of the sensori-motor period. At that stage, this ability is elementary. During the preschool period, the child is able to make such inferences about more complex and a larger variety of things. Can you recall some examples from your interactions with preschoolers which reflect this ability?

Learning language and drawing are other indicators which show that the child is thinking symbolically. In fact, language is the most widely used means of symbolic thinking. The child says her first word around the first birthday and, between the period of one and two years, acquires about a hundred words. At two years of age mental representation and symbolic thinking becomes established, and, thereafter, children acquire words at a rapid
Fantasy, another evidence of symbolic thinking, makes pre-operational thought different from sensori-motor thought. Preschoolers' world is full of fantasies and their make-believe reflects the richness of their imagination. Let us consider this aspect in detail.

Fantasy and Imagination: You know that during the sensori-motor period, the infant plays by manipulating objects — she pulls a string to make the toy monkey move or she beats the drum to make a sound. The element of imagination in play is added towards the end of the sensori-motor period.

In the beginning of the preschool years, pretend games are simple. As the child’s ability to imagine develops, these games become more detailed. Two-and-a-half year old Tutu, while playing with a stick, begins to move it on the ground. When her sister asks her what she is doing, she says, “Doggie walk”. In contrast, four year old Pinkoo’s make-believe is more elaborate. He ties a string to a paper and runs, holding it away from his body. He pretends that the paper is a bird following him. In a make-believe chase, he pretends to hide behind a ‘hill’ and crouches low on the floor, so that the bird does not reach him. He also reverses roles and makes other variations in the game. You would have seen preschoolers pretending to be mothers, fathers, grandfathers, shopkeepers, night watchmen or farmers.

Preschoolers also narrate imaginary situations/stories to others. This is another aspect of make-believe. You may have heard some children doing so. Animals, birds and children are preschoolers' favourite themes during such narrations. While playing with a friend, a five year old began narrating an encounter, imaginary of course, with a lion in the jungle. He described why he went to the jungle, how he met a lion there, the conversation and the fight they had and how he emerged the victor. The other child, not to be outdone, began speaking about his meeting with another lion, who he claimed was more powerful than the first child’s lion and how he defeated this lion. In this manner the stories continued, with both the children by turn adding frightening details, so as to seem more brave than the other.

Some preschoolers also invent an imaginary playmate who has a definite appearance and character. This playmate may be a boy or girl, animal or bird and accompanies them wherever they go. The child often carries on conversations and plays games with this playmate. In Box 18.1 is a description of Shaukat’s play with his imaginary playmate.

### BOX 18.1 : Shaukat’s play with his imaginary playmate

When Shaukat was three-and-a-half years old, his mother would sometimes hear him speaking to himself. After this happened three or four times, his mother asked him whom he was speaking to. He replied, “To my friend Govind”. Since there was no one else, his mother asked, “Where is Govind”? The child said, “He is playing with me”. The mother, understanding now that the child was pretending, asked him, “Where does he stay”? Shaukat pointed to his chest and replied, “Here”.

Subsequently, while eating his food, Shaukat would pretend that Govind was sitting opposite him. He would offer him a morsel, hold it for sometime, ask him to eat and would then put the morsel in his own mouth. He would also give Govind turns during play — he would push the toy car over to the side where Govind was supposed to be sitting and ask him to play with it. He would then go over to that side and begin playing with the car, pretending that he was Govind. After some time he would come back to his original position and say, “Govind, have you finished playing? Now give it to me”.

Sometimes children become so involved in their make-believe that they forget it is imaginary and behave as if it were real. One day Shaukat’s mother took him along when she went to visit a friend’s house. The friend, familiar with Shaukat’s imaginary playmate, asked him, “Where is Govind”? Shaukat replied, “He is sleeping”. The house was noisy with many guests and a little while later Shaukat began to insist, “Let’s go home. Govind will wake up”.

rate. We will not talk in detail about this aspect here, since the next Unit is wholly on language development during preschool years. You will read about children’s drawing in the subsequent Blocks.
Pretend play, besides being fun, also helps children to deal with feelings of disappointment and fear as well as with conflicts. You read in the first Block how Raza gave vent to his feelings of anger by beating his toy horse with his father’s belt. Another child who had been locked in a room by her mother, later made her toy monkey sit in a corner and continued to play with her other toys. In between her play, she would look at the toy monkey and say, “Sit there. You broke the plate”. In this manner, the child acted out the situation in which she had felt upset and angry and expressed feelings which she could not do openly. You may have seen children enacting actions and scenes in their play that they have observed in adults.

18.3 SOME COGNITIVE ABILITIES

What are some of the cognitive processes and skills that the preschooler acquires and develops further? How are they useful for the child? As you know, the major source of information about these aspects is Piaget’s work with children. Subsequent to Piaget, many researchers have carried out studies to verify his description of cognitive abilities. Therefore in this Section we will look at the salient characteristics of preschoolers’ thinking, first through Piaget’s eyes and then through the eyes of the later researchers. In this manner, we will trace how each cognitive ability develops over the preschool years.

It is important to know about these cognitive skills and abilities since we use them in our day-to-day lives. Acquiring concepts is based on these abilities. As you will read this Unit as well as the ones in the subsequent Blocks, this link between abilities and concepts will become clearer to you.

18.3.1 Taking Another Person’s Perspective

Being able to look at things from another person’s perspective is an important ability and is, the basis of most of our social interactions. If we are unable to consider the perspective of others, we will not be able to understand how people are thinking and feeling. A meaningful exchange will not be possible.

Piaget traced the development of this ability in children. He stated that preschool children look at things entirely from their own perspective, from their own frame of reference. Preschoolers feel that other people see, understand and interpret events and actions just as they do. They assume that others see, hear and feel about things just as they do. They think that whatever they can do, the others can. If they are feeling unhappy, so must be the others. If they close their eyes and cannot see something, they assume that others in the room cannot see it as well. Piaget called this quality of the child’s thought egocentrism. He stated that preschoolers do not understand that another person can look at the same things in a different way and can arrive at different conclusions.

An Experiment on Taking Another’s Perspective

To demonstrate what he meant, Piaget carried out the following experiment with children between four and eleven years of age. In this experiment a three-dimensional model of three mountains of varying heights and colours is placed on a table, surrounded by four chairs. The child is asked to walk around the table and see the mountains from each side. Then the child sits on one chair and a wooden doll is placed on another chair. The child is then given ten photographs, each of which shows the mountains from a different view. The child is asked to pick out the picture that shows how the mountains appear to her. Most of the preschoolers are able to do this. Then the child is asked to pick out the picture that shows how the mountains must appear to the doll. It is here that differences can be seen among children. Very young preschoolers pick up any picture, which shows they have no idea about perspectives. Preschoolers a little older, around five years of age, hold out the picture that shows the mountains from their view and not from the doll’s. This shows that they assume that the doll sees the mountains as they do. By six and seven years of age, children begin to realize that the view of the mountains is different when seen from the doll’s position, but they still cannot choose the right picture. They guess. They pick up one picture, then another and then yet another. By age nine, all children are consistently able to pick up the right picture.
In Piaget's view, the child will be able to do this task correctly only when she understands that things can look different from another's perspective. Figuratively speaking, the child has to put herself in another person's shoes.

Later Research

Researchers who have carried out studies to verify Piaget's theory state that one of the reasons why preschoolers are unable to give the right answer on the above experiment is that it is too complicated for them. Secondly, it is also far removed from what children experience in their day-to-day lives. Researchers say that there are many instances in day-to-day lives which show that preschool children do understand how another person must be thinking and feeling. You have read in the earlier Block that some two and three year olds show empathy. This means that they are able to look at events from the other person's perspective and can understand what the person is feeling. That four and five year olds speak in shorter and simpler sentences when talking to infants and use 'baby talk', shows that they are aware that the infant will not be able to follow complex sentences. It has also been found that when the experimental situation is in some way related to preschoolers' real life experiences, then their ability to consider the perspective of others becomes evident. In one of these later experiments, the researcher showed preschoolers a model of two policemen and a doll. The children were told that the doll had done something wrong and had to hide between the walls shown in the model in such a way so that the policemen cannot see it. This task, like the mountain experiment, requires the preschooler to imagine the situation. The child has to imagine herself in the place of the doll and find the corner where neither of the policemen can see it. However, unlike the mountain experiment, a majority of the children were able to do this successfully and hid the doll where the policemen could not see it. The reason for this, the researchers felt, was that this task was related to real-life. In everyday life children often do things which are forbidden and are aware of what must be done.

In another experiment, researchers took a card, on one side of which was a picture of a dog and on the other side that of a cat. Preschool children were shown both sides of the card and then the card was held vertically between the child and the researcher, so that the researcher saw one animal and the child, the other. When asked what animal the researcher was seeing, three year olds were able to say that the researcher saw the animal other than one they were seeing. But if the task is made a little difficult and both the researcher and the child are asked to look at the same animal from different angles, then preschool children find it difficult to imagine that the researcher is seeing a different view. In such a case, they often give a wrong answer.
It is not as if all subsequent research has disproved Piaget's theory that preschoolers are egocentric. Other experiments have shown that children of preschool age are limited to their own perspective. When asked to show a picture to the researcher who was facing them, preschoolers held it in such a position that they themselves could see it but not the researcher. When asked to show their fingernails, they held their hands up with their palms out and fingernails facing inwards towards themselves.

So what does this contradictory evidence tell us about the preschool child's ability to take another person's perspective? In the final analysis we can say that whether or not the child is able to take another's perspective depends upon the situation. There are individual differences as well. It is not as if the preschool child is completely egocentric. She can consider another person's viewpoint but she is more tied to her own perspective and to her own view of things than is an older child.

Check Your Progress Exercise 1

1) Read the following statements carefully. Each of them is incomplete. Along with the statements choices have been given, one of which is the most appropriate. Tick (√) the appropriate answer to each statement.

i) The cognitive ability that indicates the beginning of the pre-operational period is
   a) ability for symbolic thinking
   b) ability for goal-directed behaviour
   c) ability to take another person's perspective

ii) Pretend games
   a) become more elaborate and complex as the child grows older
   b) become simpler as the child grows older
   c) played by three year olds are same in complexity as those played by six year olds

iii) Playing pretend games, the development of language and drawing — all these three abilities are evidence of
   a) egocentric thinking
   b) reflexes
   c) symbolic thinking

iv) Egocentric thinking refers to
   a) understanding another person's emotions and responding to them appropriately
   b) the ability to play pretend games
   c) looking at things entirely from one's own frame of reference, from one's own perspective

v) Preschoolers
   a) are completely egocentric
   b) are not egocentric at all
   c) can at times consider the other person's perspective but in most of the situations they behave egocentrically

18.3.2 Matching

Three and four year olds when given a collection of objects in which only two objects are identical and the rest are different, can find the identical pair. Similarly, in an assortment where all objects are the same except one, they can spot the different one. This shows that they have the ability of matching. You could find out about preschoolers' matching abilities by designing a simple activity. Ask them to pick up leaves that are the same as each other from a collection of different leaves.
Preschoolers can separate identical leaves

If the child can match objects, it follows that she can discriminate between 'same' and 'different' and has these concepts. This ability to discriminate between same and different things is basic to many cognitive skills. It is also an important skill for literacy. The child must be able to discriminate between letters such as 'm' & 'w', 'D' & 'O' and 'd' & 'b' which tend to look similar. The basic concepts of 'same' and 'different' lead to discrimination. They also help the child to understand the concepts of similarity and difference.

18.3.3 Identifying Common Relations

Preschool children can identify common properties or a relationship between two objects which are not identical. This ability is called identifying common relations. It differs from matching in that matching always involves finding identical pairs, while common relations involves a pair that is non-identical. They are pairs because they have something in common between them. They may be opposites like up and down, hot and cold, or they may be items that go together like shoes and socks, comb and hair, flowers and vases. They may also be cause and effect relationships like cloud and rain. Basically, what the child does when pairing objects in terms of a common relation between them is to answer the question, "Which two objects are related to each other in some way"? In this ability reasoning skills are involved. This ability develops over the preschool years.

You could design an interesting play activity for children based on this ability. The activity would also help you to guage their ability for identifying common relations. One such activity has been described in Box 18.2.

Learning to pair objects on the basis of common relations gives the child an understanding of one-to-one correspondence which is necessary for understanding mathematical concepts later on. This ability is also basic to understanding more complex analogies at a later stage, such as "knife is to vegetable as axe is to ...." Learning to see a relationship between things is the basis for making sense of a complex world. As the child sees common relations between pairs, she understands that there are diverse ways of relating objects, i.e., pairs can be of many kinds — opposites, cause and effect and so on.
BOX 18.2  Play Activity

Make cards, about 4 cm square, from thin cardboard, like covers of notebooks. On each pair of cards draw two objects that have a relation between them. For example, on one card you could draw a table and on another, a chair. In this way you have a pair of cards ready. Make many pairs of cards. Then give these cards to the child and ask her to put those cards together “that are related to each other in some way”. You may have to explain to the child what exactly you mean, by pairing some cards yourself.

The objects that you draw on the cards should be those that the child can understand and those with whom she has some experience. If, for example, you make a pair of the moon and a rocket, it is quite likely that the younger preschooler would not know the connection and so will not be able to pair them. However, it is possible that five and six year olds are able to see the relationship between the two, if they are familiar with the concept. Thus, these cards will help you in another way. They will tell you about the concepts that the child is familiar with. If you use these cards with children of different ages, you will also come to know how children’s understanding develops with age.

You may wish to note down your experiences with the cards here.

18.3.4 Conservation

Piaget carried out some very interesting experiments to probe into another cognitive ability — the ability to conserve. Conservation means being able to understand that the quantity or the amount of a certain substance remains the same, even if its shape is changed or if it is...
transferred from one container to another, so long as nothing is added to or subtracted from it. On the face of it, there seems nothing difficult about understanding this and it is hard to imagine how anybody could think otherwise. Piaget found that preschoolers were not able to conserve. He found that the ability to conserve developed after the preschool years.

**Piaget's Experiments**

In one of his classic experiments on *conservation of substance*, Piaget gave preschool children a ball of clay and asked them to make another exactly like it — "just as big and just as heavy". Then he asked them if the amount of clay in both the balls was the same. All the children agreed that the amount was the same. Then, as they looked, he squashed one of the lumps of clay so that it flattened out. Now the children were asked, "Is there the same amount of clay here (pointing to the squashed lump) as there is here (pointing to the ball) or is there more here or more there?"

Preschool children in Piaget's experiments generally think that the amount of clay in the two pieces is different after one has been squashed. In other words, they do not conserve. Piaget stated that the development of the ability to conserve progresses through three stages. The younger preschooler — between four and five years — does not conserve at all. This is the first stage — i.e., there is no conservation. The next stage is the transitional stage, when children conserve in some situations and not in others. They are developing this concept but it is not stable as yet, so they may change their mind from one situation to the other. The third stage is when children conserve consistently, no matter how the object is transformed. This happens between eight and ten years of age. Now they emphatically say that the amount of clay is the same in both, i.e., they are able to conserve.

Similarly, in another Piagetian experiment to test conservation of amount, preschoolers are shown two identical glasses, both of which have water filled to the same height. On being asked, preschoolers agree that the amount of water in the two containers is equal.

![Child is shown two identical glasses with equal amounts of water](image)

Then, while the children watch, the water from one glass is poured into a third glass which is wider and shorter than the other two. In this glass the liquid obviously rises to a lower height.

![Water from one of the glasses is poured into a shorter & wider glass](image)
Now the child is asked whether there is the same amount of water in both the glasses or if there is more in the short and the wide one or in the tall and thin one. Most preschoolers insist that there is more water in the tall and thin glass. They forget that they had seen and said that the quantity of water in the two glasses was the same, just a little while ago. They agree that no water was added and none was taken away while transferring it from one glass to another, but they still insist that the short glass has less water after the transference. What happens is that their attention now gets caught by the height of the water in the two glasses and they say that one of them has more water than the other. They do not notice the difference in the width of the glasses. Piaget found that the developmental trend in this experimental was the same as observed in the earlier experiment with clay. Children go through the three stages described earlier. Once they reach eight or nine years of age, they conserve and say that both glasses have the same amount of water.

Yet another simple experiment shows aspects of the preschool child’s thought. Children are shown two sticks of equal length, which are placed in front of them, as shown in Figure 18.a. In this position both the sticks, which are equal, appear equal as well and, on being asked, preschoolers agree that they are equal. Then before their eyes, one stick is moved towards the right as shown in Figure 18.b.

Piaget’s Explanation

Why do preschoolers answer in this manner? What is it about their thinking that prevents them from realizing that the amount of clay, the quantity of water and the length of the sticks remain the same? According to Piaget, the reasons are the following:

One of the reasons is that preschoolers cannot reverse their thinking. They cannot mentally retrace the steps. For the child to conserve, she has to mentally pour the water back into the original glass or make the flattened piece of clay into a ball. In other words, she has to think back on what happened. But she is not able to do so. If she could, she would have understood that the low height of the water in the short glass is compensated by its greater width. This reversibility of thinking is crucial for conservation and, according to Piaget, it comes when the child enters the next stage of development, i.e., the concrete-operational period. You can see evidence of preschoolers’ thinking in many day-to-day situations. You may have had to intervene in an argument between two five year olds, with each one insisting that the other has more sherbet because their glasses are different in shape, even though you poured exactly the same amount in each. In fact, many parents and teachers use identical cups and glasses for children to avoid similar fights.

Another reason why preschool children do not conserve in the above experiments is because they have a tendency “to center”. Centering is one of the characteristics of pre-operational thinking. This means that the child pays attention to a single and striking feature of an object
or an event and neglects all others. She focuses only on this one aspect. This distorts her reasoning. The preschooler finds it difficult to look at various features of an object simultaneously or look at different points of view at once, which would lead to a more sound reasoning. So in the experiment with water, the preschooler will either concentrate on the width of the two glasses and say that the wider one has more water "because it is wide", or else she will concentrate on the height of the water and say that the one in which the water rises to a greater height has more of it. What the child cannot do is to consider both the height and width together.

Related to their tendency to center is their tendency to be dominated by their perceptions. Preschool children's thinking is dominated by what they see and this sometimes prevents them from thinking logically. They will agree with you that the amount of clay was equal in the two lumps before one was flattened, and that nothing was added or taken away, yet later believe that one has more clay than the other because this is how it appears to their eyes.

Later Research

Subsequent research has shown that preschool children can conserve in some cases. Researchers have found that if while pouring the water from one glass to another, the glass into which the water is being poured is covered from all sides, so that children cannot see the height of the water in it, then they are able to conserve. This seems to show that preschoolers can conserve once the things that distract them are hidden and they are not influenced by what they see. Interestingly, once the glass is visible again, many preschoolers change their judgement of equality and say that there is more water in one of them! This finding shows that they had conserved momentarily, only under special conditions. They do not have a stable concept of conservation which would prevent them from changing their opinion under any circumstances.

Recent research has also shown that if the situation is one with which the child is familiar, the preschool child conserves consistently. Children belonging to families where pottery is the means of livelihood have experiences with transforming the clay into various shapes. These preschool children understand that the amount of clay does not change with change in shape. They have acquired conservation in this particular aspect. But if these children are tested for conservation using materials and situations with which they are not familiar, they are likely to be unable to conserve. Similarly, a five year old girl, whose task it is to bring water from the nearby well everyday, will not believe that as one pours water from one container to another, the water increases or decreases in amount. You will notice instances where preschool children conserve and as many where they do not. What can we then conclude about the child's ability to conserve? Write your comments in the following space and check with the description that follows.

In conclusion, we can say that preschoolers show conservation only under special conditions — when there are no distractions and when the situation is familiar. They do not have a stable concept of conservation. In other words, reversibility of thought and the ability to consider many aspects simultaneously develops as the child enters the next stage of development — the concrete-operational period. It is then that she conserves consistently.

Why is it important for the child to understand the concept of conservation? This understanding of the principle of conservation is the foundation of logical reasoning and the basis of scientific investigations. This ability underlies many of our everyday activities. Mathematical calculations involving length, area and so on are based on conservation.
18.3.5 Classification/Grouping

Piaget carried out considerable research on how children understand the concept of classes and how they begin to classify or group objects. Before we read about this, let us understand what we mean by classes and classification.

A set of objects or events that have certain characteristics in common form a class. Thus, we have a class of books, a class of flowers, a class of animals and so on. To classify means to be able to put an assortment of objects into different groups or sets (classes) based on some property/properties which all the objects in that set have in common. In other words, it means being able to put a collection of objects into groups based on the properties they have in common. Thus you may put objects together in a set because they are all of the same colour, or same shape or because they are all toys or all animals and so on.

Within a class (set) there may be subclasses (subsets). For example, in the class of flowers there may be subclasses of roses, marigolds, daffodils etc. This means that the subclass 'rose' has the same characteristics as does the class 'flowers', but it also has some more specific characteristics that distinguish it from other flowers. Thus, if we say, "This is a rose", it implies that, "This is a flower". We can also say, "There is no rose which is not a flower", but the opposite that, "There is no flower which is not a rose" is not true, as there are other varieties of flowers.

Let us take another example of class and subclasses. When we say that there are no students in the Bachelor's Degree Programme (BDP) who do not have over 50 per cent marks, we can conclude that all students of BDP have over 50 per cent marks. When we say that a particular student is in BDP, it means that she/he has more than 50 per cent marks. But the reverse, that any one who has over 50 per cent marks is in BDP is not true because there may be students in other programmes who have over 50 per cent marks. Thus the class of students with over 50 per cent marks contains the subclass of students in the BDP.

The understanding of the concept of classes and subclasses is required in our day-to-day activities. By the time a person is an adolescent, she has mastered this type of logical thinking and the ability to classify. Before the child reaches this stage, she has to develop many abilities. She has to understand what a class is, how classes are related to one another and so forth. Piaget tried to determine how early in life children begin to classify i.e., put similar objects together.

Piaget's Experiment

To study this skill of classification, Piaget gave children various objects and asked them to put together those things that "go together" or "are similar". This is the basic issue involved in classification. In one particular experiment, children were given cutouts of rectangles, triangles and arcs of three different colours — red, blue and yellow — and asked to put the similar things together. Two and three year olds usually make a design or a picture with these different shapes — they pick up the shapes randomly and arrange them in a line or in a big circle or they make different structures and call it by a name, for example, a house. They do not notice the shape or the colour of the cutouts and do not categorize them on these dimensions. From this Piaget concluded that younger preschoolers have no concept of classes and cannot classify.

Piaget found between four and six years, preschoolers show more systematic sorting and grouping of objects. Now they begin to use shape and colour to group the cutouts. But the criterion for classification does not remain stable or consistent. By a consistent criterion we mean that if a class of rectangles is created, then it should include all the rectangles and should include only rectangles. But what happens in this age group is that the child, let us say, begins to classify using shape as the criterion and so goes ahead to put all the rectangles together. But while doing so, she suddenly notices the colour of the last rectangle and changes the criterion of classification to colour, thereby putting arcs and triangles of the same colour next to the last rectangle. After arranging some cutouts on the basis of one colour, the criterion changes to another shape and so on. Thus, you have an assortment of cutouts where the basis of classification changes from one piece to the next. This is not a true classification. This shows that preschoolers are learning to classify objects, but while they put them side by side, they get distracted by their other properties. In other words, they are dominated by their perceptions while classifying.
In the next stage of classification, around six years of age, children are able to eliminate some fluctuation in their criterion for classification. Now they decide upon the criterion and are able to maintain it throughout the classification. If they choose colour as the basis, then they will put all the similar coloured cutouts together, whether they be rectangles or triangles. So now they have three classes — three sets of different colours or three sets of different shapes.

Finally, a more highly developed classification is achieved by the child when she enters the concrete-operational period. Here the child is able to classify on the basis of both shape and colour... So, for example, the child first divides the cutouts on the basis of shape. Then, since within each shape there are cutouts of different colours, she subdivides the class of rectangles into subclasses of rectangles of different colours.

Recent Research

Let us look at what recent research on preschoolers’ ability to classify has shown. It has been found that if the task is made simple and you make it clear to the preschooler what you want, preschoolers are able to classify better than Piaget thought. One researcher working with three and four year olds designed her experiment in the following manner. She got together some picture cutouts of animals, food and furniture as well as a puppet. She told the children that the puppet really liked pictures of food. These preschoolers were then given all the pictures, and asked to put the ones that the puppet would like in one container and the ones the puppet would not like in another. When asked to categorize in this manner, i.e., when the instructions were clear to the preschoolers and when they had clues about what had to be done, the preschoolers were able to classify — they separated pictures on the basis of food and non-food categories or furniture and non-furniture categories, depending upon what was asked.

In everyday life as well, preschoolers show many instances of classification (grouping). As they separate vegetables and fruits, they are grouping. When they put red coloured beads on one side and blue ones on the other, they are grouping. As they hand you all the sweet-tasting things and keep the salty ones themselves, they are showing classification skills. To a younger preschooler, the adult needs to state the criterion for grouping and they are able to do the task. For example, when the adult says, “Give all the red beads to me”, the child is able to manage the task. The older preschooler is able to do this classification herself without any prompting, where groups differ on only one criterion. But when groups differ on more than one basis, even the older preschooler finds it difficult to classify unless she is helped.
Preschoolers can classify leaves on basis of shape

What do we then conclude about the classification skills of the preschooler? It seems that preschoolers have some basic understanding that certain things go together. If the classification task is a simple one and preschoolers have grasped what is to be done, they are able to do it successfully. However, the fact that they need to be prompted and need clues for classifying and they are not able to classify objects successfully each time, shows that they have not fully grasped the principle behind classification. This will develop during the years of middle childhood and adolescence.

How is the ability to classify different from the ability to match or the ability to identify common relations? Classification requires the child to be able to identify what several items have in common. In other words, the child has to find out which objects in the group belong together. In classification the child has to deal with a group of objects rather than just a pair as in common relations. Classification is also different from matching because here none of the items may be exactly the same. In matching the items to be matched are always exactly the same.

As you would have understood, classification requires the child to discriminate, reason, analyse and select. Being able to group is an important ability which the children must master as it is the basis for common situations. If you think about it, you will find that most of our daily activities require us to categorize and classify. Being able to classify is a prerequisite to acquiring a concept of number and other mathematical concepts. The ability to classify underlies most science and social science concepts. This ability tells the child that there is more than one way of viewing objects.

18.3.6 Seriation

Seriation is the ability to arrange items in terms of gradation of size, i.e., arranging things in an order of increasing or decreasing size. For example, when five sticks are placed in an order of size (shortest to longest), then they have been arranged in a series. Underlying the ability to seriate is the understanding of concepts of big-bigger-biggest; short-shorter-shortest and so on. While putting objects in a series, the child has to answer the question, “What comes next”? A child will be considered to have understood seriation if she can place the items correctly in order of size, put additional items into the series and correct errors.

Piaget’s Experiment

To test the preschoolers’ ability to seriate, Piaget used ten sticks of differing lengths and asked children to put them in the correct order of size. Preschoolers are generally not able to do this task. They begin by picking a stick and then selecting the next bigger one. They are able to put two or three sticks in the correct order after which errors come in. Piaget found that children could seriate correctly and consistently after they entered the concrete-operational stage.
Recent Research

However, recent research which has been carried out, making simple modifications in Piaget's method, have given different results. Current research has been done using four sticks instead of ten and it was found that most three and four year olds could put the sticks in the correct order and could insert new sticks in the correct place. This means that preschoolers can seriate but ten sticks are far too many for them to handle. Just as in the case of other abilities — taking another’s view, classification and conservation, recent research seems to bring out the picture of the preschool child as more skilful.

The ability to seriate is at the heart of most mathematical concepts and helps the child learn the relationship between quantities. This ability helps in developing the concept of number.

18.3.7 Understanding Cause and Effect Relationships

The ability to understand cause-effect relationships lies at the root of all scientific investigations. An understanding of cause and effect conveys to the child that there is an order in things. As the preschooler understands cause and effect relationships, she also knows that she can act upon objects and make things happen. This understanding is the basis for generating hypotheses and predicting results. The many examples you have read in the earlier Blocks would have brought out that preschoolers can reason and determine the possible effects of events. As you read the Unit, you will come across more examples that reflect this ability.

Preschoolers are also developing reasoning skills, as you may have gathered from your reading till now. We have talked about this cognitive ability in a separate Section towards the end of the Unit, as the Sections that follow now would give you some more idea about their reasoning skills.

Before we go on further with the discussion on cognitive development during the preschool years, let us consolidate what we have learnt till now. What does all this information tell us about the preschool child?

It is clear that when the situation is simple, distractions are removed and clues are provided, preschool children are able to take another person’s perspective, conserve amount and quantity in some situations, and do simple classification and seriation tasks. This brings out a picture of the preschooler as one who is more able and skilful than Piaget suggested.

On the other hand, Piaget has made a major contribution by showing that preschoolers think differently from older children and adults. Viewing the above points in another way, the fact that preschoolers show these cognitive abilities only when the task is made...
very simple, points towards the difference in thinking. A person who has grasped the essential concepts of classification, conservation and others, should be able to do these tasks under any situation, whatever may be the apparent distractions. Such a person then solves the problem consistently, based on principles. But preschoolers are not consistent and neither do they seem to have grasped the underlying principle, even in cases when they do the task successfully. This will be acquired during later years.

Just how differently the preschooler looks at the world as compared to a younger or an older child is brought out in the following Section.

18.4 ANIMISM

Why do you think the sun sets in the evening? While you collect your thoughts to give an explanation, Bano, a four year old, is prompt and has no doubts that the sun sets “because it has got tired and wants to go to bed” or that the “moon is hiding behind the clouds because it feels cold”. Do you remember preschoolers’ explanation about rain, described in the earlier part of the Unit? Preschoolers believe that all things are living and that they have intentions and feelings just as we do. Everything is living — the stones, the bridge, the road, the clouds, the sun, the moon, the table and the pencil. They feel that the stone “will get hurt and feel pain if you kick it” and the bridge “gets tired in the night because so many things move over it during the day”. For them, the ball rolls down the ground “because it wants to”. They will cry if the doll’s plate is lost because “now the doll cannot eat and how can it go to sleep if it is hungry”? One child would sit very gently on a chair and his was noticed by his teacher who found it very unusual, given his usual boisterous manner. One day the teacher asked him the reason for this. The child replied, “The chair will get hurt if I sit hard on it”. Preschoolers believe that everything has life. Piaget called this quality of their thought ‘animism’.

For the child, the moon and the clouds are alive because they move. The stone is alive because when you kick it, it moves. Do not be surprised it they ask you not to speak loudly in the fields at night because “the trees and the bushes (which in the child’s mind have thoughts and feelings) are sleeping”. The sun is alive because it makes you feel hot and the wind must be feeling cold in winter because you have to wear a sweater. The child feels that because she is alive, everything else is.

Everything has a magical quality about it. Preschoolers have their own views and explanations about things as must be evident from the above discussion. This makes interacting with preschoolers all the more interesting. From the adult’s view the child’s logic is often incorrect. But this must not be taken to mean that the child’s thinking is of a lower level as compared to an older child’s or an adult’s. It is just that the preschooler thinks in a manner different from that of adults.

From your interaction with preschoolers, you perhaps remember some incident or conversation which reflects the child’s belief in animism. Make a note of it in the space provided below.
Check Your Progress Exercise 2

1) The following six statements describe situations which reflect the cognitive abilities of preschoolers. Each statement reflects one ability. Identify the ability each statement describes. To help you, the abilities have been written below.

- seriation, grouping, matching, common relations, cause and effect

i) When the preschooler picks out two pencils that are exactly the same in all respects, from a collection of five pencils, she is showing the ability of ..........................................

ii) When the six year old tells her friends, "those who want to play outside stand on this side and those who don’t, stand on the other", she is showing the ability of ..........................................

iii) When five preschoolers on being asked to stand in a line height-wise, so that the tallest is in front and the shortest behind, can do so with some prompting, they are using the ability of ..........................................

iv) When the preschooler remarks that "clothes dry faster in the sun", she is showing an understanding of ..........................................

v) When the preschooler tells her brother, "The faster you move the bicycle, the sooner we will reach there", or "Drive fast! We will reach there earlier", she is showing an understanding of ..........................................

vi) At lunch time at home when the five year old places one glass each in front of her mother and her sister and says, "Mummy is bigger, so big glass for her; Didi is small, so small glass for her", she is showing the ability to understand ..........................................

If you observe preschoolers, you will find many similar instances which reflect their mental abilities. Why don’t you write down these instances in sentences like the above and when you meet other learners at the study centre, ask them what abilities your situations reflect? If you exchange views in this manner, you will come to know of many incidents which show preschoolers’ developing abilities.
2) Match the words in Column A with sentences in Column B.

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Conservation</td>
<td>a) identifying objects that are exactly identical from a collection of objects.</td>
</tr>
<tr>
<td>ii) Animism</td>
<td>b) ability to arrange items in terms of gradation of size.</td>
</tr>
<tr>
<td>iii) Classification</td>
<td>c) the understanding that the amount of a substance remains the same even if its shape is changed, so long as nothing is added to it or subtracted from it.</td>
</tr>
<tr>
<td>iv) Matching</td>
<td>d) identifying the common relation between a pair of objects.</td>
</tr>
<tr>
<td>v) Common relations</td>
<td>e) grouping objects together on the basis of some common property/properties between them.</td>
</tr>
<tr>
<td>vi) Seriation</td>
<td>f) the belief that all things are living and have intentions and feelings just as we do.</td>
</tr>
</tbody>
</table>

18.5 ACQUIRING CONCEPTS

At this time, the preschool child is learning many new concepts and increasing her store of information. From your reading till now, you would have understood that she is forming ideas about things and events, air, water, plants, trees, stars, festivals, colours, numbers and so forth. The following example will bring out how the child's understanding develops over a period of time. On a windless day, a five year old preschooler remarked, "Today there is no wind. There is only a little air to breathe". For this child, wind is what blows and when it does not blow he calls it air. Some ideas of preschoolers correspond to adult notions and some are their own reasoning about things. Concepts of objects like dog, house, chair, tree, bus, flowers and so forth are acquired relatively early. The abstract concepts of number, shape, size and so forth are acquired more slowly.

As you will read this Section, you will understand that the skills and abilities described in the earlier Section are the basis for acquiring these concepts.

18.5.1 Concept of Number

Ask three year olds to count aloud. Almost all of them are likely to begin proudly with, "one, two, three", and then confidently go on to say, "five, six, nine, ten". Ask them to repeat again and you will hear a different version altogether. They begin correctly with one, two and probably three, but then some numbers will be missed in the sequence and some will be counted out of place. If you ask three year olds to pick up one subject, they will do so correctly and they are most likely to be able to pick up two objects when asked to do so. But ask them to pick up five pebbles and most of them will not be able to pick up the correct number, the amount varying each time. Between four and five years of age, children can recite numbers correctly from 1 to 10 and, those who have been taught, can also recite number names beyond. But this does not mean that they actually have a concept of all these numbers or can count.

What do we understand by "being able to count" and "having a concept of number"? Reflect upon the following situation before you answer.

Mini, four years old, could recite numbers from 1 to 20 in the correct sequence. On one occasion, her grandmother asked her to get twelve buttons from the heap of buttons lying in the drawer. Mini 'counted' till 12 as she picked up the buttons and handed them over. Her grandmother counted the buttons. They were seven in all. She asked Mini to check whether she had really given her 12 buttons. Mini 'counted' again and said, 'No, they are fifteen.'
a) Do you think Mini knows how to count?
(Remember she can recite number names in correct sequence from 1 to 20).

b) Why do you think Mini could not pick up twelve buttons correctly?

Having reflected on these questions, try out the following activity with a four year old child in your family or neighbourhood.

First make sure that the child knows number names up to 10 at least, and can recite them in the correct sequence. Then place 10 pebbles in front of the child and ask him/her to count them aloud while touching the pebbles with his/her finger. You may need to show the child what you mean, but once he/she begins counting, do not interrupt. Watch carefully as the child counts and record your observations as per the following questions.

a) Did the child count one or more pebbles more than once?
b) Did the child leave out any pebble?
c) Did the child say a number without touching a pebble?
d) Did the child go on saying number names even after he/she had touched all the pebbles?

If the answers to all the questions are negative, then it is most likely that the child can count up to 10. If the answer to any question is positive, then there is a likelihood that the child does not know how to count.

What this brings out is that being able to recite number names is not the same as being able to count. Being able to recite numbers means that the child has a good memory. On the other hand, being able to count means that the child is moving towards building a concept of number.

Mini, in the situation described above, cannot count even though she knows the number names in the correct sequence. While counting she is making one or more of the following mistakes — counting a button more than once, leaving out a button while counting, saying a number name without touching a button or continuing saying number names even after all the buttons have been touched.

Let us describe the processes that we carry out when we count. And, to do so, nothing could be better than counting for yourself the number of purple beads in a bagful of different coloured beads! Yes, why not actually do so, and reflect upon what you did. It would be interesting to note down your thoughts and compare them with the discussion that follows.
Developing Cognitive Abilities

To begin with we identify the beads that we have to count. We are able to do so because we know that the purple ones match in colour.

Having visually identified the beads that we have to count, we separate the purple ones from the rest, i.e., we group the beads into two sets — purple and non-purple.

Then we put the purple beads in a suitable arrangement for counting. Perhaps we lay them out in a row, or arrange them in a circle, or put them in groups of two beads each, so that we wouldn’t leave any out or count any of them twice.

Next, in order to count, we must know as many number names as the number of beads, at least. Not only this — we must know them in the sequence of 1, 2, 3, 4,... This involves the understanding that each number name denotes a quantity which is one more than the quantity denoted by the previous number name. In other words, this involves some understanding of the concept of seriation.

We touch one bead (actually or mentally) as we say each name. We touch each bead only once and leave no bead untouched. This means that we pair one bead with one name. In other words, we set up a one-to-one correspondence.

\[
\begin{array}{cccc}
\text{one} & \text{two} & \text{three} & \text{four} \\
\end{array}
\]

While counting, we are also grouping the beads into two sets — those that have been counted and those that have yet to be counted.

As we touch the last bead, we say a certain number. Let us say that we had ten beads — so we shall say 'ten'. Then we shall say that we have ten beads. This means that a label (i.e. the number name 'ten') which we associated with the last bead has changed its role and is now used to describe all the purple beads that were counted. So the number name 'ten' has been used in two ways.

We carried out six different processes before we could count the number of beads. But where do most of us begin when we introduce counting to children? We begin by teaching number names without bothering to find out whether the child has the ability to match, to group (also known as classifying) and to seriate (also known as ordering).

To the fifth step in learning counting we merely pay lip service. We indicate just once or twice to the child, that each object is touched only once in counting, without giving the child enough time to understand or practise what this actually means. So it should not come as a surprise to us when the child on being reprimanded for counting incorrectly responds as Rani did: "But what's wrong? You asked me to say one, two, three as I touch these objects. So what if I can say till 20 as I touch the objects and you can say only till 15!"

The sixth step is the most confusing of them all — using a number in two ways. Do we even realise how confusing it must be for the child? The following situation often arises in this context.

A parent shows a four year old child four objects — a pencil, a flower, a sweet and a toy car. He places them in front of the child and says "one" as he points to the pencil, "two" as he points to the sweet, "three" as he points to the toy car and "four" to the flower. He repeats this for the child. Then he asks the child, "Now give me two things!", with an encouraging smile. The child picks up the sweet and gives it to the parent and is quite baffled when the parent says, "No child! I said two things. Here (adding the pencil, or the flower or the toy car). Now they are two". "Are they?" wonders the child, "But didn't he just say that the sweet was two?"

When we set the number names and the objects in one-to-one correspondence, we are using number names as temporary labels for objects. In the above example, the sweet has nothing in common with the number "two"; it is just the second object in the ordered row of objects. But when we say "Give me two things", we should have mentally dissociated the label "two" from the sweet, and reassOCIated it with any two things.

The reason why we have discussed these aspects in detail is to bring out the fact that the emphasis in many preschools on memorization of number names is misplaced and, instead of
of helping children to build a concept of number, is likely to leave them confused. Children need to develop abilities of matching, grouping, seriating and being able to set up one-to-one correspondence before they can count. These abilities have also been referred to as pre-number concepts i.e., concepts children need to develop before can acquire a concept of number. How can you help children develop these pre-number concepts? We have some suggestions in Unit 23 of the next Block.

Thus to form a concept of number the child must understand the following. Firstly, the child has to learn that the number one always signifies one item, number two signifies two items and so forth. In other words, she has to learn that every number signifies a certain quantity and that this remains the same in all contexts. Secondly, she has to understand one-to-one correspondence. She must know the correct sequence of numbers. Finally, she must grasp conservation of number, i.e., the concept that the number of objects remains the same even if they are grouped differently. For example, if there are five flowers, their number remains the same whether they are clustered together or spread out. A different arrangement of objects does not change their number.

One-to-one correspondence

We have just read that a common reason why the younger preschoolers are not able to give the exact number of objects as asked is because they have not understood one-to-one correspondence. They count one object twice or two objects as one, thus making an error. Piaget and later researchers have conducted many experiments to find out how the understanding of one-to-one correspondence as well as conservation of number develops in children.

One such experiment carried out with children between four and seven years of age is as follows. A row of objects, for example a row of glasses, is placed in front of the child and she is asked to pick up glasses from a nearby pile and make a row that corresponds to the existing one. To do this the child has to keep one glass in front of each glass in the earlier row. The younger preschoolers make the new row as long as the existing one but without paying any attention that the number of glasses in this row should be the same as in the earlier one. They just concentrate on the space occupied by the objects.

Preschoolers do not pay attention to the number of glasses
If the row which has less glasses is made to look longer than the second row, by spacing the glasses further apart in it, they feel that this row has more glasses than the second row. This means they do not have an idea of one-to-one correspondence.

Preschoolers state that second row has more glasses because it occupies more space than first row.

In the second stage in the understanding of one-to-one correspondence, children arrange the glasses in one-to-one correspondence — they place one glass opposite each glass of the earlier row. So they reproduce the exact number of objects in the second row without counting. When asked if there are equal number of objects in both rows, they agree that they are equal. In everyday situations you can see numerous examples where children display the ability to understand one-to-one correspondence. They distribute one sweet to each child, place one book in front of each and make one dress each for each of their dolls. But that these children have not completely understood the concept of number is seen by the fact that if the above correspondence of glasses is altered, so that the glasses in one row are clustered together and the other row is left as such, children change their mind and say that one of these rows has more glasses. In other words, their thinking at this stage is influenced by what they see and they change their mind, just as they did with clay or water. At this transitional stage, if preschoolers are asked to count the two sets they agree that there are "seven here" and "seven there", but since the arrangement of the two sets looks unequal to them, they insist that there are more objects in one than in the other!

Finally at six and seven years of age, i.e., towards the end of the pre-operational period, the child acquires a stable concept of conservation of number. She will not be confused even if you shift the arrangement and will be able to hand you the exact number of objects asked. By this time she has acquired a concept of number.

You may have noticed that achieving number conservation also evolves through three stages — no conservation, transitional stage and then finally, conservation.

In conclusion, one can say that three and four year olds are beginning to acquire a concept of number and can deal with small numbers. Each year the preschooler adds a little bit more to her understanding. A true and complete concept of number emerges only after the preschool years.

In Unit 23 of the next Block we shall discuss play activities to foster the development of the number concept.

18.5.2 Other Concepts

It will not be possible to describe in detail how preschool children acquire each concept. However, to give you some idea about the learning that goes on during the preschool years, let us list the concepts the child acquires.
During Preschool Years

Before we do so, it is important to emphasize that children learn by doing, which means that they develop a concept of those things and events which they have experienced. A child living in a remote village who has not seen a bus, will not be able to understand what you mean by it. Similarly, a child living in a city who has never seen a field, will not be able to grasp the concept fully. If this child has been made to memorize information like, “crops grow in fields”, she may be able to answer you when you ask her a question, but she will not have a clear understanding of it. This means that the concepts children acquire will depend on their ecological setting and the things they come in contact with. At this point it would be fruitful for you to refer to the Section on “The Socio-Cultural Context of Childhood” in Unit 1.

Let us now list some of the concepts children mostly acquire during the preschool period. Some of these are universal — children will acquire these in whatever situation they are; others are more specific to the environment children live in.

All preschoolers will have experiences with things that are heavy or light in weight, tall or short in height, narrow or wide, thick or thin, fast or slow in movement, light or dark in colour and they develop a concept of these. Given two or three objects they can, for example, pick out the heavier one, the shorter one and so on. However, they cannot make these judgements with respect to a larger number of objects. If given ten objects, preschoolers cannot say which is the lightest of them all.

Preschoolers also develop an understanding of shape and size. Through the understanding of words like “through”, “under”, “over” and “above”, the concept of space is acquired. They form their ideas about hot, cold, plants, flowers, trees, day, night, seasons and festivals. As children see animals and birds, and handle fruits and vegetables, they form concepts about them.

People interest children greatly. Through interactions with them children learn about relationships. They also form an idea about people in different types of occupation — the farmer, the fruit seller, the doctor, the policemen, the carpenter and so on. In the Blocks that follow, we will talk in detail about the kind of play activities that you can organize to foster the understanding of these concepts.

The concept of time in all its dimensions is a difficult thing for the preschooler to grasp. Time, as we know it in terms of months and years, does not have much meaning for the preschooler, even for the six year old. Three and four year olds can refer to and talk about the immediate past. They will relate to you what transpired between them and their friend some time ago. Some four year olds can talk about the events of the day before, particularly if they were important to them. They can talk about and refer to the immediate future, but with less confidence, because they have not experienced it. They can talk about the future in relation to a present or a past event, as when they say, “Next time I will eat the apple” or “When you come to my house next time, I will show you my new toy”. Five and six year olds can comprehend and talk about a longer time period. They can vividly recall events that took place a month or two ago, particularly if they are meaningful for them. Preschoolers do not grasp short stretches of time, like minutes. They understand morning, evening and night.

The concept of time also involves understanding how events occur in time and being able to sequence them. For example, given three pictures of a person which show her through different stages of life — child-young person-old person — the child should be able to arrange them in a series. Similarly, when given three pictures of a plant from the time the seed was sown to when a small stem emerged and later when the leaves grew, the child should be able to arrange them in the correct order of events. This requires the understanding that people and things change with time, that these changes are orderly and that they occur one after the other. Preschoolers are able to grasp these sequences. They also begin to understand changes within a shorter time span, as when you ask them what they do before they go to have their bath, what preparations their mother makes before she cooks the food and so on. When narrating a story to the child when you ask her, “What do you think will happen next?”, you are asking the child to state the next logical event, i.e., you are asking her to state events as they occur in time. Preschool children are able to do so and this ability improves with age. This shows that they understand that there is an order to things and all things exist in time.
18.6 THE EMERGING REASONING SKILLS

Preschoolers are filled with curiosity and wonder about the things around them and have a burning desire to learn. In the process of finding out about things, they develop a wide variety of cognitive skills. We have talked about some of these in Section 18.3. In this Section we will read about another cognitive skill — the reasoning skills of preschoolers. The examples described in this Unit would have given you a glimpse of preschoolers’ reasoning skills. Let us read about this in detail.

Preschoolers learn about things around them in the course of their conversation, activities and interaction with others. Playing in the garden, the child sees a grasshopper. Excited, as she has not seen this insect before, she calls out to her elder sister and this leads to a conversation about what it is, where it lives and what it eats. But this conversation does more than just answer her questions and give her facts. It stimulates her to think for herself as well. As the preschooler’s imagination is roused, she wants to know why it has such long legs. “With such long legs, can it climb a tree faster than me?”, she wonders.

Preschool children can reason about everyday problems, giving you a number of alternative possibilities, some of which may bring a smile to your face. On a hot day, if you are unable to think of how to cool the slide for the children to play, just ask them. When some children were asked this question, they replied, “Pour water on it”, “Melt ice on it”. Besides these effective strategies one child said, “I will blow air on the slide and cool it like I cool milk”!! This may not be a practical solution, but it shows that she is thinking of possibilities. And it is not important that every time the child suggests a strategy, it should be a useful one. The point is that she is trying to apply what she has learnt in one situation to another. It is in such ways that children learn. The talk about ice lead one preschooler in the group to suggest mischievously, “Let’s tie ice on our feet and slide from one place to another!”! This shows that not only are preschoolers gathering information but they are also using this information to suggest creative solutions.

Four and five year olds enjoy thinking about funny and imaginary situations. For instance, what if we all could live on trees, what if we had tails? Equally, they give you relevant answers to more serious questions—how can we keep the dog warm? How can we make this plant grow? When the chart paper is not sticking to the wall, what else can we do? This boy is missing his mother and wants to go home, but his mother is not there, so how can we keep him happy? There are six of us and only four crayons, what can be done? How can we keep ourselves warm in winter? If you see that a child is badly hurt, what will you do? Why do you think the cold water became hot in the sun?

Children’s answers to these questions will tell you that they are trying to understand events that happen around and are organizing their information and arriving at some conclusions. In other words, they are acquiring and developing problem-solving skills. As they try to find out the reasons for things they are, in an elementary manner, learning about hypothesis-testing.

Hypothesis-testing involves making a suggestion as regards the outcome or the cause of something and then carrying out the task/analysing the event to find out whether the hypothesis suggested was right or not. We display this skill in our day-to-day lives as we predict whether or not it will rain, as we analyse what will be the effect of a certain development on the political situation in the country, as we modify our child-rearing practices because the ones we are using are not proving to be effective. Let us understand how preschoolers’ activities involve hypothesis-testing.

Chandu, six years old, was playing with a ‘parachute’ made by his sister using a small pebble and a square piece of paper. The parachute was to be thrown upwards with as much force as possible and, on its way down, it would open up. While his sister could do this, Chandu could not throw the parachute with much force for it to reach a substantial height. He tried this repeatedly and was unsuccessful each time. He then threw away the parachute and sat on the floor on the verge of tears. He had been sitting thus for some time, when all of a sudden he grabbed the parachute, went to the terrace and threw the parachute down, giving a whoop of delight as it opened up during its fall. It is clear that the child had thought of a solution and then gone ahead to see whether it would work or not. This is an elementary form of hypothesis-testing.
You would know that hypothesis-testing is the scientific method of inquiry. It is based on making observation, thinking of possible reasons why things happen, testing out these possible reasons or causes, observing the results and then coming to conclusions. As is clear from the above example, preschoolers are beginning to use this method. You would have seen many instances when children try out their ideas. The following is another situation which shows how they do this.

A group of preschoolers was engaged in painting using water colours when one of them suggested, "Let us mix some colours and see what happens". No sooner had he said this that all the children abandoned the original painting and started mixing different colours, exclaiming with surprise and joy as new colours emerged. Their play continued like this for some time. In this way, they not only sharpened their skills of hypothesis-testing but also discovered another fact — that when colours are mixed, a new colour is formed.

The purpose of quoting these examples is to bring out the thinking abilities of the preschoolers and show how through everyday experiences, their reasoning skills develop and their store of factual information grows. Children often ask, 'What would happen if...?'", "What made that happen?" and then link these explanations with what they already know. In this way their understanding of cause and effect also grows.

To the preschooler anything that is big is powerful. They associate power with size. Raju, around five years old, was watching a line of ants crossing the verandah. He was stamping upon the ants and killing them and encouraging his two-and-a-half year old brother to do the same (not a desirable situation but nonetheless it occurred). In the line of ants, came a big ant. The child on seeing it looked scared and said to his younger brother, "Chintoo, let's run! This is a big ant, it will bite us!". 
A person who in the preschooler's eye can do something out of the ordinary is sure to win her admiration. Bharati's grandmother, having lost all her teeth, had dentures fitted. While sleeping in the night she would remove her dentures. Bharati saw her doing this one day. Not understanding what was actually involved, she was absolutely stunned to see this. She tried to remove her teeth and was obviously unsuccessful. Some days later Bharati's father got into an argument with her grandmother. Bharati, who thought that her father was fighting with her grandmother, felt that it was necessary to caution him. She said, "Baba! Don't fight with Dadi (grandmother)! She is very powerful. You know she can take out her teeth when she wants to and put them back in again"!

When reasoning is not logical

Preschoolers' reasoning capacities are getting better day-by-day, as is clear from the preceding discussion. But while there are many instances where they display logical and consistent thinking, there are as many where they display quite the opposite! Consider a few examples.

Piaget's daughter did not have her afternoon nap and so announced, "I have not had my nap, so it isn't afternoon"! In another case, a child who went to sleep during the day woke up and said, "It is night because I went to sleep"! These children have an understanding that some things go together, like the nap and the afternoon, but they get the relationship between them wrong. They see two things happening at the same time and assume that one is the cause of the other. In the above examples, the children had thought that the nap had caused the afternoon and the night, respectively. Preschoolers often focus on superficial aspects and link up two thoughts even though they have no actual relation to one another. This desire to link things often leads to hilarious situations, as the following examples show.

Salma was about five years old when her grandmother came to visit them. Around the same time, the guava tree in their house had begun to bear fruits but they were not yet ripe. It would take another month for them to become ripe and edible. One morning Salma asked her grandmother, "When will the guava become ripe"? Her grandmother (who had to leave in a month's time) said, "They will become ripe when I go". She replied thus thinking that the child would find it difficult to comprehend the concept of a month and, with the simpler answer, her curiosity would be satisfied. Little did she expect Salma to say in all seriousness, "So why don't you leave now"? Preschoolers sometimes understand things literally, as in the above example. Explanations which seem quite evident to us, may be understood quite differently by children.

Deepanshu, three years old, was watching a serial on television. The serial depicted how a prince, who had turned into a donkey because of a curse, became a man again as the princess garlanded him. Deepanshu's grandmother asked him fondly after this episode, "Deepanshu, you will also marry when you grow up, won't you"? Deepanshu replied in all earnestness, "First I will become a donkey and then I will get married"! Both Salma and Deepanshu did not have enough information about events, but in their desire to find a cause, they confidently related two unconnected events. Reasoning of this kind is very common and you must have found many examples of this in your interactions with preschoolers.

The following example, though it does not reflect faulty logic, does show that the preschooler's reasoning skills are not yet mature.

Meenu, six year old, was given three ladoos (sweets) by her mother to distribute between her two cousins. Most of us, and even older children when given this task, are likely to give one ladoo each to the two people and then divide the third one equally between them. This is the shortest and the quickest way. In contrast to this, the way Meenu solved the problem, though not wrong, showed that her approach to the problem was concrete and she could not mentally perform the task of dividing these sweets equally. She said, "I will take one ladoo and give half to both of them. Then I will take the second ladoo and give half to both of them. Then I will do the same with the third ladoo". Meenu could deal with one ladoo at a time, but not with all of them together.

The attention span of preschool children is increasing, but they are not able to concentrate on something for long. Because of this, any play and learning activity devised for them should be interesting and should be of short duration. Preschoolers'
memory also improves markedly, particularly about tasks and situations that they find meaningful and interesting. They will remember the list of things they want to buy from the market, a story they found interesting and they may recall many facts that you may have told them.

The discussion in this chapter should help you to plan play activities for preschoolers. The play activities should be such that they foster and enhance the various abilities described in the text. The description of children’s reasoning skills will also give you an idea about what you can expect from the preschoolers and how to devise appropriate play activities. For example, there is no point in devising a complicated game involving counting of larger numbers for four year olds. They will not be able to manage it. The play activities should begin from the level at which the child is and then build upon it, so that the child’s ability is enhanced gradually. The play activities should strengthen children’s concepts of same-different, long-short, tall-short, thin-wide, fast-slow, light-dark, as well as the numerous other concepts that the children are acquiring in their day-to-day lives.

For the purpose of this Course, the discussion on the development of cognitive abilities of the child concludes here. However, over the years of middle childhood, adolescence and adulthood the person’s mental abilities continue to evolve and broaden. Gradually, the child is better able to deal with abstract and hypothetical situations and to work out solutions to more complex situations. She understands that there can be different views about the same situation and uses facts to generate predictions. With growing cognitive abilities comes the ability to understand subtle humour. The following anecdote brings out the wit of a ten year old child.

Chanda’s aunt came home from the office looking unhappy. The family members asked her, “What is wrong”? She responded, “I had a major fight in the office today”. Before anyone could say anything, Chanda, who had been listening to this exchange, remarked, “So why didn’t you have a brigadier fight”?

In the text we have tried to provide as many examples as the space would allow, which reflect the preschoolers’ reasoning abilities, show their understanding of cause and effect and reflect their ability to deal with situations by generating alternative solutions. It will be useful if, as you interact with preschoolers, you keep noting the different abilities they display, the various concepts they seem to understand and the reasoning abilities they show. In this way you will have a first-hand feeling of what preschoolers are like, which will supplement your information from reading of the Unit. As you note these, you must also note down the age of the child. It is likely that a three year old will not have a concept of a tree but a six year old will. You could divide your notes in the following manner — cognitive abilities, concepts, and reasoning skills — and continue to add observations under these headings. This list will also help you to know what play activities you can devise for them.

Check Your Progress Exercise 3

1) What are the four aspects that are involved in forming the concept of number? Answer briefly in the space provided below.

2) Read the following statements carefully and state whether they are true or false.

   a) Most of three year olds do not have the concept of number beyond the number two.
b) The understanding of one-to-one correspondence and conservation of number develops between six and seven years of age.

c) The four year old understands the concept of months and years.

d) Preschoolers are able to suggest alternate ways of solving problems and one can see the beginning of the ability of hypothesis-testing in their actions.

18.7 SUMMING UP

In this Unit you have read about the thinking abilities of preschoolers. The ability to think symbolically is the hallmark of the pre-operational period. The child’s rapidly developing language, participation in make-believe play and drawing are reflections of her symbolic thinking.

We have looked at preschoolers’ abilities from Piaget’s point of view as well as from the evidence of later research studies. Piaget stated that preschoolers are not able to look at things from another’s perspective, that they do not have reversibility of thought and that they tend to center because of which they are not able to classify, seriate or conserve. However, recent research has shown that preschoolers may develop these abilities a little earlier than suggested by Piaget. They show these abilities provided that the tasks are simple, distractions are removed and they are given some clues.

The preschool years are a time when the child is learning many new concepts. She learns about everyday happenings and things she sees around her. Understanding abstract concepts of number, time, space and so forth is more difficult but nonetheless the preschooler makes some headway in these. A complete understanding of these concepts evolves during middle childhood years and adolescence.

The preschool years see the child sharpening her reasoning skills. The child tries to find out the cause of things. The foundations of problem-solving, hypothesis-testing and scientific temper are laid now, as the child makes observations and collects information. The preschooler also has the ability of matching and identifying common relations.

While on one hand preschoolers seem logical, there are many instances when their reasoning is quite the opposite. Their belief in animism reflects the magical quality of their world. Sometimes in their effort to provide a reason for everything, they link up two unconnected events, which make for some hilarious moments! The discussion in this Unit will help you to understand the thinking of children which will enable you to organize play activities for them.

18.8 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

1) i) a) is the right choice because (b) emerges in the sensori-motor period itself, while (c) emerges later in the preschool years than (a)

   ii) a)

   iii) c)

   iv) c) is the right choice. (a) involves the ability to take another person’s perspective while (b) implies symbolic thinking.

   v) c)
Check Your Progress Exercise 2

1) i) matching
   ii) grouping/classification
   iii) seriation
   iv) cause and effect
   v) cause and effect
   vi) common relations

2) (i) c; (ii) f; (iii) e; (iv) a; (v) d; (vi) b

Check Your Progress Exercise 3

1) Acquiring the concept of number involves understanding that each number signifies a quantity, understanding one-to-one correspondence, understanding conservation of number and knowing the correct sequence of numbers.

2) a) True
   b) True
   c) False
   d) True