UNIT 23 PLAY ACTIVITIES FOR DEVELOPING COGNITIVE ABILITIES AND SOME CONCEPTS

Structure

23.1 Introduction
23.2 How Children Learn
23.3 Enhancing Observation Skills: Play Activities for Sensory Exploration
  23.3.1 Play Activities based on the Sense of Touch
  23.3.2 Play Activities based on the Sense of Smell
  23.3.3 Play Activities based on the Sense of Taste
  23.3.4 Play Activities based on Vision and Hearing
23.4 Memory Games
23.5 Play Activities for Developing Cognitive Abilities
  23.5.1 Play Activities to strengthen the ability to Match
  23.5.2 Play Activities to strengthen the ability to Classify
  23.5.3 Play Activities to foster the ability to Identify Common Relations
  23.5.4 Play Activities to foster the ability of Comparing and Seriating
  23.5.5 Play Activities to help in understanding Cause and Effect Relationships
23.6 Developing Concepts
  23.6.1 How not to carry out Maths-related Experiences
  23.6.2 Play Activities for developing the Concept of Shape
  23.6.3 Play Activities for developing the Concept of Size
  23.6.4 Play Activities to develop the Concept of Number
  23.6.5 Play Activities to strengthen the Concept of Time
  23.6.6 Play Activities to strengthen the Concept of Space
  23.6.7 Play Activities to Strengthen the Concept of Measurement
23.7 Summing Up
23.8 Answers to Check Your Progress Exercises

23.1 INTRODUCTION

You have read about cognitive development during preschool years in Unit 18 of Block 4. You know that during this period the child is learning to take another person's perspective and developing the abilities to match, identify common relations, classify, seriate, conserve and understand cause-effect relationships. These abilities are basic to developing higher order thinking and acquiring concepts. They lie at the heart of all our activities. Think of any activity that you may have done a few minutes ago. Which of the above abilities did you use to carry out the activity?

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To illustrate: as you separated the vegetables in the basket to put the hard ones like gourd, potatoes and onions at the bottom and the softer ones like tomatoes and brinjals on the top, you *classified* vegetables on the basis of 'hard' and 'soft'. As you nested containers one within the other to store them in the cupboard, you *seriated* them according to their size — from the largest to the smallest.

Here are some more examples to show that the abilities of matching, classifying, seriating, identifying common relations and understanding cause-effect relationships are basic to developing any concept.

- When children pick out beads of one colour from a collection of coloured beads (in which the ability to match is involved), it helps them to develop a concept of colour;
- As they identify food items on the basis of what they like and what they do not, children develop an idea about the tastes of food;
- These abilities are also prerequisites to developing the concepts of number, shape, size and measurement. Because of this, these abilities are also referred to as pre-mathematical concepts — i.e., concepts that children need to develop before they can acquire basic mathematical concepts. In other words, these abilities are the basis of mathematical thinking. You have read in Unit 18 of Block 4 that being able to count — the first step in developing the concept of number — depends upon the abilities to match, classify, seriate, set objects in one-to-one correspondence and an understanding of conservation. When children classify objects on the basis of shape, it helps them to develop an idea of different shapes; as they seriate objects according to length it helps them develop an understanding of size;
- These abilities are involved in problem solving which requires reasoning, analysis, deduction, and prediction;

Thus the need for these abilities permeates every activity of children and helps them to develop all types of concepts — those related to the physical world, the social world, and living things as you have read in Unit 22.

We have used the terms 'mathematical concepts' and 'foster mathematical thinking in children' in the text above. Let us study these terms in the context of the preschool child.

By the term 'mathematical concepts' here we do not mean the abstract concepts used in advanced mathematics. This is the superstructure which is built upon the foundation children develop early on their own, even before we adults think of providing any systematic experiences in numeracy. The mathematical concepts that toddlers and preschoolers develop, through everyday experiences, are those of *many* and *few*, *more* and *less*, *heavy* and *light*, *fast* and *slow*, *long* and *short*, *big* and *small*. When a three year old boy upon getting one pencil and seeing his elder brother get three begins to cry, you know that he realizes he has less than his brother. He is able to understand more and less with respect to three objects. When the two year old girl on not being able to reach the biscuit can, goes looking for her elder sibling, she is demonstrating an intuitive understanding of relative height, of long and short. A four year old understands time as time to eat, time to play and time to sleep. The time it takes to reach school or the duration of waiting for one's turn on the swing — which are relevant for the child — help in the measurement of time.

Can you list other concepts which children seem to know before they begin formal schooling?

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Children develop these concepts through everyday experiences, especially play. Developing these concepts is essential before any other number teaching can take place — even just counting.

In this Unit, we shall talk about some play activities that will foster the development of the abilities to match, classify, compare, seriate, find common relations, measure and understand cause and effect relationships. Besides this, we shall also talk about play activities that help children to sharpen their sensory capacities. We shall also describe some play activities that will help preschoolers to develop the concepts of number, shape, space, time, size, measurement — i.e., the concepts which will foster mathematical thinking.

Objectives

After studying this Unit, you should be able to

- plan and conduct age-appropriate play activities to sharpen children's sensory capacities;
- plan and carry out age-appropriate play activities to strengthen the abilities of matching, classifying, seriating, understanding cause and effect relationships;
- plan and carry out age-appropriate play activities to help children develop concepts of number, shape, size, space, time and measurement.

23.2 HOW CHILDREN LEARN

Off and on, throughout the various Units, we have discussed how children acquire concepts. Let us recapitulate at this point since it will help you in planning play activities.

You know that for children to have a concept of something, they must experience it. **Discovery and exploration are the ways through which children learn. They must be actively involved in doing.** As far as possible, learning should be based on actual experiences with objects. Simply talking about concepts will not help. To take an example, simply telling children how to classify objects is of no use in helping them develop this ability. They must actually carry out tasks involving classification. However, talk and discussion must *accompany* an activity. When children are involved in such tasks, talk to them about what they are doing and provide them with labels for objects and concepts. In the above situation, when children have classified objects into groups, encourage them to talk about their criterion for grouping by asking them questions like: "Why have you put this here?", "Can I put this here?" "Why not?". When language is based on children's experiences, it helps them to understand their experiences and develop concepts. It also helps children to know the words for objects and categories — such as, 'green', 'large', 'thin', 'box'.

Giving children the opportunity to explore and discover during play and then discussing their experiences is usually the way we introduce concepts to young children. The reason why we are stressing this point here again is because when child enter the preschool or the kindergarten, the general objective is that the child should do well in studies. In most preschools this gets interpreted as doing away with play and substituting it by talking, mostly by the teacher. The emphasis is on memorizing everything — the alphabet, numbers, names of colours, names of shapes, names of fruits and so on. For most preschoolers learning becomes divorced from understanding. The following situation brings this out clearly.

Meenu is a four year old who attends a neighbourhood nursery school. One day her mother asked her to recite the numbers. Meenu recited numbers correctly, in sequence from 1 to 20. Subsequently, her mother asked her to pick up nine stones from a heap. Meenu was not able to pick up the correct number even on three attempts.

Would you say then that Meenu, who can recite correctly up to 20, has acquired a concept of number?

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Why do you think she could not pick up nine pebbles correctly?

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You too must have experienced a situation like the one described above — preschool children being able to recite numbers but not being able to count. Being able to count depends upon the ability to match, classify, seriate and an understanding of one-to-one correspondence as you have read in Unit 18.

What the above example brings out is that being able to recite numbers is not the same as being able to count. The former is at best a reflection of the child's ability to memorize, while being able to count reflects that the child has the ability to seriate and set objects in one-to-one correspondence and is onwards to building a concept of number.

The reason why we have discussed the above situation in such detail is to bring out that the fact that in most preschools the emphasis is on memorization — such as names of shapes, colours, numbers — without explaining the basis of those facts. In many cases this makes children confused. You have read in Unit 22 that imparting facts is not an end in itself, but rather that facts should be used to foster reasoning and thinking skills. Similarly, the stress on reading and writing in preschools is misplaced. This aspect shall be taken up in more detail in Unit 24 on "Furthering Language".

The aim of preschool education should be to give children an opportunity to handle a variety of play materials and take part in play activities which will help them to develop cognitive abilities and concepts on which later learning will finally develop.

It is important to be patient as children discover things for themselves. When things become difficult, the first response of children is to seek help. You should be available to help, but the help should be in the form of encouragement to look for the answer themselves. Adults tend to be impatient when the child takes time and may answer the question or do the task themselves. This prevents the child from reasoning and finding out.

As a first step in helping the children to overcome a difficulty, let them identify the problem. To do so, discuss the problem with them, ask questions about it and draw their attention to aspects they may not have noticed. Once the problem is defined, encourage children to look for possible solutions. Sometimes, children may come up with suggestions that are impractical or impossible. Do not be critical of such ideas, but recognise that learning also depends on trial and error. Encourage children to ask questions and use their response to arrive at solutions. Do not hurry to offer a solution before children have had time to think about it.

23.3 ENHANCING OBSERVATION SKILLS : PLAY ACTIVITIES FOR SENSORY EXPLORATION

You have just read that to learn about anything children need to experience it — i.e., touch it, see it, hear it and smell it. Listening to, looking at, touching and smelling comes naturally, without anyone telling us to do so. However, by carrying out play activities that are based on these senses, you can help children to observe things and events in more detail. Observation depends on the sensory capacities and only through observation can one learn. Besides sharpening children's sensory capacities, the play activities in this section will also further children's understanding of concepts. As you read about each activity, it would be helpful for you to note down the concept it builds and strengthens.

23.3.1 Play Activities based on the Sense of Touch

The activities described here help to sharpen the sense of touch. They can be used as a base for putting together experiences of different kinds and will also help the child to develop concepts. As you read them, try and evaluate whether you would be able to present them to children in the way they are written or whether you would like to change them to suit your needs.

- Children touch the things they play with. Make sure that the play objects you select for children are made of different materials — wood, cloth, paper, metal, clay and so on. As children play with different objects, talk about their texture. Ask them

how the objects feel. This will introduce children to words like soft, hard, rough and smooth and help them to acquire these concepts.

- Put some objects of different textures, which children are familiar with, in a bag or a box. Ask children to dip their hands into the bag, feel the objects and identify them in this way without seeing them.
- Create different textured surfaces in the preschool by covering some area with a doormat, sand, grass, bricks, smooth pebbles and wooden planks and leave some area uncovered. Ask children to walk barefoot across these surfaces and describe how it feels — cold, warm, rough, slippery or wet. Later, ask children to enact how it feels to walk through knee deep water, through a muddy patch after rains, on thorns and so forth.
- In an earlier Unit you have read about organizing sand and water play. These activities also provide sensory experiences.
- Take a piece of cardboard. Cut out 10 cm square pieces from it. Put glue on one side of each piece and paste sand, twig, pebbles, saw dust, velvet paper and other materials of different textures on two cards each. Thus you have one pair of cards of each texture. Using these cards you can play a game. Distribute these cards to children and ask each to find another child who has the corresponding pair. This requires children to match their card with those of others and identify the one which is exactly alike. Thus apart from strengthening the child's understanding of difficult textures, this activity also helps in the ability to match.
- When children go out in the open to play, you can engage them in the following activity. Ask them to collect things that feel smooth on touching such as a round smooth pebble, a smooth leaf, a petal of a flower, a soft feather and things that feel rough like the bark of a tree, a twig, dry grass or sand. These articles can be brought to the centre and can be the focus of discussion.
- Some activities where the children have to feel objects with their face can also be organized. These objects must be selected very carefully.

Can you list the abilities and concepts children will develop, besides sharpening their sense of touch, as they are involved in these activities? Some of them are concepts of coldness, roughness, wetness, hardness.

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23.3.2 . Play Activities based on the Sense of Smell

Normally, we do not have to make an effort to smell. If anything has a specific smell, it is noticed at once. Activities that focus on the sense of smell help children to be more observant and develop related concepts and vocabulary.

- Routine activities can be focused to talk about the sense of smell. When children sit down for a meal, the conversation if focused on the aroma of food can be the beginning of a discussion: Do they like it? What are the foods that smell good to them? Some food items like cauliflower, turnip, radish, and fenugreek greens when cooked have a very specific smell which we notice. These can be the topic of conversation. When these vegetables are cooked, children can also be encouraged to guess the name of the dishes from their aroma. Initially, children may not be able to identify the food items, but after some exposure, it will not be difficult to do so.
- Give children ginger, garlic, onion, orange peel, mustard oil, crushed leaves of a lemon tree, a rose and other things with a specific smell. Later put these in a small box each and ask children to identify them by their smell.

- Organize a trip to the market. Before going out, discuss with children that they should notice the different types of smells and try to locate their source. Of course, once actually in the market, children will be attracted by many other things besides the smells. That is natural and must be encouraged. Back in the centre, encourage the children to talk about what they saw, heard, smelt and touched.
- Most flowers have a distinct smell. Encourage children to smell flowers growing in the neighbourhood. Tell children the names of different flowers. They may not be immediately able to associate the name with the smell, but they will begin to do so over a period of time. Similarly, many trees can be identified by the smell of their crushed leaves — for example, lemon and guava.
- A story or a song that refers to different smells will be enjoyable.

Activities based on the sense of smell will help children to understand the meaning of the words such as sweet-smelling, foul-smelling, pungent and sharp-smelling. Children may not understand and use these words immediately, but the experiences in differentiating various types of smells will strengthen their powers of observation. It is possible that what a child may categorize as "smells good" is stated by another child to "smells bad".

List the concepts and abilities that are being strengthened through the play activities described above. For example, identifying things that smell good and those that do not, helps to foster the ability to classify.

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23.3.3 Play Activities based on the Sense of Taste

Infants put almost everything they find into their mouth. You know from your reading of Block 2 that this is a form of exploration. As children grow older, they learn that they cannot and should not put everything in their mouth. But nevertheless this sensory channel tells us a lot. Children should be encouraged to taste many kinds of food. Talking about the taste — whether what they ate was bitter, sour, sweet, salty — will help them to develop these concepts. The tongue is also an organ for judging. Children will be able to talk about whether what they ate was soft or hard.

You can put up a chart on wall and divide it into columns with categories — salty, sweet, sour, bitter. As and when children tell you the taste of things they ate, you can enter their names on the chart.

23.3.4 Play Activities based on Vision and Hearing

All our activities involve listening and looking, including the ones described in the preceding sub-sections. However, some specific activities based on these senses can be planned. You will read about a variety of such play activities in Unit 24 on 'Furthering Language'. Here we shall describe some to serve as examples.

- Ask children to recall what they saw on the way to the centre/school.
- Ask them to note what is new about a particular plant in the centre — there may be a new flower, a shoot, a few leaves that have turned brown and so on.
- Talk to children about the various sounds they can produce using their body. Bring to their notice the sounds we make all the time but pay no attention to, such as heart beats, breathing and the sound of our footsteps.
- You can play a game of follow the leader where the 'leader' claps or stamps in a particular rhythm and other children repeat it.

So, these were some play activities that you can organize to sharpen children's sensory capacities and observational abilities. We would like to emphasize one aspect at this juncture. We have stated the play activities in separate sub-sections which gives the feeling that activities related to each of the senses have to be organised separately. This need not be so — in fact, many times it will not be possible to maintain this distinction. When you ask the children to smell a leaf of a lemon tree, they will also feel it and look at its shape and colour. When children eat different foods they will taste it, smell it and look at its appearance all at once. The sensory experience is usually a total experience involving all the senses. Therefore, how you organize an activity will depend on your objective and also on how children react to it. When asking children to explore different flowers, you may ask them to limit themselves only to their smell or you may talk about the feel and look of the flowers as well. By and large, go along with the children's interests.

23.4 MEMORY GAMES

Memory is an integral part of cognitive functioning and our day-to-day activities. Memory involves storing information efficiently in the brain and being able to recall it when needed. Children's ability to store information efficiently and recall it develops as they grow. Some of the play activities we have mentioned in the preceding section also involve recall. Can you identify these? Check your list with the one that follows.

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Some activities where recall was involved were: talking about what children saw on the way to the centre, identifying an article by smelling it, thinking of the smells that children like, pointing out what is new about the potted plant.

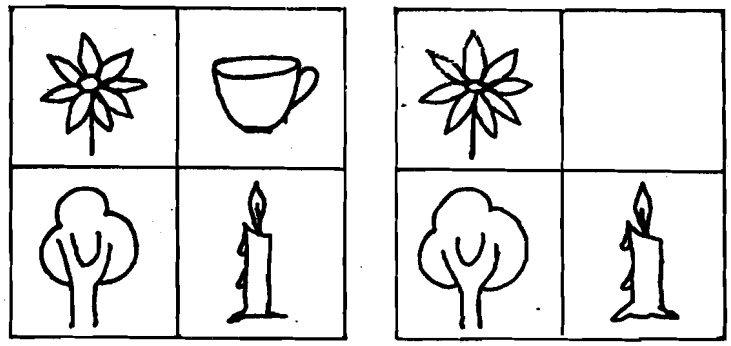
The following are some interesting games based on the use of memory.

- Put three or four objects in front of the children and ask them to look at them carefully. Then cover them with a cloth and remove one of the objects without letting the children see it. Then remove the cover and ask them to name the object you have taken away

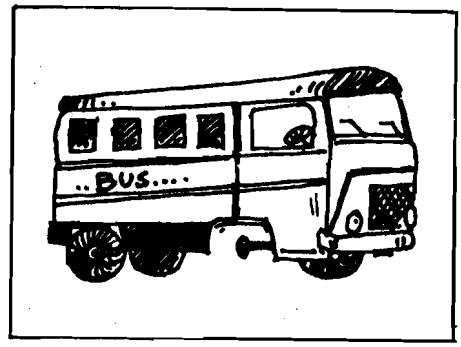
- A variation of the above game is as follows. Show the objects, then cover them and ask children to name the objects they saw. As children get used to playing this game, you can increase the level of difficulty by increasing the number of objects.

- Draw the events from a familiar story on a set of 7 or 8 cards. Then jumble them up and ask children to put them in the order of the events of the story. This will be a difficult activity for younger preschoolers. You will be more successful trying it with 5-6 year olds. Keep the number of cards to four or five in the beginning Increasing the number of cards will make the activity more difficult

- Take two cards of similar size. On one, draw four objects and on the other, three objects. Show the first card to children for a while. Then take it away and show the second one. Ask them to tell or draw what is missing. Variations of these can be played.



- Draw objects that children are familiar with on different cards and leave out something from the drawing. For example, while drawing a bicycle, leave out the handle bar, the pedals or one wheel and ask children to tell what is missing.



- Converse with children about events that have occurred in the recent past. Ask them, for example, the names of children who had not come the day before.

Check Your Progress Exercise 1

1) What do you understand by the term pre-mathematical concepts?

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2) What do we mean by the term 'mathematical concepts' in context of toddlers and preschoolers?

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3) 'The best way to explain a concept to a child is to 'talk about it'.' Do you agree with this statement? Give reasons for your answer.

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4) 'The stress in most preschools on memorization of facts is correct.' Do you agree with this statement? Give reasons for your answer.

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5) Indicate the concepts and abilities that are strengthened as children participate in the following play activities.

i) Children separate things that feel similar on touching from a collection.

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ii) Each child looks for another with a similar textured card.

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iii) Children put together leaves that are alike from a collection of leaves.

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iv) Children identify objects in a bag by smelling them.

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v) Children talk about what they saw, heard, smelt and touched in the market place.

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vi) Children complete the missing part on the drawing of the object.

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23.5 PLAY ACTIVITIES FOR DEVELOPING COGNITIVE ABILITIES

Let us now read about some play activities that will help to develop children's ability to match, classify, find common relations, compare, seriate, measure and understand cause and effect relationships. Besides strengthening these abilities, the play activities mentioned here also help in developing concepts such as those of colour, shape, number and size.

A point one must keep in mind while planning activities is the level of difficulty. Initially organize simple tasks for matching, classifying, seriating and so on. Gradually make the activities complex. How this can be done has been explained in each sub-section dealing with a particular ability.

23.5.1 Play Activities to strengthen the ability to Match

As you know from your reading of Block 4, **matching involves identifying and putting together those objects which are identical.** For example, identifying red circles of the same size from a collection of circles of different colours and sizes. Can you recall from your reading of Unit 18 in Block 4 how the ability to match is useful in learning?

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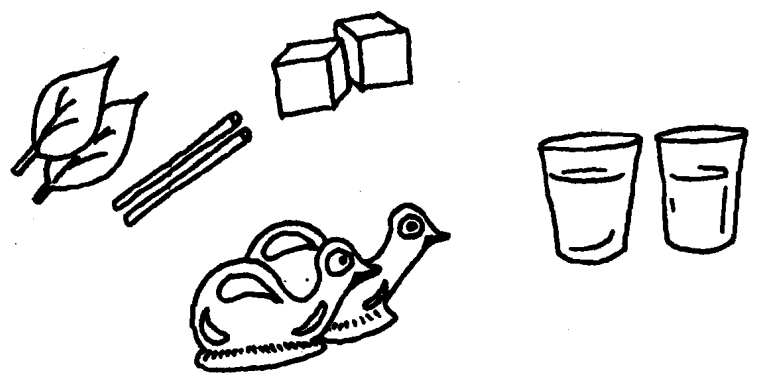
The opportunity to provide experiences in matching abound in everyday life. Some play activities that will help children to develop the ability to match are described in this sub-section. But before we read these, **let us read about some principles to bear in mind while devising matching activities.**

- **While introducing matching activities, it is important that the different objects from which some have to be matched, vary in one respect only.** For example, when asking children to match pencils of a certain colour from a collection of pencils of different colours, their shape and size must be the same and only the colour should vary. When asking children to match buttons of different shapes according to a particular shape, their colour and size should be the same and only the shape should vary. Can you say why? This is because initially children find it difficult to consider more than one attribute at a time. If the pencils varied in terms of both their colour and size, then most children are likely to consider either the colour or the size during matching, but not both together. What may happen is that children begin by matching with respect to colour and so pick out a few pencils that are of same colour as the one you asked them to match with (but not necessarily of the same size) and then their attention shifting to size, they may ignore the colour completely. Thus their collection may be something like this.

- Use a variety of materials for matching activities so that children have varied experiences. Use leaves, sticks, blocks, toys, containers and things easily available in your setting.



- We have said that initially it is not necessary to name the property on the basis of which you are asking children to match. However, **as children have had several experiences of matching, explain and talk about the attribute on the basis of which they are matching.** For example, when they have matched different colours in different situations (pencils, leaves, beads, cloth etc.) you can say: "They are all red in colour and these are green"; "These are round and these are square". Thus through the activities of matching, children will develop concepts of shape, size, colour and texture. As you ask children to put all the toys in one basket and all the

paints in another, children are matching objects according to the criteria 'toys' and 'paints'. They have thus developed a concept of 'toys' and 'non-toys', 'paints' and 'non-paints'.

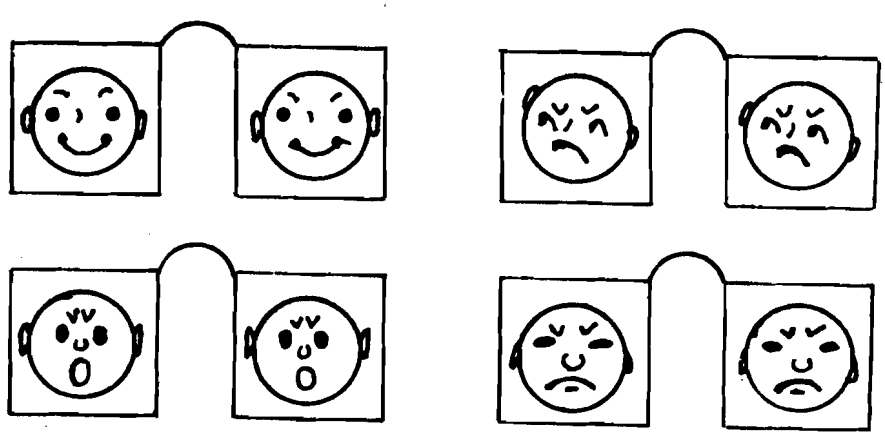
- **Gradually, as children are able to match on the basis of one attribute, you can increase the complexity of the task by asking children to match objects that vary on two attributes** such as colour and size; shape and colour and so on. Some examples of such activities could be asking children to pick out leaves of a particular shape and colour from a collection of leaves of different shapes and colours, separating onions from a basketful of vegetables, which requires the children to match the vegetables in terms of their shape, colour and, may be even smell, in order to pick out all the onions.

The following are examples of some specific activities you can devise to foster children's ability to match. Try them and develop some more of your own. We have begun with simple activities, leading on to more difficult ones.

- Place a collection of pencils of different colours but of same shape and size and ask the children : "Give me all the pencils that look like this" (holding up a red pencil for the children to see). You can also say: "Give me all the pencils of this colour" (holding up the pencil for the child to see), if the children understand the word 'colour'. **In the beginning it is not necessary to name the property on the basis of which you are asking children to match.** In the above example, the word 'red' need not be used, as children may not yet have the label, "red".

- Similarly, from a collection of round and square buttons, put aside a square button and ask children to pick out others like that. There is no need to use the words 'square' or 'round' initially. Showing children the object with which others have to be matched is enough.

- Make some cards from covers of old notebooks, calendars or greeting cards. Draw or paste pictures of different objects on these cards. Each object must be drawn on two cards. You can also draw a pair each of the faces shown below. Distribute these cards to children and ask them to look for the child who has a card like theirs.



- Give children a mixture of two pulses and ask them to separate them into two heaps. To make the task difficult, increase the number of pulses in the mixture and include some that are similar in shape or colour, for example, red gram and bengal gram. To separate the pulses, children will need to consider their colour and shape.

- Paste pictures of different objects on different boxes. Give the objects that match with these pictures to children and ask them to put each object into the right box.

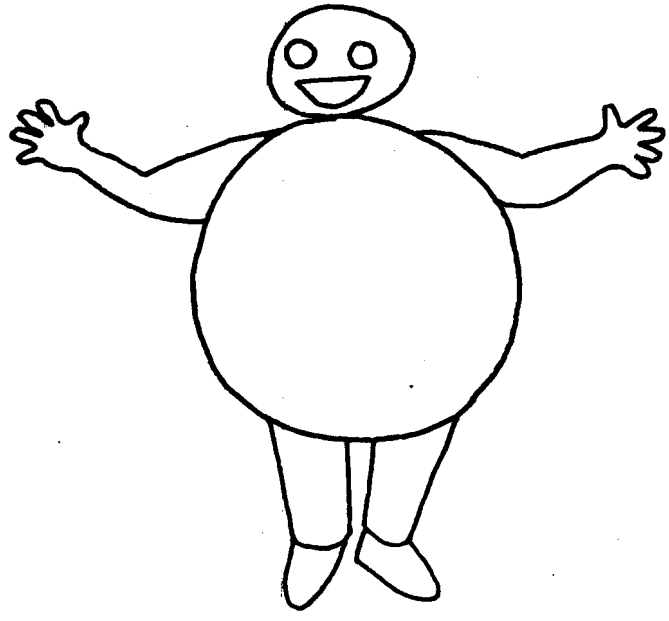
- Ask children to match flowers and leaves they may have collected according to their colour, shape or size.

- Cut out many cloth pieces of the same shape and size but of different textures — velvet, cotton, wool, tweed. Put these in a container and ask the children to pick out all the pieces of a particular texture — say velvet.

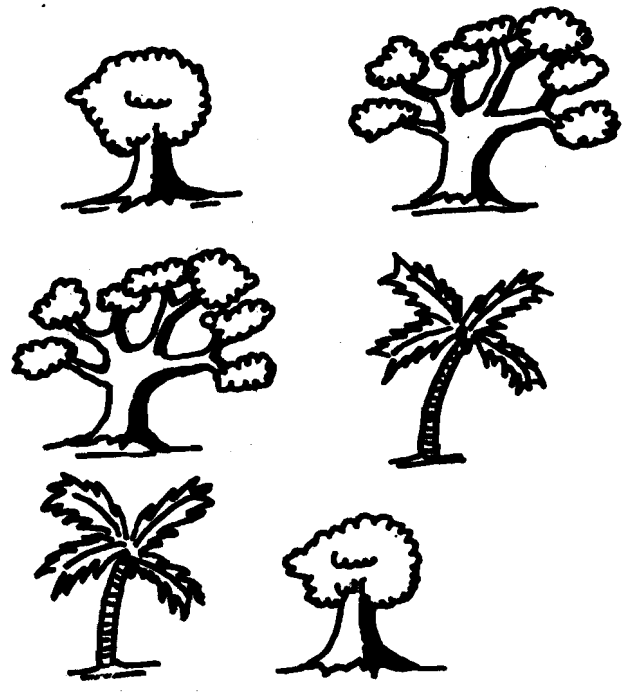
As a variation, distribute the cloth pieces among children and ask them to find others with pieces of similar texture.

To increase the complexity of the task for older preschoolers, cut these cloth pieces into different shapes. Now children will have to consider two dimensions — shape as well as texture to match the cloth pieces.

- Ask the children to colour all the circles (O) or leaf shapes ( ) in a picture such as the following:



- Another activity requiring matching can be as follows:
  Which trees are identical?



- To encourage children to match on the basis of weight you can try out the following activity. This is likely to be difficult for the younger preschoolers, but stimulating for the five or six year olds.

  This activity involves making a balance. You would have probably made one from old shoe polish tins or lids of containers when you were a child.

  To make a balance take a twig about 25 cm. in length and attach shoe polish tins to

its two ends using threads. Use a nail and hammer to make holes in the tin to put the thread through it. Then show children a pebble and ask them to find others from the pile that weigh the same as the one given by you, using the balance. Initially, you will have to show the children how to use the balance. This can be a group activity. Each child gets one turn to choose a pebble and weigh it to see whether it matches in weight with the one you gave. While one child weighs, the others in the group can be asked to predict whether or not it will match in weight. They will find it stimulating to see whether their predictions will tally with reality. This activity, besides fostering the ability to match, also strengthens the concept of weight. Through such activities children develop an idea of heavy and light and later "heavier than", "lighter than" and "the same weight as".

- Gardening provides many opportunities for matching. Ask children to pull out weeds from a grassy plot. In this way they will be matching the shape of grass blades with the shape of the leaves of the weeds.

In this way you can set up numerous activities where the criteria on the basis of which children match is shape, size, texture, colour, material, weight, function or any other. Think of some more play activities based on the ability to match and write about them in the space below.

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As we have emphasized earlier, it is important to talk to children about what they are doing. Asking them questions like: "Why do you say they match?" will help them to

develop concepts. Children have to learn to abstract from their concrete experiences and using language is the first step in this direction.

23.5.2 Play Activities to strengthen the ability to Classify

As you know, **classification (or grouping or sorting as it is also called) involves putting together things that have some characteristic in common.** As children get experiences in grouping objects they develop the concepts of "alike", "different", and "belongingness". Can you recall from your reading of Block 4 how the ability to group helps in learning?

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The ability to classify develops from the ability to match and most of the play activities designed to foster the ability to match can be developed into classification activities. While in matching activities the objects to be matched must be alike in all respects, in classification activities the objects placed in a group are different from each other but have some property/properties in common.

Once children are able to match, they are ready for sorting or classification activities. Sorting tasks arise in play and every day activities as children are asked to put the doll's clothes in one bag and the doll's ornaments in another; as they put the unclean plates in one tub and the clean ones in another; as they separate squares and triangles from paper cutouts.

In the preschool these early experiences can be extended. Before you read about some play activities to foster the ability to classify, consider the following situation and answer the questions that follow.

Four-year-old Vivek attends a preschool centre. The preschool worker gave him cutouts of triangles and rectangles of two different colours — red and blue. Thus there were red triangles and red rectangles, and blue triangles and blue rectangles. The educator asked him to "put similar things together". She had expected that the child would make four groups — red triangles, red rectangles, blue triangles and blue rectangles. Vivek, however, did not make such groups. He began by selecting a blue triangle. Then he picked up another triangle red in colour and placed it next to the first one. Then he picked up a red rectangle and placed it next to the red triangle. Then he created the second group where he placed a blue rectangle, followed by a red rectangle and finally a red triangle. At this point he stopped.

On another occasion at home, Vivek's mother was busy separating two pulses that had got mixed — Green gram and Bengal gram. To finish the task sooner and also to manage Vivek's mischief, his mother asked him to help her. Vivek joined her eagerly and correctly separated the pulses into two piles.

It is quite clear that Vivek could not do the classification task set up by the educator but he could classify in the situation at home.

1) Would you say that Vivek is able to classify? Give reasons for your answer.

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2) *Why could Vivek not classify in the first situation?*

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Compare your answers with the discussion that follows.

The first activity requires the child to keep two criteria in mind while classifying — shape and colour, while in the second activity the child needs to only keep the colour of the pulses in mind while separating them. The former is a relatively difficult task for a preschooler. In the first task Vivek began by using shape as the criterion for classification. Then his attention shifted to colour. Thus he picked up a red rectangle and placed it next to the red triangle in group one. Thus his basis for classification changed from one piece to the next. This is not true classification. One should be able to decide upon the criterion for classification and maintain it throughout the activity.

Also, the second situation is more meaningful for the child and he is familiar with it. It makes sense to the child, while the first one seems artificial.

We have discussed these points in detail because they have implications for devising play activities. **Begin the classification activities where objects differ on one criterion only. Introduce these activities in situations and ways that are meaningful for the child. Gradually the classification tasks can be made more complex** — involving sorting by two criteria as described in the situation above. Of course, many preschoolers will not be able to do this. Do not force them if they find it difficult.

With these aspects in mind, **let us now broadly list the classification activities in terms of level of increasing difficulty**. We begin with the simpler ones and go on to the more difficult ones. Following this, we shall describe some specific play activities.

- Initially give children material to classify in any way they like. Talk to them about what they have done.
- Follow this up by asking them to classify on the basis of physical characteristics — like colour or shape or texture. Explain what has to be done — "Put together all the objects of red colour"; "Put together all the things you would see on a farm"; "Find from this pile all the things a carpenter would use". Initially you may have to show the children how to do the activity.
- At the next level of difficulty, the instruction is more general — "Put together all the objects that go together" or "Sort all of these into two groups so that each group has objects that go together."
- Asking children to make categories on the basis of function or a class like vegetables or fruits is more complex.
- Classification activities taking two dimensions into account are difficult for preschoolers. In such activities, there is more than one way of classification. For example, ice cream sticks coloured in different colours and of two different sizes can be classified either on the basis of colour only, or on the basis of size only. In this way one gets two groups. If both colour and size are taken into account, one gets four groups — red and long sticks, red and short sticks, green and long sticks, green and short sticks. The classification which includes the dimension of shape as well as colour is more sophisticated. However, classification on the basis of one criterion is also correct. In such a case, when children have made groups on basis of one attribute, either colour or size, draw their attention to the fact that each group can be further sub-divided. The important point in classification activities is that the child should be able to maintain the criterion for classification throughout the activity.
- Asking the children to state what is common to a group of objects you have put together is more complex than all the former activities.

The following are examples of some play activities you can devise based on the principles discussed above. We begin with the simpler ones which lead to the more difficult ones.

- Make available a variety of vegetables and ask children to sort them into groups. Let children evolve their own criteria for classification and group them in any way they like. Once they complete the activity, talk to them about the criteria they have evolved by asking them questions like: "Why are these together?", "Why not put this here?"

- Provide a collection of bells — cow bells, decorative bells, christmas bells — and invite children to classify them on any basis that they like — colour, shape or sound. Once they have sorted, ask them their basis for classification.

- When children finish playing with blocks and are putting them away, ask them to put blocks of a particular colour together.

- While they are enjoying a meal, discuss the foods that taste sweet, sour or salty.

- Collect leaves of three different shapes and ask children to "put together the leaves that look alike". Initially you may need to help them. Show them the three different leaf shapes and indicate that they form three groups. Gradually such help must be lessened. Then you may word your instruction as: "Put the things that belong together in one group".

- Give children buttons which vary only in terms of colour or shape or size. Ask them to put the similar buttons together. If children find it difficult to carry out the activity based on this general instruction, be more specific and ask them to "put all the round ones together" and so on.

- Fill a box each with a variety of shells, seeds, beads, or rocks. Ask children to sort these on the basis of shape, size or colour.

- Make available items of clothing to be sorted on the basis of colour or function.

- When children have had many experiences with concrete objects you can organize classification activities that involve pictorial representation. For example, draw an apple, a banana, an orange, an onion, brinjal and radish and ask the children to colour the objects that go together.

- Put together some objects in a group on the basis of some common property. Show this to the children and ask them what in their opinion is common to these objects grouped together.

Use a variety of material for classification activities — cloth pieces that differ in texture, twigs that differ in size, books that differ in thickness, pebbles that differ in weight. For the activity concerning weight, children will need the balance described earlier and they may find the activity difficult to carry out without your help.

Talk to children about the classification activity: "Why have you made the groups like this?", "What is common between these objects that you have placed together?" This is necessary for two reasons — talking about what they have done helps children to clarify their thoughts and you come to know how far they have grasped the concept.

Many of the activities listed under Section 23.2 can be converted into activities for classification. Can you identify which these are? One of these is described below to help you recapitulate.

- Give children various textured papers cut into uniform shapes and sizes so that there is only a single criterion for classification. Ask them to "put the papers that feel alike in a group" or at a more general level to "put papers together". Cut these papers into a variety of shapes for older children to have more than one criterion for classification.

Classification activities build the concept of **some, none, one** and **all** as children realize that "some are in this group" and "none is left". Children also develop concepts of colour, texture (rough, soft, hard), size (longer, short), thickness, shape.

Check Your Progress Exercise 2

1) What is the difference between matching and classification activities?

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2) Why is it important that the objects you set up for matching and classification initially vary in one respect only?

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3) Make a list of at least ten objects that you can use for matching activities that have not been mentioned in the Unit.

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4) List the classification activities that you can carry out with preschoolers in terms of level of increasing difficulty.

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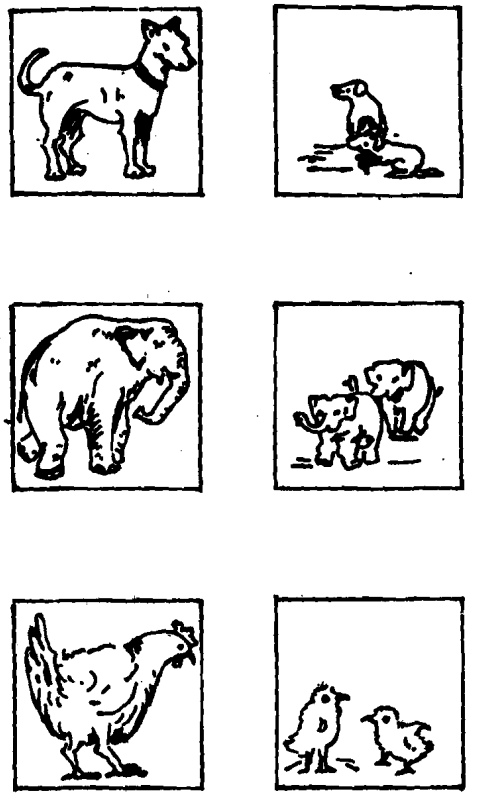
23.5.3 Play Activities to foster the ability to Identify Common Relations

You know that **being able to identify common relations means being able to see a relationship between a pair of objects that are not identical or similar.** In Block 4 you read about a play activity based on this ability in Box 18.2. Let us read about some similar play activities. These activities will foster children's reasoning abilities. While many kinds of pairs can be formed, we must remember that the preschoolers will enjoy simple pairing.

- Draw pictures of the foods commonly eaten by a particular animal and say: "It is lunch time and the animals are feeling hungry. Which food should I give to whom?"
- Draw pictures of various vegetables and fruits. Draw the vegetables and fruits separately on different cards and ask children to stick the appropriate fruit/vegetable on the plant. If children are not familiar with the plants, they will find the task difficult. Substitute the plants and vegetables with familiar things.

- Collect or make pictures of animals and their young ones and ask children to match the young one to the adult animal.



Take a collection of pairs, mix them and put them in a box. Children will enjoy pulling them out one by one and pairing them. You can take articles such as cup and saucer, shoes and socks, toy-dog and its leash and so on.

Think of some more activities and write about them in the space here. This will help you in planning activities for children as part of your practical work.

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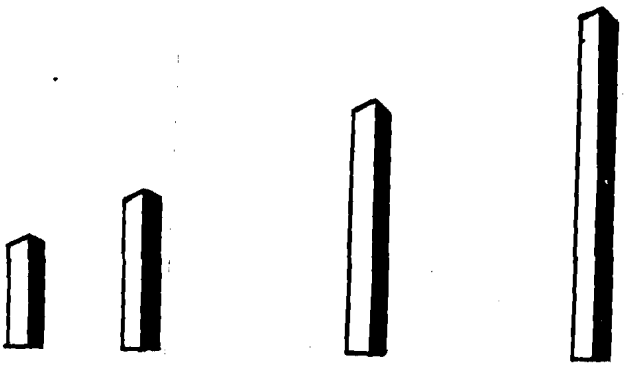
23.5.4 Play Activities to foster the ability of Comparing and Seriating

You have read about preschoolers' ability to seriate (also known as order) in Block 4. **Ordering or seriating involves arranging more than two things in gradation of size, shape, colour or any other attribute so that there is a sequence from the first to last.**



But before children can arrange more than two objects in a series, they must be able to compare. **Comparing involves only two objects. It involves establishing a relation between two objects on the basis of some specific attribute such as colour, texture, shape, weight, size or any other.** Children are able to compare before they are able to seriate.

Preschoolers make comparisons naturally especially when the subject involves them personally. They say: "I have more juice", "My pencil is bigger." When children compare, they develop concepts of big and small, long and short, thick and thin, new and old, more and less, many and few, heavy and light, loud and soft. As an educator, you must plan experiences in the preschool that foster children's ability to compare. The following situations can easily be devised in the preschool.

- You can create many situations in the preschool when children are asked to compare objects on the basis of different attributes. Ask children which block is heavy and which is light, which twig is long and which is short, which colour is dark and which is light, whose voice is shrill and whose is hoarse.

- Comparison activities also help children to understand one-to-one correspondence. You know that this ability is basic to counting. The following activity, involving comparison of quantities helps the child to understand one-to-one correspondence. Take some pebbles (or any other material) and divide them into two groups with four and six pebbles each. Ask children to say which group has more pebbles. For a child who cannot count, this involves setting objects in one set into one-to one-correspondence with objects in the other and seeing in which group the pebbles are left over. Such activities strengthen the concepts of more than, less than, how many and same.

Many day to day situations will arise when children will need to deal with more than two things at the same time — for example, when they are asked to pick the smallest plate first from a collection of plates of different sizes, when they have to choose the biggest piece of cake out of many pieces. In this way they begin to realize, and you can help them see, that comparative terms like big and small, long and short are not adequate. In a collection an object is longer than some and shorter than others and one is the longest and one is the shortest. Matching activities where you ask children to match objects according to colour, length or shape lead children to understand concepts involved in seriation. When objects do not match, it makes children see them as "longer than" and "wider than" as compared to another.

Can you think of other day to day situations that promote understanding of concepts involved in seriation?

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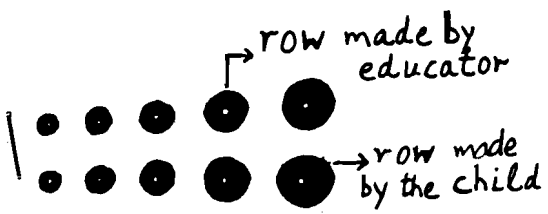
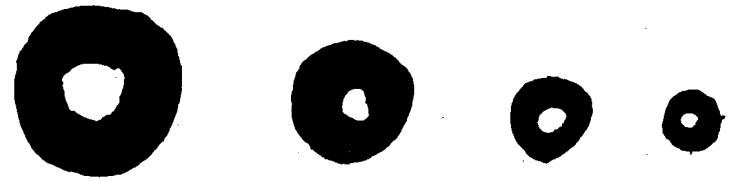
In the following paragraphs **we have described the principles behind planning seriation activities in terms of levels of increasing difficulty.**

- The simplest seriating activity is asking children to copy a pattern. For example, make a row of seeds that increase in size and ask children to make a similar row using seeds from a heap.



- At a higher level of difficulty is asking children to continue a pattern. For example, in the above case ask the children to extend the row of seeds you have made.

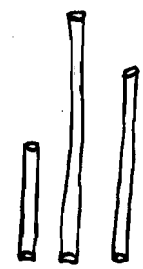


The question to be answered in ordering activities is "What comes next?"

- At the next level of difficulty is asking children to arrange a collection of objects on the basis of some attribute such as colour, length, width (thickness), or weight such that there is a uniform gradation. Seriating to shape and colour is easier than seriating according to length (size). Initially you may need to prompt by asking questions such as: "Which is the smallest?", "Which is longest?", and explain how to do the task.

  When children have put objects in a series incorrectly, you will need to help them see their mistake by asking questions like: "Is A (pointing to the object) thinner than C (pointing to the object)?" or "This one looks bigger, should it not come here?"

- Begin by giving children three objects to seriate and then gradually increase the number. Seriating more than five objects may be difficult for preschoolers. What happens is that while seriating they place the first stick and then compare the length of the second stick with reference to the first one. But while placing the third stick, they tend to refer only to the second stick, instead of looking at the total arrangement. So you may have an arrangement that looks like the following:



The child must perceive the third stick in relation to both the first and the second — that it is longer than the first, but shorter than second, and, therefore, must come in between them. But the child perceives each subsequent stick only in relation to the last stick that has been put in the sequence, and, therefore, does not get a uniform gradation.

Keeping the above principles in mind, the following are some examples of play activities that can be devised to foster the ability to seriate.

- Give children containers or rings of different sizes to be fitted into each other so that none remain;
- Ask children to stack play material according to size, with the big ones first, then the smaller ones and then the smallest ones on the top;
- Ask children to arrange flowers, sticks or leaves according to increasing or decreasing size;
- Seal different amounts of pebbles in tin boxes and ask children to shake them and then arrange the boxes according to the sound they produce.

Think of some more play activities that involve seriation and put them down in the space below.

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When carrying out seriation activities, you will use words like 'last', 'first', 'in between', 'before', 'after' and 'next'. Thus children develop these concepts. Such activities will also help them to see that attributes are relative. A button which may be the largest in one set, may be the smallest in another. Thus there are no absolute dimensions. Activities of ordering by size help to strengthen concepts of "bigger than", "longer than", "smaller than", "biggest" and "smallest" "longest" and "shortest"

23.5.5 Play Activities to help in understanding Cause and Effect Relationships

The ability to understand cause and effect is the basis of all scientific understanding and any kind of investigation.

Children show an intuitive understanding of cause and effect from infancy itself. When the infant moves her leg to shake the crib or shakes the rattle to make a sound, she is demonstrating that she understands that her action (cause) has a result (effect). Of course, at this stage the infant cannot tell what is the cause and what is the effect and if both the cause and the effect are not visible, she will not be able to make the connection. As children grow, not only are they able to tell the cause and the effect if one is not apparent, but are also able to predict what will happen (effect) as a result of an action (cause) and deduce what may be the reason (cause) for a particular event (effect).

In the preschool centre, **encourage children to talk about the cause(s) and effect(s) of an event.** Ask questions such as why, when, what and how — they lead to an understanding of cause and effect. For example, when the children ask: "How did the clothes dry?", you can provide the answer: "Because the sun warmed them." Alternatively, you can stimulate them to look for answers by asking them a question in return: "What do you think made it happen?"

You have read about many activities in Unit 22 on 'Exploring the Environment' which foster the ability to understand cause and effect. It would be helpful to recall some and write about them here.

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Check Your Progress Exercise 3

1) What are some of the concepts that the child acquires through seriation activities?

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2) What is the difference between comparison and seriation tasks?

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3) Why is seriating more than five objects difficult for preschoolers?

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4) List seriation tasks in an order to increasing difficulty.

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5) How can you help children acquire an understanding of cause and effect relationships?

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23.6 DEVELOPING CONCEPTS

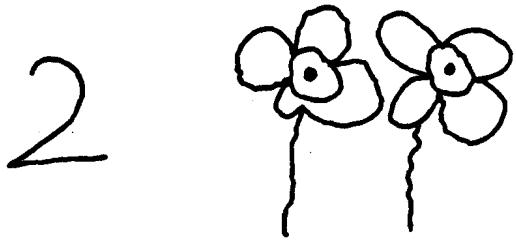
Along with most of the play activities that we have described in the preceding sub-sections, we have stated the concepts they strengthen. However, for clarity and to help you recapitulate, we shall in this section describe some play activities for developing certain concepts.

The concepts that we shall talk about in this section are those ot shape, size (which includes the concepts of length, area and volume) number, measurement, space and time — mathematical concepts, so to say. It is important to remember that when we speak of imparting these concepts to preschoolers, we are not thinking of these in formal terms. Thus by the concept of volume for preschoolers we do not mean the formula 'length x breadth x height' or calculations based on this. We simply mean experiences of the type: "How many cups of water it takes to fill a bucket?". When thinking of shapes we mean the many experiences of sorting and seriating shapes. Before we go on to describing play activities to strengthen these different concepts, it would be useful to discuss how not to impart these concepts to children.

23.6.1 How not to carry out Maths-related Experiences

You may have noticed that in many preschools, activities related to the concept of number begin with making the child learn the numbers names from 1 to 10, gradually moving on to numbers till 15, then 20 and soon. This is considered as counting. Having read an account of what it means to count in Block 4, you will agree that such rote learning of number names does not mean that the child has developed a concept of number or can count. There is no attempt to build the concepts of matching, classification, seriation, or one-to-one correspondence which, we have seen, are basic to being able to count. Almost simultaneously, the child is taught to write 1, 2, 3.... and so on, without waiting to develop the child's eye-hand coordination necessary for such a task. Most children at this stage are between three and four years of age. Beginning in such a way, with no reference to real life situations, number names seen meaningless to the child. Really how meaningless the entire exercise can be is clear from the following situation.

Four year old Rajni was reciting number names — some of them in order and others randomly. The child's aunt sitting nearby asked her: "Can you write 'two' ?" Rajni said "yes" and wrote the following:



When the aunt asked what had she drawn alongside, the child replied 'flowers'. On asking her why she had drawn them, she replied that: "This is the way 2 is written in the book". When her aunt said: "If I draw two ducks here, will they be '2'?" Rajni replied: "No they will not."

It is quite clear that Rajni had no idea that '2' refers to any collection of two objects. Can you say then that the child had a concept of numbers even though she could write the numbers names from 1 to 10?

The following situation is typical of how activities related to numbers are carried out in many preschools.

She planned an activity to help the children understand the concept of number. To do so, she hung a chart on the wall which had numbers 1 to 20 written on it. Besides each number there were corresponding number of objects. She pointed to each number by turn, spoke it aloud and asked the children to repeat it thrice. After this, she asked the children to indicate the number 4 using their fingers. Only one child out of 20 could do it. She said "Very Good" to this child and then asked the children to indicate another number. She did this with each number and each time only 1 or 2 children could respond. During this activity most of the children were inattentive. They were looking somewhere else or talking to each other.

A similar emphasis on rote learning is placed when it comes to learning about shapes and colours. In most preschools children are repeatedly shown the standard shapes of square, triangle and rectangle in the form of paper cut-outs or drawings and made to memorize their names. However, these paper cut-outs are merely two-dimensional representations of a variety of shapes that exist in the environment. Learning about shapes would be more meaningful if the educator used real objects and materials. Learning the names of the standard shapes is no indicator that the child has an understanding of the concept of shape. Children will learn the names of shapes in any case as a consequence of handling different objects and materials during play activities. When the focus becomes learning the names of shapes only, it is then that the educator's approach becomes restricted.

In the subsections that follow, we shall describe some play activities for strengthening concepts of shape, size, number, measurement, space and time. As we said earlier, among the play activities described in the preceding sub-sections of this Unit, there are many that will help in developing an understanding of these concepts. It will be useful for you to identify these play activities before you read further.

23.6.2 Play Activities for developing the Concept of Shape

Can you recall from your reading of the earlier sub-sections, the play activities that can be organised to help children acquire the concept of shapes?

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The following are some activities you can organize. We have listed the simpler ones first, gradually moving on to the more complex ones. However, we have not described each play activity in detail since you have read about them in the earlier sub-sections.

- Begin with activities involving matching different shapes. You have read about many such activities in the sub-section 23.5.1. Initially, you do not have to name the shape. Just ask the child to "find all the leaves that look alike" or "find all the cloth pieces that look like this" (holding up cloth piece for children to see). Indeed, some irregular shapes will have no names at all.

- When children have had enough experiences in matching, you can move on to classification activities. Remember, for the initial activities, whatever material you choose for classification should be alike in all respects except the shape. Can you recall why this should be so?

  Give children buttons, bottle caps, leaves, pebbles, beads, pens, containers (and anything else easily available around you) of different shapes and ask them to "put together those that are alike" Initially you may have to help children by creating groups and asking them to add more to each group from the pile. As they get experiences with this, they will be able to make groups on their own.

- When children are able to do some of the play activities of the type mentioned above, move on to a more complex one. Put objects of different shapes into groups and ask children the basis for the grouping.

- Along with above activities, focus children's attention on the shapes of objects around them. Ask children to identify all the round objects in the room or all the cylindrical objects (you may not use this name but show an object that is cylindrical and ask children to find others like it and so on).

As you will carry out these activities, you will find the opportunity to introduce the names of certain shapes. Label the shapes if it seems necessary for the activity or if the children show a need and a desire to know the names. Children should not be forced to learn the names of the shapes.

- Many indoor and outdoor play activities and games described in Unit 21 which involve the uses of tyres, blocks, etc. foster an understanding of shape.

23.6.3 Play Activities for developing the Concept of Size

Any activity in which children have to compare objects of different sizes, put the objects in a series, identify the longest one or the shortest one, or pick out the one which comes next, they are dealing with size. Such activities may deal with the length of objects (such as arranging sticks from shortest to longest), volume (such as identifying the largest container) or area (such as arranging in an increasing order cloth pieces of different sizes).

You have read about many such activities in the preceding sub-sections. To help you recapitulate, we have briefly described them here. We begin with the simple activities leading to more complex ones.

- You know that initially children use the words 'long' and 'short', 'tall' and 'short', 'big' and 'small' and not their comparative usage such as 'longer than', 'shorter than', 'thicker than' 'longest' and 'smallest'. Therefore, initially plan such activities for children which involve comparison of two objects. This will help them to develop concepts of long and short. tall and short, thick and thin, big and small, deep and shallow.

- When children seem comfortable with these terms, introduce activities that involve more than two objects. Plan matching activities where children have to 'find all sticks as long as this one', 'all cups as big as this one', 'all twigs as thick as this' 'one' from a collection of these objects. As they match, you can draw their attention to the ones that are "longer than", "shorter than", "thicker than", "thinner than" the specimen.

- Matching activities can be followed by classification activities based on size. Collect various objects that differ only in the dimension of size (either length, area or

volume) and ask children to put together objects of same size together. It is likely that you may need to make the two groups for children initially, explain the basis for the groups and then ask them to add new items the groups. Gradually, avoid giving such instructions and let children manage on their own.

Ask children the reasons for their grouping. It is quite likely that they may have grouped objects on basis other than size. Talking will help to clarify children's thinking and give you some idea about how children think.

You can use various objects for classification. You have read about such play activities in the section 23.5.2.

- Seriation activities also help in developing the concept of size. You have read about such activities in section 23.5.3. Seriation boards are available in many toy shops. This is a wooden board with pegs of different sizes which have to be put into the right holes. Initially, children will use trial and error to determine which peg goes in which hole, but gradually they will be able to judge which peg fits into which hole by looking at it.

- Besides the above activities which specifically focus on size, many outdoor and indoor games, described in Unit 21, contribute to a understanding of size. As children find that they can crawl under some play equipment and not through others, that they can jump over certain structures but not over others, as they stretch to reach a bar, as they choose different balls for different types of play and as they select a stick of just the right size to play cricket, they are dealing with dimensions of size.

23.6.4 Play Activities to Develop the Concept of Number

As you know the ability to match, classify, seriate and set objects in one to one correspondence are basic to developing a concept of number. You have read about play activities to foster the first three abilities in section 23.5. Let us study how one can strengthen children's understanding of one to one correspondence.

Understanding one to one correspondence

The following situation typically occurs when one interacts with preschoolers who are learning how to count.

An educator placed 10 pebbles in a row and asked Pankaj to count how many were there by touching them. Pankaj counted the pebbles thrice and came up with a different answer each time. What was happening was that Pankaj either left out a pebble while counting, or counted a pebble twice.

His counting was something like the following:

*	**	*	*	*	*	*	*	*
one	*two*	*three*		*four*	*five*	*six*	*seven*	*Eight*

Sometimes children continue reciting number names even after each pebble has been touched and counted.

Children who make such errors have not understood one-to-one correspondence. They have not grasped the idea that each object has to be touched only once during counting and no object can be left untouched and only one number has to be called out while touching each pebble. Before children can begin to count, they need the experience of setting -up objects in one-to-one correspondence. To understand one-to-one correspondence, children need to understand the meaning of 'many' and 'more than', 'less than' and 'as many as'.

Children as young as three can understand the difference between many sweets and few sweets, particularly when the difference between them is large. If you set up two piles of stones, one of which is a much bigger heap than the other, then children will be able to point to the one which has more stones. More and less are children's everyday experiences — as they compare the quantity of juice in the glasses, the number of pencils or the number of sweets.

Children's everyday experiences help them to develop an idea of one-to-one correspondence. As they check whether there are as many plates as the number of people to eat, they are setting up people and plates in one-to-one correspondence. Typically, the child says out aloud — "This plate is for Mummy, this is for Papa, this is for Pinki, this is for Bhaiya and this is for me". As the child finds one blouse for each of her dolls she is setting up the dolls and the blouses in one-to-one correspondence. You can devise many activities to strengthen this concept such as the following.

Layout a row of pebbles and ask the child to make another row with as many pebbles as the first one. Ask them to put out as many beads as the number of leaves; as many paint brushes as the number of children; to put one toy car each in the toy garages. Through such activities children develop the idea of "as many as".

Can you think of some more activities to strengthen an understanding of one-to-one correspondence?

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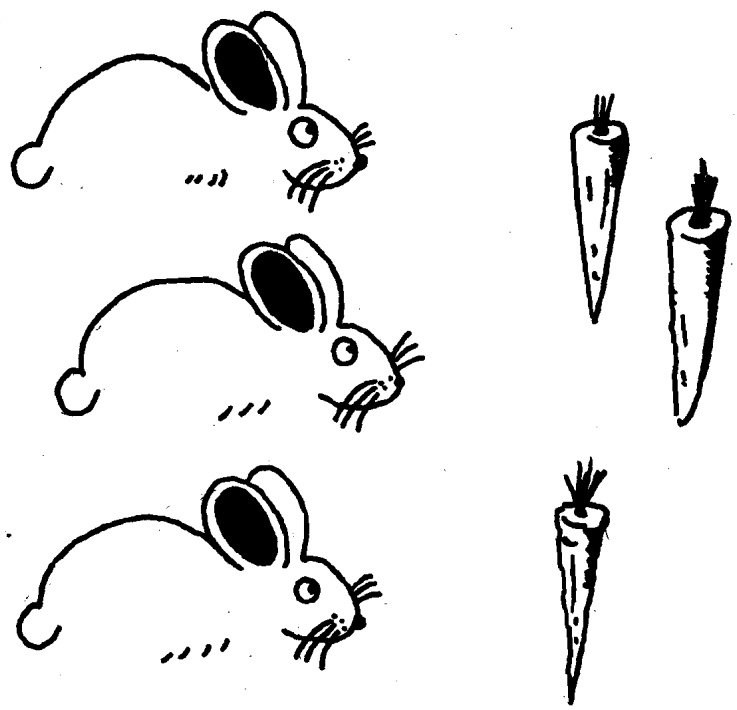
When items in one group is less or more than those in the other, then arises the concept of 'more than' and 'fewer than'. The situations described above can be easily adapted to lead to an understanding of 'more than' and 'fewer than'.

During the activities ask children questions like: "Are there as many plates as the number of children?", "Are there more leaves or more beads?"

You can also devise play activities involving one-to-one correspondence through pictorial representation. Through an activity like the following, ask the child to find out if each rabbit has a carrot to eat.



Ask the child to connect a pair of carrot and rabbit with a line. Such activities will help the child to visually understand what is involved in one-to-one correspondence.

Introducing counting

Many experiences in matching, classifying, seriating and setting-up objects in

pre-number activities. These are the base from which the ability to count and other numerical abilities will grow. Hurrying up and introducing counting before the child has had the chance to explore the above mentioned pre-number concepts, may cause confusion to the child.

Most of us while introducing number names and teaching how to count, do so in the absence of real objects. We present number names to children in a sequence, expecting that children learn them in the order and understand what they mean. But to many children this may not make sense, as we have said in the earlier part of the Unit. It would be helpful to introduce **counting using objects.**

When learning how to count, children need to understand that each successive number is one more in quantity than the previous one. However, the typical way in which we introduce numbers creates confusion, instead of helping the child understand this. Most of us begin in the following manner.

Often when counting objects for the child, we move from one object to the next, saying "one, two, three" and so on as we touch each object. The child, on seeing the adult touching these items, which in all other respects look alike, and saying a different word for each one, may conclude that 'one', 'two' and 'three' are names of these objects. We do not explain to the child that we called the second object 'two' because we assumed that we are now referring to a collection of two objects — the object that we touched earlier and the one we are touching now. We understand this and we expect the children to follow this by themselves, without our explaining to them. In fact, we do not even realise that the child may be confused. **This confusion can be easily avoided if you introduce counting in the following way.**

As you begin counting, touch the first object and say: "This is one leaf" and take it to another side. Then take the second one, move it towards the first one and say — "This is one more. So now there are two. One and one more make two" and continue in this way. In this way, it becomes clear that the number name refers not to a particular object but to the size of the group of objects that we have kept to one side. Such a method helps the child to know that there is a sequencing of number names and that the subsequent number is one more than the previous one.

When you have introduced some numbers in this way, give children repeated experiences with these numbers. Give them opportunities to encounter 'two' in different situations — two people, two sticks, two pencils, two balls. Some of us, when teaching children how to count, always use the same material again and again — pebbles or buttons or sticks. But this really restricts children's experience and prevents them from generalizing that 'two' refers to collection of *any* two objects. In fact, they might develop a notion which you had no intention of fostering — that number names and pebbles (if you have been using pebbles for counting) go together and that nothing else except pebbles can be 'one', 'two', or 'three'. Rajni's example described in sub-section 23.6.1 brings this out.

There is another aspect you need to remember when introducing numbers. When using pebbles or beads for teaching counting, most of us tend to arrange them in a similar pattern each time for a particular number name. For example, to represent '2' we usually arrange the pebbles as . .; to show '3' we lay them out as ... for '4' as : : & so on. Here the child may begin to think that it is something about the arrangement of objects that is called 'two', 'three', 'four' and so on. **This confusion can be avoided if we keep the smaller numbers, i.e. numbers smaller than 10, in different patterns.** Thus when showing three objects you can, on one occasion, put them in a row, on another as a triangle. Four objects could be arranged as  or  or 

Introduce a few numbers at a time. This gives the child enough time to understand what they mean by manipulating different materials, will lead to a more permanent learning and avoid confusion later on.

The script in numbers should be introduced after the children have had considerable exposure in counting using concrete objects. However, most of us do quite the opposite — we introduce a number name by writing its script on the board or the notebook. For the adult, the script is a very convenient way of handling numbers. It is easier to write '4' on the board rather than showing children four objects. But a

hurry with introducing script limits the child's experience with concrete objects; children may begin to think that 'two' has something to do with the shape of written symbol '2' instead of understanding that symbol is just an arbitrary way of denoting 'twoness'. Not until the children seem to have some concept of numbers should the script be introduced and then too the reason for introducing the script should be explained — that the script is a convenient way of dealing with large numbers; that we do not need to collect nine objects, for example, when we talk of 'nine'. It is easier to write it as '9'.

Check Your Progress Exercise 4

1) State whether you agree or disagree with the following statements: and give reasons for your answer.

   i) Being able to recite number names in the correct sequence means that the child is able to count.

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   ii) Learning about shapes would be more meaningful if the educator uses real objects and materials instead of two- dimensional shapes in the form of paper cut-outs and drawings.

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   iii) A child must be able to set up objects in one-to-one correspondence before she is able to count.

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2) What are some of the aspects you should keep in mind while introducing counting to children?

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3) What are the type of play activities you will carry out with children to help them develop the concepts of

   i) shape

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ii) size

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23.6.5 Play Activities to strengthen the Concept of Time

You have read about the preschooler's understanding of time in Unit 18 of Block 4. It will be useful for you to refer to that section before you begin reading about the play activities mentioned here. To briefly recapitulate: time as minutes, hours, weeks, months or years does not make much sense to them. Younger preschoolers can talk about the present, the immediate past, and the immediate future. They understand morning, evening and night, day before, today and tomorrow. They also remember some salient event that may have happened some time back — such as a trip or an accident where they hurt themselves. The older preschooler recalls longer time spans and also develops a better understanding of how events occur in time. The following are some activities which you can try with preschoolers. The simpler activities are described first and they lead to the complex ones.

- **To help children understand the past, present and future you can set up some imaginary situations**

— "Let's pretend it is early morning. What are we going to do now?" Talk about what they did yesterday and what they will do tomorrow.

— "It's night time now. What do you do at night? What does the dog do? What do the tress do?"

— "What are you going to do in the holidays in summer?"

- **Some situations that deal with a short span of time can help children understand that one can measure time**

  Most of us spontaneously carry out such activities with children, such as: "Let us see whether you finish your food first or I finish cleaning the utensils" or "I will count till ten. Let's see if you can get me the book placed on the shelf".

In this way, you can use any activity of the child as a segment for measuring time. Children can compare their activities. For example, how many blocks can one child fit into the shelf while another child fills a bucket of water.

- **Linked to time is the concept of speed.** As children begin to understand time, they also talk of things that are fast and slow. Plan some activities around this concept.

— Ask children to go to a certain point — first slowly and then fast. Ask them which takes less time.

— Talk of animals/vehicles that move fast and those that move slow. Draw these on a card depicting that they are in a race and ask children which will reach the finish line first.

Think of some more activities and write them in the space provided here.

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- **Plan activities to help children understand how things change over a period of time.** With the older preschooler waxing and waning of the moon is an interesting topic for a discussion. Children will notice the change in the size and shape of the moon over a number of days. If you record the changes daily, by drawing pictures of the moon each day on a calendar, children will be able to comprehend the difference during successive days. They can discuss how many days elapse between new moon and full moon, how many full moons in a month and so on.

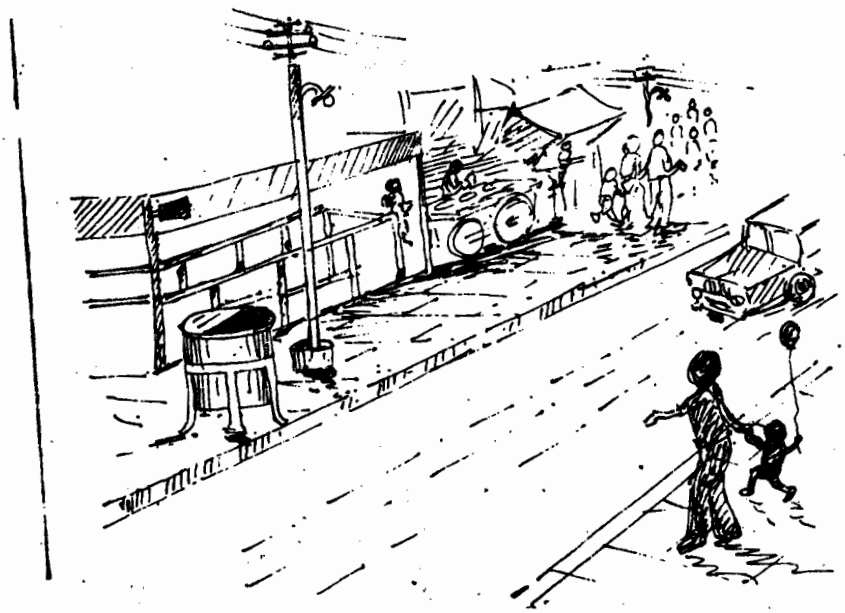
  Growing a plant from a seed and observing how it grows with time can be a fun-filled project which can be used to show children that things change with time.

  Depict a sequence of events on cards and ask children to arrange the cards according to how the events would have occurred. In the beginning, represent children's own activities on the cards. For example, depict children's morning routine — waking up, brushing the teeth, having a bath, eating and coming to the centre. Ask children to arrange them in sequence. What other sequence of events can you depict on the cards?

(a) (b) (c)

23.6.6 Play Activities to strengthen the Concept of Space

The concept of space involves the understanding that objects occupy some space, the idea of far and near, above and under, through and over. The many outdoor and indoor games described in Unit 21, where children get opportunities to run, climb, jump and crawl help them to develop a concept of space. Refer to this Unit for specific activities.



Besides these, you can plan specific activities such as the following to strengthen the understanding of far and near, over and under.

- Take a picture from a calendar or a newspaper (such as that printed on page 96) and ask children to name the things that appear closer to them and those that are further away. Gradually, ask more specific questions such as: "What is nearest to the car?" Add more details to the picture to make the activity more complex.

23.6.7 Play Activities to strengthen the Concept of Measurement

Measurement is an integral part of developing mathematical concepts. An understanding of measurement involves three aspects:

- an understanding of the need for a unit of measurement against which objects are to be measured,
- the understanding that measurement can be expressed as a multiple of any number of units,
- that while creating an arbitrary unit of measurement may be appropriate in a specific instance, it is not possible to compare measurements taken by various arbitrary units. (For example: The instruction "go sixteen steps" would yield a different distance for different people, depending on the length of each person's step).
- that for different measurements to be comparable, there must be standardized unit.

However, for children to understand these aspects, they need many informal and spontaneous experiences of measuring. They must get opportunities to discover these principles for themselves. In their day to day activities, children are required to know size as when the teacher says: "Give me the smallest pencil" or when the child remarks: "I am taller". When children compare and order objects, they are measuring not with respect to some standard unit but they are establishing the relationship of objects with each other.

To help the children understand that there is a need for a unit of measurement, you can carry out the following activities:

- Ask children to measure how long the rooms are by seeing the number of steps it takes to cover the rooms. Similarly, they can measure the playground, the kitchen and other places. Expressing the measurement in terms of number of the steps, they can compare the different lengths.
- Counting the number of cups of water it takes to fill buckets of different sizes.
- Finding out how tall each child is by marking the height against the wall and measuring this with a rope or a ribbon.
- Determining how many blocks/pieces of paper it takes to cover the table/a section of the garden or floor.
- Using a balance to measure all sorts of materials — shells, rocks, bolts, pine cones. Ask children to find out how many shells it takes to balance a nail, a box, a pine cone, a cotton ball or paper clip. Such an activity will help children to see that big in size does not always mean that the object is heavy as well. These experiences will help to contribute to an informal and intuitive understanding of length, area, volume and weight. Of course, children may not be using these words or understand the concept fully. But these experiences will lay the foundations for understanding these concepts when they are introduced formally in primary grades.

Through these play activities will also arise some contradictions which will spur children's thinking towards a need for standardized unit of measurement. For example, as each child measures the room and expresses it in terms of number of steps, point out that the length of room becomes different with each child. Ask the children the reason for this. You can discuss that the length of each child's step varies. Similarly, as children measure the number of cups it takes to fill a bucket, give them cups of different sizes. This will again lead to a discussion that the number of cups it takes to fill the bucket depends on the size of the cup. Such activities will help them to develop the concept of size. This awareness can then lead on to a discussion that you need a

standard unit of measurement, if measurement made by different people is to be comparable. To reinforce this aspect, you can devise activities like the following.

- Ask each child to give you a handful of sand. Then ask them to compare the heaps. Each heap will be different from each other. Point this out to the children. As a variation, ask them to cut a piece of cloth of the size of their hand.

From experiences such as above you can evolve the need for a standard unit of measurement. However, you will have to judge by children's reactions how far they are ready to extend these experiences. Basically, the discussion on the need for a standard unit of measurement must evolve from children's own perceptions. When children find out that the result is different each time, it indicates that they are ready to extend their thinking a little further. By and large, it is only after the preschool years that children will see the need for standardized measures and are able to use them. So do not hurry children towards this understanding during the early childhood years, but rather provide experiences such as those described above to serve as a base for thinking later.

Check Your Progress Exercise 5

1) What are the type of activities you can organize with preschoolers to help them develop a concept of time?

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2) What are the type of activities you can organize with preschoolers to help them understand the concept of measurement?

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23.7 SUMMING UP

In this Unit, you have studied about play activities for developing sensory capacities, memory, cognitive abilities of matching, classification, seriation, identifying common relations, and understanding cause — effect relationships, and acquiring concepts of number, space, time, shape, size and measurement.

You know that children learn through exploration and discovery and, as far as possible, learning should be based on concrete experiences with real objects. However, in many preschools the emphasis is on memorization without giving children adequate opportunities for acquiring abilities and concepts through discovery. Learning based on memorization alone does not lead to a complete understanding.

The various activities based on sensory capacities, besides sharpening the powers of observation, also help children to develop concepts of texture, smell, taste, colour and sound.

When planning play activities to strengthen the concept of matching, you can use shape, size, colour, texture, function, material or any other attribute of the objects as criterion for matching. Thus along with developing the ability to match, children will also develop these concepts. Initially, the different objects to be matched must vary in one respect only. Gradually, you can increase the complexity of the task by varying two

attributes. As children become familiar with these activities, discuss with them what they are doing. This will help them in understanding concepts and also give you an idea about how much children know.

Classification activities follow from matching activities. The criterion for classification can be the same as for matching. In the initial activities, the objects used for classification should vary in one dimension only.

While setting up activities to identify common relations, use simple pairs which the preschoolers will understand.

Activities of comparing involve establishing a relationship between two objects on the basis of a specific attribute such as colour, shape, size, texture, weight or any other. Comparison activities help children to develop concepts of big and small, long and short, thick and thin, new and old, light and dark. Seriation activities involve setting-up a relationship between more than two objects and enable children to see things as relative to one another — as bigger than, older than, thinnest and longest. The simplest seriating activity is asking children to copy a pattern; at a higher level of difficulty is asking them to continue a pattern; then comes asking children to arrange a collection of objects on the basis of some attribute. Initially, begin by giving children three objects to seriate; preschoolers will find it difficult to seriate more than 5 to 6 objects.

To encourage children to understand cause-effect relationships, ask them questions like why, how, where and what. Be patient while they think for solutions. Do not be in a hurry to answer the questions yourself.

Through the above play activities, children will develop concept of shape, size (length, area and volume) number, measurement, space and time i.e., mathematical concepts. The emphasis in many preschools on rote learning of these concepts is wrong. To help children develop concepts of shape and size, begin with matching activities and follow with classification activities. Use a variety of materials for these activities so that children are able to generalize the concept of shapes and size to a variety of objects. Many outdoor and indoor play activities also help to develop an understanding of shape and size. Through these activities, there will be many opportunities to label the names of shapes. However, do not force children to learn these names. This will happen in the course of time. To help children develop the concept of size, you can plan seriation activities as well.

Developing a concept of number depends on the abilities of matching, classification, seriation and setting up objects in one-to-one correspondence. Spend considerable time on these activities. When introducing counting, do so using concrete objects. Introduce children to a few numbers at a time and give children repeated experiences with these. Use a variety of materials — pebbles, plates, twigs, books — when introducing counting so that children are able to generalize. The script in numbers should be introduced after children have had considerable exposure in counting, using concrete objects.

Play activities to strengthen the concepts of time, space and measurement have been described in the Unit.

23.8 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

1) These are the concepts or abilities that children need to acquire before they can acquire basic mathematical concepts. These abilities are the basis of mathematical thinking and pre-requisites to developing the concepts of shape, size, measurement, number, space and time. The pre-mathematical concepts are the abilities to match, classify, seriate, set objects in one-to-one correspondence and an understanding of conservation.

2) The mathematical concepts with reference to toddlers and preschoolers are those of big and small, long and short, thick and thin, wide and narrow which children begin to acquire on their own through every day experiences and play, even before we

think of providing any systematic experiences in numeracy. These are the foundations from which will develop the formal and abstract mathematical concepts.

3) No. Talking about a concept in absence of concrete experiences is meaningless to the child. Discussion and talking about concepts are important but these must *accompany* concrete experiences with real objects and not substitute or precede them.

4) No. Facts are not an end in themselves. It is more important to develop reasoning skills in children. Children will acquire facts in any case as they use reasoning.

5) i) The ability to match and classify; the concept of texture

ii) The ability to match; the concept of texture

iii) The ability to classify; concept of shape, size, colour and texture as they look for similar leaves

iv) Memory; concept of smell

v) Memory; concept of colour, shape, size, smell and texture; concept of different objects

vi) Concept of the object; memory

Check Your Progress Exercise 2

1) Matching involves identifying and putting together objects that are identical. Classification involves identifying objects that have some characteristic in common.

2) This is because initially children find it difficult to consider more than one attribute at a time. They get distracted if the objects vary on two attributes and are not able to consider the two attributes simultaneously.

3) Answer the question thinking of objects available within your setting.

4) i) Initially, give children material to classify in any way they like. Talk to them about their criteria for classification.

ii) Ask them to classify on the basis of some physical attribute like shape, colour or size and explain what has to be done.

iii) Keep the instruction more general

iv) Classification on basis of function

v) Classification on basis of two dimensions

vi) Asking children what is common to a group of objects you have put together.

Check Your Progress Exercise 3

1) The child acquires the concept of size — of length, area and volume. She begins to understand the usage of terms like longer than, longest, shorter than, shortest, wider than, narrow than, lesser than, more than, biggest, smallest. She also develop an idea of weight — heavier than, lighter than; colour — lighter than, darker than; sound — hoarse and shrill, loud and soft; concept of number, she also understands the usage of terms before, after, in between, first and last.

2) Comparison tasks involve two objects while seriation tasks involve more than two objects.

3) While seriating the child has to look at the entire arrangement and view each stick to be placed in relation to all the sticks that have been placed earlier. But the preschooler tends to focus only on the last stick that has been placed and so perceives each subsequent stick only in relation to the last stick that has been placed and, therefore, does not get a uniform gradation. Use of more than five objects makes the task complicated for the preschooler.

4) i) Begin with comparison activities

ii) Ask children to copy a pattern

iii) Ask children to continue a pattern

iv) Ask them to arrange a collection of objects in a gradation on the basis of some attribute like colour, shape or size.

v) Begin with three objects, gradually moving to more

5) Encouraging children to talk of causes and effects of an event will help in this. Ask them questions of why, how, what, and when.

Check Your Progress Exercise 4

i) No

ii) Yes

iii) Yes

2) Introduce counting using real objects. Introduce a few numbers at a time and give children repeated experiences with these numbers, using a variety of objects so that children are able to generalize that a particular number refers to a collection of any objects in that amount. Use different arrangements when denoting numbers smaller than 10 with objects. Introduce the script in numbers after children have had repeated experiences in dealing with numbers using concrete objects.

3) i) Activities involving matching and classification using a variety of materials; asking children to point out different shapes in the environment; some indoor and outdoor play activities.

ii) Activities involving matching, classification, seriation and some indoor and outdoor play activities.

Check Your Progress Exercise 5

1) Activities to help children understand past, present and future; activities to help children understand that short spans of time can be measured; activities to help children understand how things change with time — both over a short time span and a longer time span; activities to help them understand the link between speed and time; activities related to how events occur in time.

2) Activities to help children understand that there is a need for a unit of measurement; activities to help children understand the need for a standard unit of measurement.