UNIT 8 STAGES OF COGNITIVE DEVELOPMENT DURING EARLY CHILDHOOD

Structure

8.1 INTRODUCTION

In Unit 7, you have read about what is meant by cognitive development, what are concepts, the process of concept formation and how visual impairment affects the process of concept formation. You also read that thought develops from the time the child is born. However, the nature of thinking changes as the child grows.

In this Unit, you will study about the stages in development of thinking — in other words, about the stages in cognitive development. These stages of cognitive development are applicable to children with visual impairment as well. Visual impairment causes some delay in cognitive development, about which you will read in detail in this Unit. You will also read about some strategies to support the cognitive development of children with visual impairment.

Objectives

After studying this Unit, you will be able to:

- List the stages of cognitive development as outlined by Jean Piaget;
- Understand the processes of assimilation and accommodation in cognitive development;

- Explain the key characteristics of the sensorimotor and pre-operational stages of cognitive development;
- Identify the impact of visual impairment on cognitive development during these stages; and
- Discuss strategies to foster the cognitive development of children with visual impairment.

8.2 STAGES OF COGNITIVE DEVELOPMENT

The stages in cognitive development, from the time the child is born, till the stage of adolescence have been studied and described in detail by a Swiss psychologist, Jean Piaget. According to Piaget, children's cognitive development occurs in an orderly manner in a series of stages. Some children may be more advanced than others at particular ages, but the developmental sequence does not change. According to him, cognitive development proceeds through four stages:

— sensori-motor stage
— pre-operational stage
— concrete operational stage, and
— formal operations stage.

Piaget has provided detailed descriptions of each of these stages – however, we shall in this Course, study only about the first two stages.

Piaget has explained that the development of thinking takes place through two related processes of **assimilation** and **accommodation**.

- Assimilation of new information occurs when children try to make sense of new events by relating them (assimilating) to the information and concepts they have already developed.
- However, if the new information does not fit the already existing way of understanding and organizing the world, then the child modifies her existing patterns of thinking or accommodates her thinking to include the new understanding.
- The child attempts to maintain a balance **(equilibrium)** between assimilation and accommodation and in this process, her thinking develops.

For example, a child has seen a red rose and has formed an idea of what is a rose. Now she sees a white rose and immediately calls it a rose because she notices that it is the same as the red rose except in its colour. So the child has fitted new information into her existing knowledge base. In other words, the child has assimilated the new information into what knowledge the child already has. Of course the child has also expands her knowledge base to include the idea that roses can be white too, but the idea of what is a rose remains the same. In another case the child has seen tomatoes and knows they are red in colour. Then she comes across a fruit such as 'apple' which looks red like a tomato but is not the same in hardness and taste. So now the

child is not able to fit the new information about the apple into her existing information about tomato. So now the child modifies her thinking and adds a new concept 'apple' to her thinking. In other words, now the child has accommodated her thinking according to the new information, since the new information was not fitting into her existing information. This is accommodation.

8.3 THE SENSORIMOTOR STAGE

The period from **birth till two years** of age is the period of sensorimotor stage of development. It is known as the sensorimotor stage of development since **during this period the infant understands the world through her senses and motor capacities (i.e., actions).** This means that the infant learns about people and things in the following ways:

— by doing some action on them – such as holding, banging, pulling etc.; and

— on the basis of how these objects, events and people appear to her (i.e., information from senses)

Let us understand how thinking develops in the first two years.

- The newborn child adapts to her environment in the earliest months of life through her reflex actions. These reflexes help her to survive and help in learning. You may be thinking how do reflexes help in learning. Let us understand this through the example of the sucking reflex. In Unit 7 you read the example of how the infant refuses to suck on the nipple which gives a sugary syrup (pacifier) because it does not satisfy her hunger; however the infant continues to suck on the mother's breast or the milk bottle because it satisfies her hunger. This means that the infant can discriminate (differentiate or identify) between food and non-food items, based on whether sucking on the item satisfies her hunger or not. **This is the beginnings of learning.**
- By two months of age, the infant **begins to show an interest in things around her** and starts reaching for them. She looks at things for longer periods of time.
- By three months she **begins to understand what the actions of others mean/indicate**. For example, by the specific gestures and actions that the mother makes, she knows that it is time for feeding. This also shows that **the infant remembers and that her memory is developing.**
- Between 4-8 months of age, the infant **begins to understand that her actions can have an effect** — for example, when she kicks, the ball moves; when she drops an object, it makes a noise. This is the beginning of understanding of cause-effect relationships.
- Before the age of 4 months, the infant believes that things she cannot see do not exist. You can see this when you hide a toy the baby is playing with. She may get confused or upset briefly but then she quickly forgets about it and gives up looking for it. However, between the age of 4 to 7 months, the infant begins understand that objects continue to exist then

when not visible. Now if you take away the toy and hide it, the infant will continue to ask for it and will not stop crying till she gets it back. This means that she is developing **the idea of object permanence** – that is, the idea that objects continue to exist in the environment even if these are not visible to her.

- Between 8-12 months of age, the infant begins to **carry out actions with an intention**. This means that she has already planned an action before carrying it out. This means that she understands which action will have what effect and what action/actions will be appropriate in a given situation. She can also coordinate two or more actions to reach a goal. This **goal-directed behaviour** helps her in solving problems, such as removing the cushion to reach for the toy. Her action of removing the cushion will be called a planned action since before doing the action she realizes that this action will help her to get the toy.
- Between 12-18 months of age, the infant **tries out different ways of doing things. She experiments.** She changes and varies her actions to produce different results. You must have seen infants repeatedly throwing the toy to see how far it goes or throwing it from different heights to see the difference in the sound produced. In both these cases, the infant is changing her action to bring a change in the result. The ability to change (vary) actions also helps the infant to use **trial-and-error method** to get what she wants. In the process, she learns. We all use trial and error method and learn from it — for example, we think a particular solution would be appropriate and we try it out (this trying out is called a trial), but when it does not turn out to be alright (in other words, there is error), we change our solution and again try it out.
- Between 18-24 months of age, an important development takes place — **the infant begins to represent events, objects, and people mentally (in her mind).** This means she can form an idea or a picture about events, objects, and people in her mind. How does this help, you may be thinking? It is a very important development due to two reasons:

  - ✓ The child does not have to carry out an action each and every time to know what effect it will have. She can mentally plan her actions and judge what the result would be and then carry out the action which, according to her, is most suitable.
  - ✓ Mental representation also helps the child to judge what could have lead to a certain result. For example, if she sees a broken toy, she will be able to think of possible cause — it could have fallen down. She has not actually seen it falling but can imagine (mental activity) that it must have.

Mental representation is a necessary part of our daily life — we mentally plan our day, or the route we will take to school, or our holiday before we actually physically carry out these activities. The beginning of this ability appears by the end of infancy, as we have described above. This does not mean that the trial-and-error way of learning is replaced completely — we all use this even as adults but with mental representation, we have a more effective way of solving problems.

The above description of the child's thinking abilities shows that the infant is an intelligent thinking being. She is not able to talk or walk until the end of first year, but she displays her intelligence in many ways, right from the initial days.

"I am your Mummy!"
Imitation is an indication of the child's ability to represent events in her mind

8.3.1 Impact of Visual Impairment on Development of Thought during Sensorimotor Period

Some of the ways in which visual impairment affect development during the sensorimotor period are as follows:

a) Object Permanence

The sighted child uses vision to develop object permanence. When vision is impaired, the child has to reach for objects based only on sound input of the object. Consequently, children with visual impairment develop object permanence nearly one year later than sighted children.

b) Cause and Effect Relationships

A child who cannot see might not want to do things because she cannot see what happens when she carries out an action. So her motivation to do anything is reduced. The child might not know that she can make things happen or if a pleasurable action is taking place, she can continue to make it happen. Thus, visual impairment can cause a delay in understanding cause and effect relationships.

c) In general, the cognitive functioning of the child with visual impairment is slower to develop than that of the sighted child and

the chief reason for this is the limitation in range of experiences due to lack of vision. Even a small degree of residual vision can play a very significant role in enabling cognitive development. .

8.4 THE PRE-OPERATIONAL STAGE

This period begins from two years of age and lasts till six to seven years. These are the years of early childhood (also called 'preschool years'), as you have read in Unit 1. As you have read above, by the end of the sensorimotor period, the child develops the ability of mentally representing events, objects and people and also begins to form concepts. The development of these abilities represents the transition from the stage of sensorimotor development to pre-operational stage of development. There are some characteristics features of a preschooler's thinking which makes this stage different from the stage before it (i.e., sensorimotor period) and the stage after it (i.e. concrete-operational period). Let us read about the cognitive abilities and the nature of thinking of the preschooler, her cognitive abilities and the concepts she develops in the following Sub-sections.

8.4.1 Development of Concepts

During this period, the child develops many concepts such as those of

— Space — over/under, up/ below, forward/backward

— Size — length, width, height-tall/short; broad/narrow; long/short

— Shape — circle, square and so on; three dimensional and two dimensional and shapes; regular and irregular shapes

— Time — day/night; morning/evening/afternoon; today/ tomorrow/ yesterday

— Distance — far/near

— Speed — fast/slow

— Colours

— Number — more/less; many/few; one/many, many/none, as many as/ more than/less than/equal to: one, two three and so on

— Area, Volume

— Weight—-heavy/light

— Living/nonliving

— Temperature —hot/cold/warm

— Plants

— Animals

— People

— Vehicles

— Festivals

In other words, **she begins to develop concepts of everything she sees in her environment.**

Of course, **the concepts take time to develop fully.** We give two examples to explain what we mean:

i) **Concept of Size:** Our concept of size includes the concept of relative size — that something can be bigger or smaller in relation to something else; we can also consider many objects in terms of their length and arrange these from the longest to the smallest. The three-year-old child begins by first forming an idea of 'long' and 'short' in relation to two objects. Around four years of age, she can understand longest and shortest when given three objects. However, even a six-year-old child is likely to get confused when you give her ten sticks and ask her to arrange these in increasing order of height. This is because she cannot consider many objects simultaneously and think of relative size. This ability will develop in middle childhood years.

ii) **Concept of Number:** Likewise, with respect to the concept of number, the child does not immediately develop the concept of quantity. A three-year-old child might be able to say number names till 10 or even 20, but if you ask her to pick up six stones from a pile, she is likely to make a mistake – she will either pick up more or less. If you have interacted with preschool children and asked them to count the number of beads in a string, you may have noticed that they say one number name and then touch two beads or they say a number name and do not touch any bead. This happens because they have not developed idea of one-to-one correspondence – that one number name represents one quantity only. So in order to learn to count correctly (in other words, develop a concept of quantity), she needs to first develop concepts of more and less, one and many, none and many, one-to-one correspondence, and know the number names in the correct order. Gradually she will learn to associate the written numerals with the number name (that 'five' is represented by the number '5'). After she is able to count correctly, she is able to understand more than, less than, equal to and then develop the understanding of addition and counting.

What we are explaining is that **the development of all concepts takes place in a sequential manner from simple to complex. The beginnings of this process can be seen during the preschool years. Concepts continue to evolve through the rest of our lives.**

8.4.2 Mental Representation and Symbolic Thinking

As explained in the above sections, mental representation is an integral part of our lives. It has been explained above how mental representation enables the child to mentally plan her actions which saves her the effort and time to try out an action each and every time. It also helps her to understand cause-and-effect relationships when either the cause or the effect is not visible. In our day-to-day life there are many instances when the cause and effect do not take place at the same time in one's presence and these have to be inferred.

Another important impact of mental representation is on the nature of the child's play. During infancy (in the sensorimotor period), the child's play is in terms of physical actions on objects – she kicks a toy, bangs it or throws it

etc. **With the ability for mental representation, the child is able to engage in symbolic thinking.** Symbolic thinking means using an object or an action to represent something. For example, the symbol of a star means the work is good. The symbol of a plus sign means that there is a doctor's clinic nearby.

Being able to engage in symbolic thinking enables the child to play pretend games. She can now imagine that an object or an action or a person is something which it is not, such as she herself pretending to be a teacher or using a plastic box as a truck. This play is now possible because the child is able to represent in her mind that a particular action, event or object can be used to mean something else. You would have seen preschool-aged children engage in pretend play as doctors, farmers, parent, teacher, police and so on using a variety of play materials as stethoscope, or kitchen utensils or blackboard or guns. This is evidence of symbolic thinking.

Drawing is another outcome of the ability to mentally represent events and engage in symbolic thinking. Most children love to draw and if you ask them what their depictions mean they will tell you a detailed story.

Pretending that the stool is a moving 'train' shows the child's ability to think symbolically

8.4.3 Difficulty in Reversing Thought

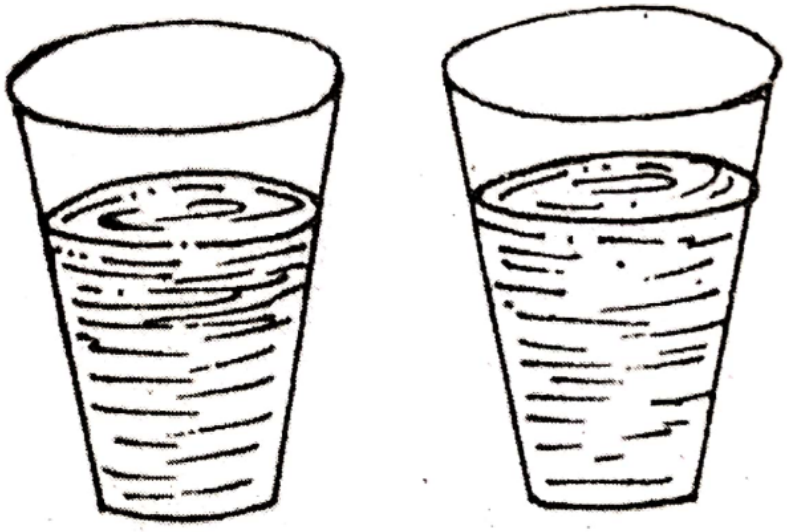
The nature of the preschooler's thinking is understood best when we understand the meaning of the term 'pre-operational'. The word 'operation' has a specific meaning in Piaget's description of cognitive development. The term 'operation' refers to mental action which is reversible. For example, we can mentally think of a ball of clay, and then we can mentally flatten this ball of clay into a flat circle (without actually doing so) and then roll it into a ball again. All the while we understand that the amount of clay remains the same no matter what its shape. Similarly, we can mentally pour water from a glass into another glass and then back into the earlier glass knowing that the amount of water remains the same. **So an 'operation' is a mental act in which objects are changed or transformed and can then be returned to their original states.**

Let us now read about some of the experiments done by Piaget with preschool children, to understand about the child's ability to reverse her thinking. These experiments are called conservation experiments.

Conservation means being able to understand that the amount of a particular substance remains the same even if its shape is changed (in other words, the area it occupies is changed) or if it is transferred from one container to another. If two glasses of equal width and length are taken, and water is poured in them to the same level and then in front of the child, water is poured from one of these glasses into a narrower glass, then the level of the water will rise higher in the narrow glass. Now, the preschooler is likely to believe that the water in the narrow glass is more because the height of the water in this glass is more. This means that the child is not able to show conservation of liquid. In the same way, the child will believe that when a ball of clay is flattened, the flattened piece of clay now has more clay. In other words, **the child is not able to conserve amount. This happens because the child is not mentally able to reverse the action –** she is not able to think that the water poured into the second glass can be poured back into the original glass; similarly she is not able to roll the flattened clay back into the ball of clay, which it was at the beginning.

It is seen that there are stages in learning to conserve:

- The first stage is when the child is not able to conserve at all. Three-to four-year-old children are most likely to be at this stage.
- In the second stage, the preschooler conserves in situations which are familiar to her but does not conserve in unknown situations. For example, a four-year-old child who helps his father in the daily business of making lemon soda, will probably not think that the quantity of soda increases when it is poured from the bottle into the glass. This is because he sees this happening daily.
- In the third stage, the child conserves every time, consistently. This happens after the stage of preoperational thinking is over, that is around 8-10 years of age.



Child is shown two identical glasses with equal amounts of water

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

8.4.4 Taking Another Person's Perspective

Communication and interaction is possible only when we consider the other person's perspective. **Taking another person's perspective means being able to see the situation form another person's point of view.** This ability develops gradually as the child's thinking develops. During the pre-operational period the child finds it difficult to see the events and the situation from the perspective of another person. They often assume that if they know something, others will know it too or if they can see something, others can see it too. This is because the child centres on (focuses on) one aspect of the situation and cannot understand or see (visualize) things from another person's perspective. If you hide a doll at a place where it is not visible to the child, but it is visible to another person standing at a different location in the room, the child is not able to make out that the other person is able to see the doll. The preschooler assumes that others see a situation as she does, and this quality of the child's thought has been called 'egocentrism'. However, we also need to remember that in some situations which are

familiar to the child, the preschooler may be able to see the situation from another person's perspective very clearly.

8.4.5 Classification

Classification means making groups of objects on the basis of a property common to all the objects in the group. For example, in a collection of round beads of red and blue colour, putting the red beads in one group and blue beads in another. Or in a collection of leaves and flowers, putting the leaves in one group and flowers in another. Besides the above-mentioned descriptions of the nature of preschooler's thinking, the child's ability to **reason, understand cause-effect relationships and solve problems develops further during the pre-operational period.**

8.5 IMPACT OF VISUAL IMPAIRMENT ON THE DEVELOPMENT OF THOUGHT DURING THE PRE-OPERATIONAL PERIOD

Some of the ways in which visual impairment affects the development of thinking during the pre-operational period are as follows:

a) Mental Representation

For the sighted, the visual perception of the object helps to create a mental image of the object. This is called mental representation of the object or mental image of the object – in other words, we see the object in our mind even though it is not present before us. This is a very important ability and helps us to function in day-to-day life because you can understand that if we have to actually have all objects and people present before us in order to carry out any action, then how difficult it would be to carry out our day-to-day work. Our imagination is based on our ability for mental representation. Language is also a type of mental representation. We use a word to represent an object – once we associate the word and the object, we can imagine and talk about the object even when it is not present before us.

Most of us believe that mental images are formed only through the sense of sight and that formation of imagery is linked to visual perception. But mental images can also arise from the senses of hearing, touch and smell, which are the non-visual modalities. Children with visual impairment can generate mental images from touch (haptic) or auditory input. These non-visual inputs can help the individuals with visual impairment to create a variety of mental representations such as memory of objects they have touched and heard the sound of; spatial understanding (mental map) such as in which direction is the bedroom, the kitchen and the bathroom; numerical understanding such as how many objects make up a particular number and so on. These mental representations help them in mobility, study, work and all aspects of day-to-day living.

In general, children with visual impairment have the ability to form images in their minds as sighted children. But the mental representation formed by the individuals with visual impairment about a particular

object will be different from mental representation about the object formed by the sighted.

Further, some mental representations may be difficult for children with visual impairment to form. For example, how does a visually impaired child estimate distance? In case an object (toy car) is kept at one foot away from the child with visual impairment, when you say, 'take the car which is kept one foot away in front of you', the child may not be able to estimate the distance and hence the child cannot extend the hand at one foot approximation. The child may extend hand well below one foot or show floppy hand movements. Whereas a sighted child can estimate the distance and take the object. Similarly, when we ask a 5-year-old blind child who is coming to school every day for three months to estimate the distance between school and home — which needs spatial ability (awareness of distance mentally) — the child cannot mentally understand the space whereas a sighted child can understand the space mentally due to visual perception which plays key role in imagery and mental representation.

Forming mental representations is challenging among children who are born blind. If a child lost vision some years after birth the child may find it easier to form mental representations as the child has formed some understanding about the world around her based on the sense of sight. The challenge to form mental representations can be overcome by teaching the child to efficiently use the intact non-visual sense modalities.

Another difficulty which children with visual impairment is that they find it difficult to actively change or work with these mental images. This means that while blind individuals can form and recall mental images, they might find it challenging to actively manipulate these images in their mind. Let us understand with an example also.

Imagine a person who is blind and has a mental image of a square. They can remember this image and know that a square has four equal sides and four right angles. This is like how a sighted person would remember a square. However, if they are asked to mentally "rotate" this square or imagine changing it into a triangle, they might find this task challenging. This is because it requires actively manipulating the mental image, which can be difficult without visual input. So, while they can form and recall the image of a square, actively changing that image is where the challenge arises.

b) Construct of World

We all form an idea of the world around us and vision is the main way in which we do so. You have read in detail in Unit 7 how the process of forming concepts and construct (idea) about objects is different in sighted children and those who have visual impairment. You have read about different types of touch – synthetic and analytic. Most objects are big and cannot be held in the hand and the child has to construct or build up an image of the objects by sequentially touching its

components. They also use the sense of smell, taste and hearing. Hearing helps the child to understand what the object is and where it comes from. Smell becomes an indicator where she is — for example, if the smell comes from the kitchen, it means that one is in the kitchen. In older children smell may become important indicator such as whether the smell is that of a hospital/ pharmacy/ restaurant. The way the visually impaired child builds the image of world is different from sighted because sighted children use vision mainly to gather information. Therefore, the child constructs a reality that is different from that of the sighted child's. The construct of the world and the concepts of the children with visual impairment are in some ways more restricted than those of sighted children because their range and quality of experiences may be more restricted.

The child with visual impairment has limited ability to coordinate and organize elements into higher levels of abstraction, and to verify the information. The process of establishing concept-defining attributes and relationships is more problematic for the child with visual impairment and less accessible to guidance. The visually impaired child is continually involved in problem solving, but this process, which is essential to future development, is more difficult and less rewarding for him.

c) Form Constancy

Form Constancy is a visual perceptual skill that allows you to understand that a form, shape or an object stays the same even when it changes it size, position or is in a different environment. For example, you recognize that a bottle is the same bottle whether it is kept straight or it is placed diagonally or it is kept horizontally. It is a visual perceptual skill because you develop this understanding based on your sense of vision. Actually when the bottle is in different positions, it is at different angles and it casts a different image in your brain, but your brain learns to integrate all these images and see it as the same bottle. You do not think that it is a separate object each time you see it from a different angle.

Understanding form constancy is difficult for the visually impaired child. If they have touched an object in one position and the next time its position or angle is changed, they may find it difficult to recognize that it is the same object. Because of this they may find it difficult to use various play materials or carry out certain activities. The child needs many opportunities of touch various objects in different positions so that she can understand the idea of form constancy of the object.

d) Conservation

A child with visual impairment shows delays in conservation of substance, weight, volume, length and liquids. The chief reason for this is limitation in the range and quality of experiences. The caregivers and educators have to be aware of the need of providing deliberate and wide variety of experiences through the other senses so that the child can develop the ability to conserve.

e) Classification

Limited opportunities to explore objects and to understand similarities and differences between objects may cause children with visual impairment to make errors during classification. Concepts of same and different (which is the basis for classification) can evolve only if children identify the distinguishing variable on which to focus. Since they have to rely on the senses of touch and hearing, this takes time to develop.

8.6 FOSTERING DEVELOPMENT OF CONCEPTS IN CHILDREN WITH VISUAL IMPAIRMENT

Thus, when fostering development of concepts in children with visual impairment, you need to organize a wide variety of stimulating activities and experiences. Though factors like degree of impairment, age and motivation of the child influence concept development, the most important factor is the type of experiences and activities that you can provide to the child. The wider and richer the range of experiences, the better will be his development of concepts and understanding of the world around.

Children with visual impairment will also need guided exploration and explanations regarding what they are engaging with. Explanations provide the children with vocabulary associated with the experience, help the child to make sense of what they are experiencing and help them to connect their new learning with previous experiences. Such experiences help to develop children's understanding of new concepts, develop their language, and motivate them to explore their environment.

You will read about specific strategies and activities that you can use to foster cognitive development of children with visual impairment, in Course 3 – BCD -103.

Planning activities that enable children with visual impairment to touch objects helps them in concept development

Check Your Progress Exercise 1

1) Answer the following questions briefly in the space provided below.

   a) How does mental representation help the child?

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   b) What are the four stages of cognitive development according to Piaget?

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   c) What is assimilation in the context of cognitive development?

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   d) Give an example of accommodation in cognitive development.

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   e) What is the sensorimotor stage of development, and what characterizes this stage?

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   f) What are some characteristics of the pre-operational period in cognitive development?

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8.7 SUMMING UP

- Cognitive development delineates how children's thinking evolves through specific stages, starting from birth until adolescence.
- The sensorimotor stage, from birth to two years, is marked by infants understanding the world through their senses and motor actions. During this period, they develop crucial cognitive abilities like object permanence and cause-effect relationships.

- The pre-operational stage, from two to six/seven years, sees the emergence of symbolic thinking and the development of various concepts such as size, number, and classification.
- Visual impairment can delay cognitive development, particularly in understanding object permanence, cause-effect relationships, and classification.
- To support children with visual impairment, a range of stimulating and guided experiences are essential. These help bridge the gaps in concept development and enhance their understanding of the world.

8.8 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

1) **Check Your Progress Exercise 1**

a) Mental representation enables the child to:

— mentally plan events. She does not have to carry out an action each and every time to know the effect it will have

— judge the reason (course) of a result (effect)

— play pretend games.

b) The four stages of cognitive development according to Piaget are:

- Sensori motor stage
- Pre-operational stage
- Concrete operational stage
- Formal operations stage

c) Assimilation occurs when children integrates new information into their existing knowledge and concepts by relating the new knowledge to what they already know.

d) Accommodation happens when a child modifies existing thought patterns to incorporate new information that does not fit the current understanding. For example, a child learning about tomatoes being red and then accommodates her thinking when she comes across an 'apple', so as to create a new concept 'apple' which looks similar to a tomato but differs in taste and hardness.

e) The sensorimotor stage occurs from birth to two years of age. During this stage, infants understand the world through their senses and motor actions. They learn by doing actions on objects and by perceiving information from their senses.

f) The pre-operational period spans from two to six/seven years. During this period, children develop concepts and engage in symbolic thinking. However, since they cannot reverse a mental action, they find it difficult to conserve and take another person's perspective.