

# Scientific Thinking Characteristics of Early Childhood

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**Abstract:** Childhood is the age of the most effective in developing all aspects of child development. One of the developments that have to be developed for early childhood are cognitive development. In the realm of cognitive development of children are trained to think critically when directed in the right way, then the child is able to think scientifically. In this paper will be discussed regarding characteristics of scientific thinking in terms of textual, contextual, and problem solving.

**Keywords:** scientific thinking, childhood, cognitive development

## 1. INTRODUCTION

Childhood is the age of the most effective in developing all aspects of child development. First i.e. Religion and Moral Values developments, both physical development of motor skills, language development Third, Fourth Cognitive Development, Social development Emotional Fifth and Sixth Art development. One of the developments that have to be developed for early childhood are cognitive development.

Cognitive is a mental activity associated with perception, thinking, memory, and management of information that allows a person to gain knowledge, solve problems, and plan for the future or all the psychological processes related to how individuals learn, pay attention, observe, visualize, predict, assess, and think about the environment (Desmita, 2010).

Cognitive Development aims to develop children's ability to think can cultivate learning abilities, can find a variety of alternative solutions, helps children to develop logical mathematical ability and knowledge of space and time, as well as having the ability to think carefully.

Prabowo and Nurmala (2010) suggests that cognitive Bloom developed based on three domains, namely the aspects included in the cognitive, affective, and psychomotor. Cognitive domain is the domain associated with the function of processing information, knowledge and expertise. Affective domain deals with the attitudes and feelings, and psychomotor function associated with manipulative and physical abilities. In the cognitive domain covers aspects no knowledge, understanding, implementation, decomposition, combining, and evaluation.

In the realm of cognitive development of children are trained to think critically when directed in the right way, then the child is able to think scientifically. In this paper will be discussed regarding characteristics of scientific thinking in terms of textual, contextual, and problem solving.

## 2. DISCUSSION

### 2.1 Scientific Thinking traits

#### 2.1.1 Understanding Scientific Thinking

Scientific thinking is logical and empirical thinking. Logical sense, empirical meaning is discussed in depth based on facts that can be justified (Hillway, 1956). According to Mustafa (2016) to conduct scientific activities as well needed means thinking. Availability of scientific study made it possible to regularly and carefully. One part of cognitive development that is logical (Rijal, 2017). As the purpose of early childhood education is that children are able to think logically in everyday life.

In addition, scientific thinking too uses of reason to consider, decide and develop. Thinking is a process that led to knowledge. In science (based on the principles of knowledge), or using the principles of logic to the discovery, validation and explanation. According to Salam (1997), the notion of scientific thinking is as follows: (1) process or human activity to find / get knowledge; and (2) the thought process to come to a conclusion in the form of knowledge.

#### 2.1.2 Characteristics of Scientific Thinking

Early Childhood equipped with a high curiosity wanted capabilities. Our job as parents is to direct their curiosity in the right direction. The high curiosity then delivers the child to critical thinking. Critical thinking that if we point the right way, it will develop the ability to think scientifically. Broadly speaking, according to Johnson (2011) characterizes critical thinking on Early Childhood is analytical, systematic, organized, and logical. It is certainly based on the facts of observation along the experiments they do in accordance with the level of development.

Furthermore, Piaget has identified four main periods in cognitive development, namely the period of

sensorimotor (born - 2 years), the period of preoperational (2 - 7 years), the period of concrete operations (7 - 11 years), and the period of operation formal (11 and over). Early childhood development is at the stage sensorimotor and preoperational. Children's cognitive construct their own world, building structures mental structure to adapt to their world. Adaptations of children involving the assimilation that incorporates the new information with existing knowledge and accommodations that child adjustment to new information. Behavioral characteristics sensorimotor and preoperational stage of development:

a. Sensory Motor Period (0-24)

The growth ability of children looked on motor activity and simple perception. The main features of its development based on the action, and do it step by step.

- Reflexive Stage (phase reflection; 0-2 months) is characterized by simple reflex movements such as grasping, sucking.
- Primary Circular Reactions (reaction first round; 2-4 months) have the same characteristic reflection Behavior appear again ruling such as closing and opening again and ruling grip.
- Secondary Circular Reactions (reaction second round; 4-8 months) has a characteristic repetition of motion changes to produce interesting effects such as kicking one leg so the ornament hanger on cots more moves.
- Coordination of Secondary Reactions (coordination reaction second; 8-12 months) has a characteristic response be coordinated into a more complex set of movements. Measures taken by "accidentally" such as babies pick up objects behind the curtain to take the hidden objects.
- Tertiary Circular Reactions (third round reaction; 12-18 months) characterized by discovery of new ways to produce the same result or achieve the same goal, for example, the baby may pull a pillow at her in an attempt to get a toy that is on it.
- Invention of New Means Through mental of (the discovery of the new source through mental combination; 18-24 months) is characterized by evidence of the representative system which is internal, stage Indicates troubleshooting before you actually can provide a response.

b. Preoperational period (2-7 years)

- Phase Preoperational (phase preoperational; 2-4 years). Kids have been able to use the language in developing the concept, although it is still very simple. So frequent misunderstanding of the object.
- Intuitive Phase (phase intuitive; 4-7 years). Kids have been able to use the language in developing the concept, although it is still very simple. So frequent misunderstanding of the object, Children has been able to acquire knowledge based on the impression of a rather abstract. In drawing conclusions often not expressed in words. Therefore, at this age, children have been able to reveal.

According to Piaget (in Santrock, 2014), children who are in the sensorimotor period to acquire knowledge about the world of physical measures that they do. A baby develops from a reflective action, instinctive at the time of birth until the end of this period. While in the pre-operational phase, i.e. the age range of 2-7 years has begun to use a mental picture to understand their world. Although there are several obstacles in the thinking of the child at this stage, such as the centralization of egocentrism, but the ability of a permanent object in the concept of cause and has evolved in this period.

If the sensorimotor stage children only have a reflex behavior patterns, on a pre-operational stage the child has started to form a stable concept, raises mental thoughts, cultivate egocentrism, and constructed a magical belief. In its development, at this stage is divided into two sub-stages of development, namely the symbolic function and intuitive thinking. In sub-stage symbolic who are at the age of 2-4 years old children begin to have the ability to mentally describe an object that does not exist. However, the thought of children at this stage still have limitations such as egocentric and animism.

Later in the second sub-phase is intuitive that occurs around the age of 4-7 years where children always want to know the answers of all the questions marked with intensity asking children more often. As a mark of the period the child intuitively knows something and acquire knowledge without using their rational thinking. As the weakness of their thinking abilities in this period is centralization, in which children simply focusing on one character and ignoring other characteristics, exemplified by the lack of the ability of conservation (Papalia, 2008).

In Piaget stage of development, logical thinking ability of children is closely associated with the coordination and adaptation which included a scheme, assimilation and accommodation. Besides the ability in the operation, classification, and deductive reasoning hypothesis is a measure of the development of logical thinking in children. And not escape equilibrium also in the process as the process that children in order to develop his reason to a higher level.

## ***2.2 Scientific Thinking Judging from the Aspect of Textual, Contextual, and Problem Solving***

### ***2.2.1 Textual***

Here is the cognitive development of infants aged 12-24 months according to Piaget, the child is at the sensorimotor stage.

- Tertiary Circular Reactions (third round reaction; 12-18 months). The discovery of new ways to produce the same result or achieve the same goal, for example, the baby may pull a pillow at her in an attempt to get a toy that is on it.
- Invention of New Means Through Mental (the discovery of the new source through mental

combination; 18-24 months). Evidence of the representative system which is internal, stage Indicates troubleshooting before you actually can provide a response.

### 2.2.3 Contextual

As a first illustration of contextual characteristics of scientific thinking is, let's say a toddler at the age of 18 months. When faced with the meal in front of him, which he did was eat with the right hand. Here we see him begin to understand the concept of right and proper behavior, i.e. eating it right-handed. The toddler also seen show more self-contained with its own meal. She also made observations of the environment what is done by the parents to sit cross-legged as they ate in a position sitting on the floor. Moreover, how does he eat using their hands and also through a process of observation he had done repeatedly until finally in food in such manner.

As a second illustration of contextual characteristics of scientific thinking is, let's say a toddler toddlers ages 18 months same as Figure 1. When faced with eating in front of him, which he did was eat with the right hand. Here we see him begin to understand the concept of right and proper behavior, which eat it right-handed. The toddler also seen show more self-contained with its own meal. He also followed what was done by the parents to sit in a chair while enjoying a meal in front of him. Similar to the first illustration, the child nevertheless observation / observation of the environment.

### 2.2.4 Problem Solving

As for solving the problem in the stage of Tertiary Circular Reactions and Invention of New Means Through Mental of this, children have found ways to solve the problem by doing a physical action. When children eat, what he did with the theory. But in the process, the child has some problems that need solving.

Toddlers considerable difficulty in eating foods such as noodles. As he scooped up, the noodles will be detached from the spoon. After repeatedly trying and failing, based on the experience that he found a way, that he uses his left hand to grab the noodles and placed on the spoon is in the right hands. After the noodles are already in spoon, meal he began bribing. In that way continue to exercise until he finished eating because they feel full. This shows the child has been able to make observations and simple experiments according to the level of ability.

## 3. CONCLUSION

Early Childhood equipped with a high curiosity wanted capabilities. The high curiosity then delivers the child to critical thinking. Critical thinking that if we point the right way, it will develop the ability to think scientifically. Broadly speaking, according to Johnson (2011) characterizes critical thinking on Early Childhood is analytical, systematic, organized, and logical. It is

certainly based on the facts of observation along the experiments they do in accordance with the level of development. Furthermore, Piaget has identified four main periods in cognitive development, namely the period of sensorimotor (born - 2 years), the period of preoperational (2 - 7 years), the period of concrete operations (7 - 11 years), and the period of operation formal (11 and over). Early childhood development is at the stage sensorimotor and preoperational.

Scientific Thinking in terms of textual, contextual, and Problem Solving is how the Early Childhood able to perform activities in accordance with the study of theory in her life. If amid these activities there are issues, then they are able to solve them with the solutions they deem most appropriate.

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