

# DEVELOPING COGNITIVE ABILITIES IN CHILDREN AT SCHOOL

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Cognitive development refers to the study of intellectual development in a child. The study includes an attempt to understand information processing, conceptual resources, perceptual skill, language learning, and other aspects of brain development in children. Philosophers and psychologists through history have both marveled at the phenomena of knowledge accumulation, retention, processing, and utilization. Cognitive development is crucial not just towards independent belief-formation (regarding self, universe, and God) but also towards active intelligent involvement in the making of history; for history is the product of beliefs in action. Animals don't create history because their existence is merely instinctual and not intellectual. It is humans who create, interpret, and record history.

In the past philosophy (both secular and religious) played significant roles in providing the framework for psychological theories of cognitive development and child education. For instance, the doctrine of reincarnation played an important role in Plato's theory of knowledge as recollection and education as a midwifery intervention to help a soul recollect what was innate to it. Similarly, the idea of a pre-existent, pure, and all-sufficient soul played an important role in the doctrines of Jainism and Hinduism where education towards self-realization, spiritual austerity for refining of cognitive capacities, became ideal. On the other hand, there were those who rejected the view that the soul possessed any innate information at birth. People like John Locke (1632-1704) talked of the mind as a *tabula rasa* (blank slate) at birth. The child, thus, is born in absolute ignorance and gains knowledge step by step as impressions are made by experience upon the slate of his mind. Immanuel Kant (1724-1804) rejected this view and instead came up with the theory of *phenomenalism* that argued, that the mind is not a blank slate but is actively involved in trying to understand the world within its own limitations; we may say it's like a computer with pre-installed software (*a priori* forms and categories) that actively synthesizes and interprets all incoming data and outputs it as processed information. John Dewey (1859-1952) went a little farther. He emphasized on knowledge as the result of activity and his theory has come to be known as instrumentalism or experimentalism. He emphasized on education that prompted thinking in order to solve problems and thus results in experiential knowledge. Modern psychological theories of cognitive development have much in relation with the philosophy of *instrumentalism* or *experimentalism*. The study of cognitive development is a wide field; however, we'll try here to only briefly examine a few psychological theories that try to explain the experience of learning among children.

## I. THEORIES

### A. Theories of Conditioning

There are two chief forms of conditioning known among psychologists: one is called *Classical Conditioning* (the theory whereof was developed by Ivan Pavlov (1849-1936) and popularized by J.B. Watson (1878-1958)); the other is called *Operant* or *Instrumental Conditioning* (the theory whereof was developed by B.F. Skinner (1904-1990)). According to WordNet, conditioning

refers to a learning process in which an organism's behavior becomes dependent on the occurrence of a stimulus in its environment. For instance, a child never fears a white rat, but he fears loud noise. If the loud noise is made to repeat with every appearance of a white rat for a number of times, then the child will start fearing the white rat even if it appears without the loud noise. The whiteness and the furriness of the rat will then be so generalized that the child will try to run away from every appearance of a white furry object, thereafter. Here, fear is a behavior dependent on the loud noise (which stimulates fear-response). After a few associations with a white rat, it conditions the white rat to elicit the same kind of fear-response. This is an example of *Classical Conditioning*.<sup>1</sup> Similarly, as in *Operant Conditioning* which explains why people avoid behavior that brings pain (punishment) and develop behavior that brings rewards, some have argued that, children usually learn language by trying various combinations of sounds and being rewarded (for example, with praise and attention) by their parents and others for those sounds that represent true language.<sup>2</sup> It has also been noticed by the proponents of the learning paradigm that "a child who is reinforced frequently and only (or largely) for using English correctly might develop better verbal skills than would a child who receives less reinforcement or who is reinforced for using poor English."<sup>3</sup>

## **B. Piaget's Theory of Cognitive Development**

Jean Piaget (1896-1980) is considered to be the most important modern theorist in the study of cognitive development. He developed the most detailed and comprehensive theory of cognitive development and called his approach *genetic epistemology*, which is the study of the origin (*genesis*) and development of the nature and acquisition of knowledge.<sup>4</sup> Piaget's view is also referred to as a constructivist view. *Constructivism* states that "people interpret their environments and experiences in light of the knowledge and experiences they already have. People do not simply take in an external reality and develop an unchanged, exact mental copy of objects or events. Instead, they build (or "construct") their own individual understandings and knowledge."<sup>5</sup> It is the view that "people construct their own knowledge and understanding of the world by using what they already know and understand to interpret new experiences."<sup>6</sup> Not only does one conform the world to one's own previous understanding of it; but, he also allows himself to be modified and conformed to the new knowledge he attains.

It is important to note that Piaget's theory of cognitive development is deeply connected to the biological development of the child. Therefore, the stages of cognitive development that he talks about, which we'll observe later, are quite biologically fixed. Three terms are important in understanding Piaget's theory of cognitive development: *organization*, *adaptation*, and *reflective abstraction*.

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<sup>1</sup> Clifford T. Morgan, *A Brief Introduction to Psychology*, 2<sup>nd</sup> edn. (New Delhi: Tata McGraw-Hill, 1977), pp 85-87.

<sup>2</sup> Clifford T. Morgan, Richard A. King, et al, *Introduction to Psychology*, 7<sup>th</sup> edn. (Delhi: Tata McGraw-Hill, 1986), p. 439.

<sup>3</sup> Robert J. Sternberg, "Individual Differences in Cognitive Development," *Blackwell Handbook of Childhood Cognitive Development* (Ed. Usha Goswami; Blackwell Publishing, 2002), p. 601. *Reinforcement* refers to the repetition of a stimulus (either reward or punishment) to reinforce a particular behavior response.

<sup>4</sup> Morgan et al, *Introduction to Psychology*, p. 425.

<sup>5</sup> John L. Cook & Greg Cook, *Child Development: Principles & Perspectives* (Boston: Allyn & Bacon, 2005), Ch.5, p. 6.

<sup>6</sup> Ibid.

Organization is the tendency to form increasing coherent and integrated entities. According to Piaget, the organized pattern of action or thought is called the *scheme*. Children attempt to understand the world through various “ways of knowing”. Each specific “way of knowing” is a *scheme*, an action sequence guided by thought.<sup>7</sup> With the help of the scheme, which is the building block of cognition, the child attempts to organize and construct his understanding of the world. Two examples would be, *compare scheme* (when the child compares similar things to understand something; like he may look at a cow and using the compare pattern think that it is similar to a dog, but of a bigger size) and *contrast scheme* (when the child contrasts a particular thing with another thing; like he may find that the dog barks and does a few things that the cow never does). By putting the various constructs together, the child attempts to arrive at a conclusive idea of the object before him.

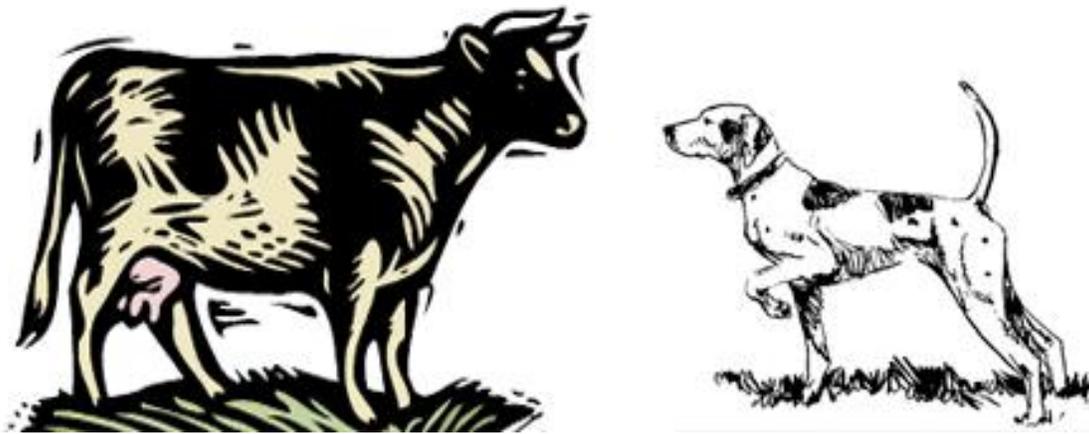


Figure 1: The cow is not a large doggie

Adaptation, according to Piaget, is the way in which knowledge develops. It involves the interplay of two processes: *assimilation* and *accommodation*. A child’s attempt to understand something new is by means of either *assimilation* or *accommodation* or by both. *Assimilation* occurs when the child forces the object before him to conform to his prior understanding. For instance, when a child looks at a cow and tries to fit it (assimilate) it into her prior knowledge of dogs, she ends up concluding that the cow is a very large dog. However, when she is shown that the cow neither barks nor eats the way a dog does; neither does a dog eat grass or chew cud the way a cow does, she modifies her prior understanding and accommodates the new information to distinguish the cow as an entity different from the dog. This is called *accommodation*. Piaget also spoke of *equilibrium*, which is the tendency of the developing individual to stay “in balance” intellectually by filling in gaps in knowledge and restructuring beliefs when they fail to test against reality.<sup>8</sup> If a particular act of *assimilation* does not work completely, one ends up in an imbalanced state called *cognitive disequilibrium*. To resolve this disequilibrium, the child attempts to accommodate or adjust her schemes to achieve a pragmatic level of understanding. If she is successful, she has struck at *cognitive equilibrium*.

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<sup>7</sup> Morgan, et al, *Introduction*, p. 426

<sup>8</sup> Morgan, et al, *Introduction to Psychology*, p. 425

Reflective abstraction is a way of acquiring understanding by thinking abstractly about a particular experience, and thus coming to generalized conclusion about the same. For instance, a boy takes six stones and arranges them in one line; then he takes the stone and rearranges them in two lines. He *notices* that the number didn't change despite being arranged differently. Through reflective abstraction, he concludes that number is not affected by arrangement. When a child is able to do that, he has reached the level of reflective abstraction in the stages of cognitive development.

One another concept emphasized by Piaget was *egocentrism*. According to this principle, children place their view at the center of their understanding of the world and fail to recognize that other viewpoints may also exist. In Piaget's own words, "To think egocentrically means on the one hand that one does not adapt oneself to the sayings nor to the view-points of other people, but brings everything back to oneself, and on the other hand, that one takes one's own immediate perception as something absolute, precisely to the extent that one fails to be adapted to the perceptions of other people."<sup>9</sup>

That leads us to a discussion of the Four Stages of Cognitive Development that Piaget identified. They are the *Sensorimotor Thought*, *Preoperational Thought*, *Concrete Operational Thought*, and *Formal Operational Thought* stages. Each stage is further divided into various sub-stages.

#### STAGE 1: SENSORIMOTOR STAGE (From Birth to 2 Years)

At this stage, the infant knows the world as merely sensory, perceptual, and motoric.<sup>10</sup> The stage has several sub-stages. At the beginning of this period, the baby does not distinguish itself from the rest of the world, and its behavior is restricted to the use of reflex patterns<sup>11</sup> which are gradually incorporated into "intentional movements designed first only to repeat, later to maintain, and then to produce new changes in the environment; increasing understanding of means-end relationships."<sup>12</sup> The development of knowledge during this period is simply sensory and motoric. The child begins to learn to suck, for instance, the nipple by *accommodating* his sucking *scheme* to the shape of the nipple. Thus, he also is able to *assimilate* the nipple into his sucking *scheme*. As far as perceptual development is concerned, at the beginning of this stage when an object is presented before the child and then hidden, he isn't able to note that the object still continues to exist. He doesn't look for it. However, after a few months, he attains *object permanence* and when an object is hidden, he looks for it.

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<sup>9</sup> Jean Piaget, *Judgment and Reasoning in the Child* (Trans, Marjorie Warden; NY: Hartcourt, Brace & Co, 1928), p.228

<sup>10</sup> Morgan, et al, *Introduction*, p.426

<sup>11</sup> Morgan, *A Brief Introduction*, p. 62

<sup>12</sup> Morgan, et al, *Introduction*, p.426

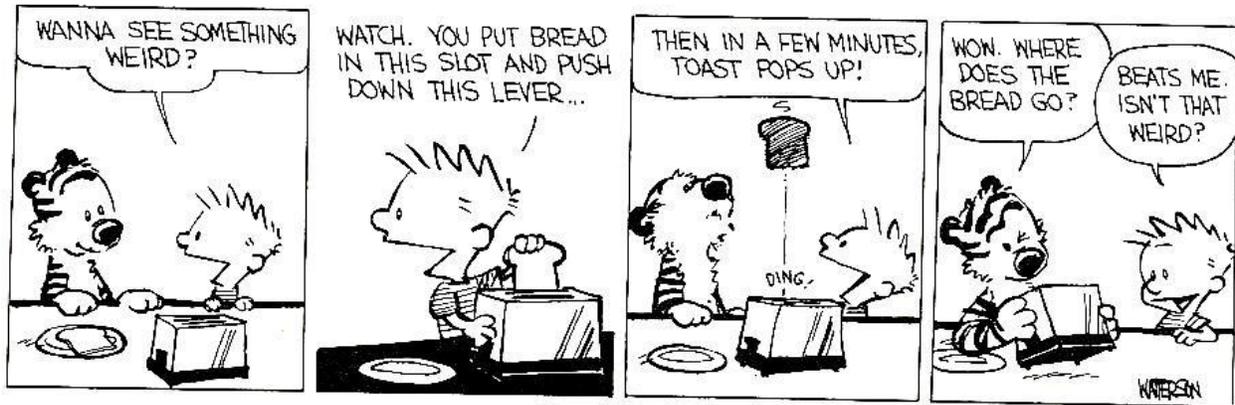


Figure 2: Toast Permanence.<sup>13</sup>

### STAGE 2: PREOPERATIONAL STAGE (From 2 to 7 Years)

This is called the *preoperational period* because during this period the “operation” of logical thinking is not yet developed.<sup>14</sup> This is illustrated by the lack of *conservation* and *reversibility* reasoning at this stage. For instance, if the child is shown two glasses of the same width with equal amount of water and asked if both of the glasses have equal amounts of water, he would answer “yes”. But, if one pours the water from one of the glasses into another glass which is narrower in shape, in which the water level looks higher, he will answer that the narrower glass holds more water than the wider one. He fails to discern the *conservation* of water. Similarly, if the same number of coins are arranged in two rows in equal columns, the child will discern them to be of the same number; however, if one row of coins is spread wide, he’ll answer that the spread out row contains more coins.

This period, however, is also the period of a rapid development of language.

### STAGE 3: CONCRETE OPERATIONAL STAGE (From 7 to 12 Years)

This is the period where systematic reasoning appears; however, the children are still bound to concrete, here-and-now situations. They are now able to understand *conservation* and *reversibility*; for instance, they’ll answer that the water in the narrower glass is the same amount as the one in the wider. The child is also able to invent alternative strategies, for example, two ways of getting to the store.<sup>15</sup> However, abstract reasoning is absent at this stage.

### STAGE 4: FORMAL OPERATIONAL STAGE (12 Years Onward)

This stage is characterized by logic, reasoning from hypothetical propositions, and evaluating hypotheses through testing all possible conclusions. Present reality is seen as only one alternative in an array of possibilities. The child can think about thinking and uses theories to guide thought.<sup>16</sup> Abstract thought emerges during this stage.

<sup>13</sup> <http://psysc613.wikispaces.com/Stages+of+Development>

<sup>14</sup> Morgan, *A Brief Introduction*, p. 63

<sup>15</sup> Morgan, et al, *Introduction*, p. 426

<sup>16</sup> *Ibid*, p.426

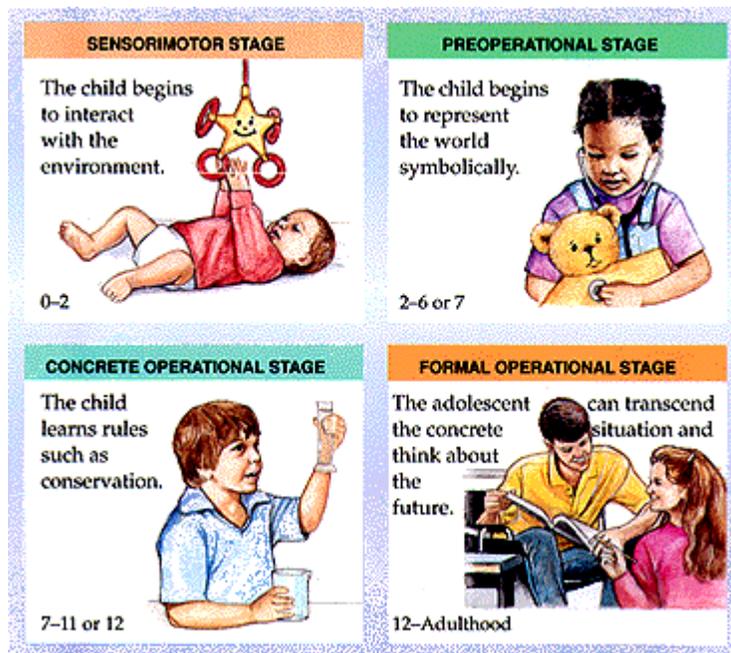


Figure 3: Piaget's Stages of Cognitive Development.<sup>17</sup>

### C. Vygotsky's Sociocultural View of Cognitive Development

While Piaget's theory gave detailed and experimental account of the cognitive development of the child, many psychologists felt it didn't take into account the social cognitive development of the child. Lev Semyonovich Vygotsky (1896-1934), a Russian psychologist developed a holistic human cultural and biosocial development which is today commonly called as *cultural-historical psychology*.<sup>18</sup>

Vygotsky emphasized on the importance of *mediation* to assist the child in developing his cognitive capacities. In the Indian philosophy of education, this *mediation* was personified in the *Guru*, who helped, instructed, and guided the child into the pathway of knowledge. For an Indian learner, the presence of the more capable *Guru* as both an ideal and an instructor was indispensable. Vygotsky identified that there was a gap between one's actual solving of a problem at a snapshot of time and one's potential to problem solving with the help of someone more capable. He called this gap the *Zone of Proximal Development (ZPD)*. *Mediation* can take place in structured settings (such as a classroom) or in informal day-to-day settings (such as parents talk with children on the dining table). In process of time, the child is able to internalize the strategies of problem solving that he learns and is able to implement them in life. *Mediation* must be tailored to be more effective, and the strategies mediated to the child shouldn't be so difficult that he isn't able to understand them. The optimal level of difficulty lies within the ZPD. ZPD, according to Vygotsky, is the distance between a child's "actual developmental level as determined by independent problem solving" and the child's level of "potential

<sup>17</sup> <http://etec512group3.wikispaces.com/Piaget>

<sup>18</sup> Wikipedia contributors. "Lev Vygotsky." *Wikipedia, The Free Encyclopedia*. Wikipedia, The Free Encyclopedia, 12 Aug. 2012. Web. 16 Aug. 2012.

development as determined through problem solving under adult guidance or in collaboration with more capable peers." The ZPD refers to the range of problems a child can solve if given some assistance.<sup>19</sup> It is "a metaphorical description of the difference between individual performance and performance that is guided by experts."<sup>20</sup> Crossing the ZPD is essential for a child to attain the next level of development; this is accomplished with the help of more knowledgeable others (MKOs). Vygotsky emphasized the role that socio-cultural mediation (help of others) plays in the cognitive development of the child.

## II. Application of the Theories for Cognitive Development in Children

### A. Role of Teachers in the Cognitive Development of the Child

The teacher must realize that conditioning does play a major role in developing patterns of responses in a child. The teacher must be able to encourage the right kind of behavior and discourage the wrong one in order to help shape the form of responses that are conducive to a sound development of the child's cognitive capacities. While corporal punishment has been largely and justly discouraged in the schools, teachers must creatively come up with constructive designs of rewards and punishment that will help build the child's cognitive capacity.

Also to be remembered are the implications of Vygotsky's theory for instruction that "the most effective instruction involves giving children *challenging material, along with help in mastering it.*"<sup>21</sup> The teachers play an important role in both providing the child with challenging materials as well as help them in mastering them. Vygotsky investigated child development and observed the important roles that cultural mediation and interpersonal communication play in the development of the child's higher mental functions. The child becomes cultured, as we may put it, through these various mediations and interactions that also represent the shared knowledge of a culture. This process is known as *internalization*. Information and practical ideas available in the culture of the environment, outside the child, are gradually internalized to form cultural adaptation; thus, development occurs, though primarily through language.<sup>22</sup> Indian philosophers spoke something similar to what Vygotsky was saying when they talked of *Sabda* (Word) as an evidential source of knowledge in the culturing of a person. The *mediation*, as we saw earlier, was considered to occur chiefly through the *Guru*, who embodied the authority of the *Sabda* (which generally refers to all available knowledge, whether of arts, science, warfare, or entertainment). Vygotsky's theory has helped develop more reciprocal and interactive models of education in modern times. It frees the school and the classroom from being a boring place for the children. There is more activity, interaction, and the teacher is not someone who spoon-feeds the student, but someone who creates interest, makes the classroom relevant, and helps the student to gain an insight of the knowledge available outside of him, to internalize it.

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<sup>19</sup> John & Greg, *Child Development*, 5.27

<sup>20</sup> Shawn M. Rowe and James V. Wertsch, "Vygotsky's Model of Cognitive Development," *Blackwell Handbook of Childhood Development*, p.552

<sup>21</sup> John & Greg, *Child Development*, 5.27

<sup>22</sup> "Lev Vygotsky", <http://mennta.hi.is/starfsfolk/solrunb/vygotsky.htm>

Further, schooling, inevitably, cannot ignore the cognitive capacity of the child as dependent on his biological age-framework, as Piaget's research has shown us. Thus, children within the age group of 2 to 12 would usually profit nothing from talks that contain a lot of abstract theories, despite their being communicated in concrete analogical terms. An example of this is seen in one conversational scene from the BBC Comedy series *Outnumbered*.<sup>23</sup> In this scene Karen, a child, is confused by what a psychotherapist, Brick, is trying to explain:

*Angela:* They play hide and seek only they have to try and find themselves.

*Karen:* Find themselves? That'd be easy. You just look down and...there you are.

*Brick:* No Karen, sometimes you try and find something inside you, that you didn't know was there.

*Karen:* Like a tapeworm?

*Brick:* No not that, it's a...

*Karen:* Or like a spoon that you swallowed by mistake?

*Brick:* No, (to others) She's very little isn't she... (then, to Karen) we've all got dark places inside our head.

*Karen:* Well of course we have. It's entirely dark. Unless we put like a window or we sawed the top of our head off....

.....

*Brick:* Actually, there are hidden feelings inside all... we have to acknowledge. We have to give these feelings a name. We need to say "Bob!". You see we call these feelings "Bob, Get back! and..."

*Karen:* Why Bob when you can call it anything like Steve or a girl's name like Lucy... Why do you have to call it Bob?

*Brick:* Well, you can say Lucy, but it doesn't work for me.

*Karen:* Is this your job to say stuff like these?

*Brick:* Trust me, it's... it's very useful?

*Karen:* No, I don't trust you, because you're just talking nonsense.

*Brick:* If you could only listen to me for two seconds. Well, it is not something that a child necessarily understands... but, it is something....

*Karen:* But, I do understand what you saying, it's just that it doesn't make any sense....

A few guidelines for training children at the various stages of development would be as follows:<sup>24</sup>

**PREOPERATIONAL PERIOD (2 to 7 Years):** Use concrete illustrations and visual aids to teach concrete facts. Make instructions relatively short, using actions as well as words. Explain with actions, imitations, and gestures. Try explaining things by looking at them from the child's own viewpoint: don't expect the child to be able to see the world from someone else's viewpoint. Give children a lot of things to learn by practice; but avoid overuse of workbooks and other paper and pencil tasks. Provide opportunities to play with clay, water, or sand. Take field trips. Discuss what they are seeing on TV.

**CONCRETE OPERATIONAL PERIOD (7-12 Years):** Continue using concrete props and visual aids. Provide time-lines for history lessons. Provide three-dimensional models in science. Demonstrate simple scientific experiments in which the students can participate. Give the students the chance to see and manipulate objects and test out their ideas. The lectures and

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<sup>23</sup> *Outnumbered*, 7<sup>th</sup> May, 2010. (Writers: Andy Hamilton & Guy Jenkin), [bbc.co.uk/comedy](http://bbc.co.uk/comedy)

<sup>24</sup> "Jean Piaget's Developmental Stage Theory,"

[http://sites.wiki.ubc.ca/etec510/Jean\\_Piaget's\\_Developmental\\_Stage\\_Theory](http://sites.wiki.ubc.ca/etec510/Jean_Piaget's_Developmental_Stage_Theory), August 17, 2012

readings should be brief and well organized. The child can progressively move from shorter to longer readings. Require readings with a limited number of characters. Use outlines, hierarchies, and analogies to show the relationship of unknown new material to already acquired knowledge. Give opportunities to classify and group objects and ideas on increasingly complex levels. Present problems which require logical, analytical thinking to solve. Focus discussions on open-ended questions which stimulate thinking (e.g. are the mind and the brain the same thing?).

FORMAL OPERATIONAL PERIOD (12 Years Onwards): Use visual aids as well as simple and somewhat sophisticated graphs and diagrams. Provide students opportunities to discuss social issues and hypothetical ideas (for instance, the Time Machine or Time Travel, Other Worlds). Encourage students to explain how they solve problems. Try teaching broad concepts with the help of materials relevant to the students. For instance, when discussing about the Independence Struggle, consider what issues united the nation. Use lyrics from popular music to teach poetic devices, to reflect on social problems, and so on.

### **B. Role of Parents in the Cognitive Development of the Child**

With regard to the parent's role in helping the child develop his cognitive capacity and abilities, nothing can be more instructive than the Book of Proverbs. Interestingly, the Bible has the best set of instructions necessary for helping the child grow in way of perfect wisdom that God wishes him to grow in.

*"My son, hear the instruction of your father...."* (Prov.1:8). Speak to your child all the while. We have seen that cultural mediation and interpersonal interaction play a very crucial role in the cognitive development of the child. A parent has the divine calling to nurture the child not only in the things of the body but also in the things of the soul and of the spirit. Instructive conversation at home helps shape the child foundationally. According to the Bible, wisdom is not just about intelligence; it is that holistic cognitive development of a person whereby he is able to make the right social decision in light of his spiritual identity before God. Therefore, the Bible defines the "fear of the Lord" or a holy reverence of God as the fountain of wisdom and knowledge (Prov. 1:7). Departure from this holy reverence has a debilitating effect on the holistic cognitive structure of a person (Rom.1:21, 28). The home provides the amiable environment conducive to the child's growth in the wisdom of salvation (crucial things that need to be internalized for the right form of development).<sup>25</sup> It is the responsibility of the parents to maintain the health of the homely environment. Nagging, provocation, indiscipline, incontinency, and irrational and unpredictable behavior introduce an imbalance in the conditioning framework and confusion in the child's mind regarding a proper cognitive appraisal of reward and punishment. Parents must not just speak instruction through their lips but also through their lives (Eph.6:4). It is only when the child has learnt to listen to his parents (Prov.1-7) that he'll be able to listen to the voice of wisdom when he comes to age, i.e. when his cognitive capacities have properly developed (Prov. 8,9). Parents should be able to choose the right kind of stories and object lessons to communicate to the child the essential principles on which his life is to build. The guidelines listed above for the teachers will also be helpful to the parents at home.

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<sup>25</sup> See 2Timothy 3:14,15

*"The rod and rebuke give wisdom" (Prov.29:15).* Disciplining a child is a crucial element of mediation that blends into itself both the challenge and the value of wisdom. Discipline should administer wisdom, not mere physical retribution. It should correct the thinking pattern of the child. It should not be a means of trying to force the child to do things by means of terror; it should be able to give wisdom: the rod and rebuke go together. The rod is the rod of correction, not condemnation (Prov.22:15; 23:13). Rebuke is not angry outburst and rage. Rebuke is the serious show of disapproval of a particular action. It proceeds from grief, from love. The rod and rebuke prevent the child from growing wild and bring him into the mold of culture. It subjects the chaotic forces of folly within the heart of the child to the ordering power of the Moral Law. A family that lacks this strand of sound judgment and prudence will fail to provide the conditions necessary for the health of a child's cognitive life. Discipline is only discipline when it is administered by the hands of love. Discipline is not just a matter of discipline with rod; it is also a matter of discipline with reward. The parent must also apply proper discipline in rewarding the child for every progress the child makes. The reward should be appropriate and meaningful or else it loses its meaning and significance. A simple word of appreciation and praise does great good to spur the child to improve further. The rod and reward refer to the discipline of feedback that is essential to the growth of any human being; for feedback is the resonance of social life and identity.

## CONCLUSION

We have briefly glanced through a few theories related to the cognitive development of a child and observed the implications that modern psychology has for child education. The theory of conditioning helps us understand the behavioral responses of children. It also helps us understand properly the role of reward and chastening in the education of the child. Piaget's theory of cognitive development helps us to understand the cognitive development of a child along his biological timeline. This helps us to be reasonable in the terms and methods we choose to help a child develop cognitively at each stage of his life. Finally, Vygotsky's theory helps us to understand the significance and role of cultural mediation, interaction, and the need for programs that are tailored to help the child successfully internalize the social knowledge in his social development.

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