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Observing Development as Defined by Piaget and Vygotsky in the Preoperational and Concrete-Operational Child

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Throughout history, psychologists have conducted research to find out why people act and think in certain ways, and what creates the foundation of human thought processes. In an analysis of cognitive development, the widely-referenced views of Swiss philosopher and scientist Jean Piaget, as well as those of Russian developmentalist Lev Vygotskty, prove invaluable. Interaction with those in the preoperational and concrete-operational stages of development shows an adherence to the characteristic patterns of those phases in some cases, while indicating a blur between phases in other instances. In an original case study of two children, ages five and eight, the theories of Piaget and Vygotsky guide the researcher to identify and evaluate their behavior in, and responses to, a number of experiments and questions.

Interestingly, Piaget believed that children move through a series of stages in order to develop cognitively. He identified four stages: sensori-motor intelligence, preoperational thought, concrete operations, and formal operations (Wadsworth, 1971, pp. 26-27). Within these stages of intellectual organization, Piaget believed that children use schemata, "cognitive *structures* by which individuals intellectually adapt to and organize the environment" as biological means of adaptation to changes in the physical environment (Wadsworth, 1971, p. 10). Adaptation consists of assimilation—when the child integrates new perceptual matter into an existing schema—and accommodation, when the child creates a new schema or modifies an old one in order to fit the perceptual stimulus. The necessary balance between assimilation and accommodation to incorporate information is known as equilibrium (Wadsworth, 1971, pp.10-19).

While Piaget analyzed cognitive development, Lev Vygotsky examined the learning capabilities of children undergoing this process. He believed that there was a gap between what children are cognitively capable of on their own, and what they are capable of with assistance. He termed this the zone of proximal development, or the distance between the "actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable

peers." (Brown, Metz, & Campione, 1996, p. 146). A frequently-used concept related to this model is that of scaffolding, which refers to the structures and support provided by parents and peers to guide the child to a higher level of functioning, as in tutoring (Pratt, Kerig, Cowan, & Cowan, 1988, p. 832). Both of these concepts were seen with Subjects A and B.

The subjects observed were siblings. This may have correlated to differences in their responses, as the younger child had an older sibling to aid in his cognitive development. Subject A, Anthony, was five years old, and would have been labeled by Piaget as a child in the preoperational stage of development. This is the period from two to seven years that introduces symbolic representation and "is characterized by the development of language and rapid conceptual development" (Wadsworth, 1971, p. 26). Subject B, Kathleen, had just turned eight years old, and was in what Piaget called the concrete-operational stage of development. This is the period from seven to eleven years, when "the child develops the ability to apply logical thought to *concrete* problems" and is no longer perception-bound (Wadsworth, 1971, p. 26). In order to obtain the most accurate and detailed results possible, Subjects A and B were analyzed separately and away from others, and a video camera was used to document the process.

In the first portion of each subject's analysis, he or she was read *The Rainbow Fish* by Marcus Pfister and told that he or she would get a chance to talk about the story later on. Each was then asked by the researcher, "Can you tell me what happened this week, since Easter?" Subject A, in the preoperational stage, replied with few words and details, referring only to himself. He said, "I got my new present…a duck," "I made an Easter egg," and "I got my class book for a day." Here, Subject A displayed egocentrism—"he sees himself as the primary cause of all activity," putting himself at the center of everything and being unable to perceive that others may have differing points of view (Wadsworth, 1971, p. 46). In the preoperational child, the 'It's all about me' line of thinking is common; Subject A did not attempt to construct imagery for the researcher because he would assume the researcher had seen everything he had.

Subject B, in the concrete operational stage, provided a complex answer that included multiple examples and references to various people. She talked about having trouble with a friend in school, going to dance class, getting stuck in traffic with her mother during a parade, doing homework, attending religion class, and going to her brother's little league game. Subject B, realizing that the researcher had not perceived the same things as her in the past week, attempted to provide the researcher with detailed mental imagery; the response showed clear language enhancement that should have developed by the transition to the concrete-operational stage. When prompted with questions by the researcher ("Did anything else happen?" and "What happened at school/home/etc.?"), both subjects gave further descriptions—this exemplifies the aforementioned concept of scaffolding.

In a test for the conservation of volume, each subject was shown two small Ziploc bags filled with marbles and asked if they would agree that there was an equal amount in each. As the subjects watched, the marbles from one bag were then dumped into a much larger bag, and they were asked which bag then had more marbles. Subject A agreed that the bags of marbles were originally equal, but insisted that the smaller/fuller bag had more marbles than the larger bag. According to Piaget's theory, this is because the preoperational child has not yet developed an understanding of conservation, "the conceptualization (schematization) that the amount or quantity of a matter stays the same regardless of any changes in shape or position" (Wadsworth, 1971, p. 76). As a preoperational child, Subject A also had not yet developed reversibility, the ability to follow a line of reasoning back to where it started, by understanding that actions can be reversed (Wadsworth, 1971, p. 75). Therefore, seeing the marbles put back into the original bag did not affect his answer. This shows another characteristic of preoperational thought known as centration, the tendency to fixate on the perceptual aspect of a stimulus and use perceptual, rather than cognitive, evaluation (Wadsworth, 1971, pp. 74-75). Subject A focused on the appearance of the 'full' and 'empty' bags of marbles in his determination of which contained more.

Subject B originally identified the smaller bag as the one with more marbles; after the researcher asked a few questions and explained the process however, Subject B changed her answer and said that the amount of marbles was equal in each bag. When asked, "What if I put the marbles back in this bag?" Subject B answered that the amounts were equal. When the researcher said, "So if the marbles in these bags are equal and all I did was pour marbles from one bag into another…" Subject B finished the sentence, realizing her error. This shows that she had developed both the ability to conserve through scaffolding, and was able to use reversibility to understand the concept. Since Subject B was at the beginning of the concrete-operational stage, her initial confusion was understandable—the ages Piaget applied to each stage explain *typical* behavior, and "the chronological ages during which children can be expected to develop behavior representative of a particular stage are not fixed (Wadsworth, 1971, p. 27). Initially, both subjects used assimilation to interpret the new perceptual question into their existing schemata that say full is greater than empty; Subject B adapted her answer using accommodation to create a new schema in learning that amounts of objects can remain equal even when they take different forms.

Next, each subject was shown a picture of the researcher's birds (who they were familiar with) in a cage; the birds were facing in different directions, and three shapes—a heart, a circle, and a star—were positioned around the cage. The subjects were asked what they saw, and then what each bird was able to see. Subject A responded that he saw the birds, the cage, and all three objects. When asked what each bird saw, Subject A pointed to all three objects, even though none of the birds were in a position to be able to see them all. Subject B responded that she saw the birds, the cage, other items in the cage, and all three objects surrounding it. She said, "Sherbet sees the circle, Marshmallow sees the heart, and Lemonade sees the star." This shows the aforementioned concept of egocentrism in the preoperational child, because he was unable to assume the perceptions of others, and instead projected his own perception onto them. Subject B, in the concrete-operational stage, was able to separate her own perception from that of each bird.

In the next experiment, each subject was asked a series of questions to test for the presence or absence of precausal thinking, "things that happen together to cause each other," attributed to will and preoperational concepts (Pulaski, 1980, p. 100). Subject A displayed the preoperational concepts of egocentrism, animism (believing the world of nature is alive and conscious), and artificialism (believing that human beings created natural phenomena), in his answers (Pulaski, 1980, p. 44-47). He asserted that school ends at 3:00 so he can watch *Suite Life On Deck* (egocentrism), that the clouds move so the sun can hide (animism), and that the sun is yellow because "*they* couldn't make it in any other color" (artificialism). Subject B, the concrete-operational child, provided more in-depth answers with logic and reasoning, which is typical of her stage. She talked about how God created the different seasons and weather. When asked why school gets out at 3:00, she gave a long, detailed answer that described the school-day agenda. However, Subject B once again displayed some indication of preoperational thought; when asked why the sun is yellow she said, "Because they wanted to make it shine bright, and what is brighter than yellow? Nothing!" This displays artificialism.

Next, the subjects were shown a poster with two rows of items on it—a row of four apples on top and a row of six bananas below it; the rows were evenly spaced. Each subject was first asked whether there were more apples or more bananas, and subsequently whether there were more bananas or more fruits. Subject A replied that there were more bananas than apples, and then immediately that there were more fruits than bananas. This shows that, although Subject A was still in the preoperational stage, he had already developed a sense of class inclusion or classification—the ability to recognize part-whole relationships of classes and subclasses (Vila., 1996, p. 197). Subject B replied that there were more bananas than apples, and then that there were more bananas than fruits. When the researcher prompted Subject B by asking if apples and bananas are both fruits, she said, "So there are more fruits than bananas because both are fruits." This shows how, by means of scaffolding, Subject B was able to move from perceptual preoperational thinking to a logical level of

concrete-operational thinking. The fact that the results for this experiment were the reverse of what was expected could be due to the fact that "the rates at which children pass through the stages may not be identical, due to experiential or hereditary factors."

Finally, the subjects were asked to recall what they remembered from the story *The Rainbow Fish*, read to them at the beginning of the analysis. Subject A remembered one component from the middle of the story. When prompted with questions by the researcher through scaffolding, he was able to give further information about the story, yet still provided very short and simple answers: "A scale," "No," "Share," "He shared them," "Happy." Subject B recalled many of the details from the beginning, middle, and end of the story on her own; rather than needing the questions prepared by the researcher, Subject B covered those aspects of the story in her response. As is typical of a child in the concrete-operational stage, Subject B provided answers of a higher level that included what certain characters said, an analysis of character behavior, and her personal opinion on the story. Subject B did not require scaffolding in order to provide these answers.

Overall, Subject A displayed behaviors characteristic of a child in the preoperational stage of development and Subject B displayed behaviors characteristic of a child in the concrete-operational stage. In some cases, Subject A showed signs of logical thinking that suggest he may be progressing rapidly toward the concrete-operational stage. Additionally, Subject B, who is still in the early portion of the concrete-operational stage, showed some signs of regressing to preoperational perceptual thinking, suggesting that she has not yet fully cut ties with the preoperational stage and transitioned to that of concrete operations. Both subjects showed that cognitive development is a continuous process, and that cognitive abilities are aided by scaffolding.

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