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Mental Models in Children

Researchers in the area of child psychology have taken an interest in how children revise their understanding of the world. Stella Vosniadou and William Brewer (1991) postulated a theory called mental models, which provides insight into how genuine understanding is attained. The postulated mental models are created and then tested to build up one's understanding of how the world works. Additionally, this theory implies there may be points in time where there is some understanding of a concept, yet it is still incomplete. Vosniadou and Brewer wanted to explore these intermediate mental models and develop evidence of understanding in progress.

Experiment

In the year 1991, they conducted an experiment of childhood learning known as, "How Children Learn the Earth Isn't Flat". The purpose of the experiment was to investigate how children conceptualize knowledge regarding the earth's shape. Specifically, they were interested in the children's initial knowledge about the shape of the earth and how this knowledge changed throughout elementary school as they were exposed to the conventional understanding that the earth is a sphere.

Vosniadou and Brewer (1991) interviewed sixty children who were between the ages of 6 and 11-years-old. Each child was asked 48 questions designed to probe and identify their mental model of the earth. Initially the responses seemed inconsistent, but eventually a clear pattern emerged. Majority of children fit into defined categories, which demonstrated children are likely to construct similar mental models. The first category was the rectangular Earth and the second category was the disc Earth. The first and second category imply the Earth is flat. The third

category was the dual Earth, which suggests humans live on one Earth that is flat and there is another spherical Earth in space. The fourth category was the hollow sphere, which children thought humans lived inside the Earth. The fifth category was the flattened sphere, which explains there are flattened areas on the earth. The sixth category included the children that exhibited true understanding of the Earth's shape. The last category consisted of the remaining children that either gave inconsistent answers or provided inconstructable models.

The results of the experiment demonstrated how the mind comes to terms with new concepts that are unfamiliar or contradictory to our senses. In regards to this study, the child's everyday experience suggests the Earth must be flat. This constructs their first mental model. Then they are exposed to the widespread notion that the Earth is a sphere. As children work to grasp this concept, they update their original model incrementally. It is during these time points that children try to integrate their previous understanding with the new concept.

Vosniadou and Brewer (1991) propose the reason why children find it difficult to believe that the earth is a sphere is because of two presuppositions. The first presupposition is that the ground is flat. Children perceive the ground as flat therefore they believe the Earth is flat. The second presupposition is that unsupported things fall. Children cannot conceptualize how people can live on Earth if it is a sphere and not fall off. Two examples of mental models constrained by these presuppositions are children in the hollow sphere and dual earth category. Researchers found that the children gained some understanding that the Earth is a sphere, but they still held onto the idea that it was flat or that it was impossible to live on a sphere.

The work of Vosniadou and Brewer demonstrated the mental processes that take rote learning to genuine understanding. They found as children let go of their presuppositions, they were unable to were acquire true understanding. Therefore the authors concluded real

understanding may be less about learning new concepts and more about letting go of old ones. Since the work of Vosniadou and Brewer, additional studies have continued to support the proposed psychological theory, mental models. Other researchers claim there are discrepancies in the original experiment. These studies suggested the interview conducted by Vosniadou and Brewer was confusing and ambiguous, which contributed to the children's misconceptions about the earth's shape. Additionally, differences in the children's original responses may be attributed to cohort and cultural effects. Lastly, the findings of replicated studies indicated children have substantially more of a scientific understanding and less of a naive mental model.

Reference:

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