Scientific thinking in young children: Theoretical advances, empirical research, and policy implications [1]

Science, 337, (6102), pp. 1623-1627.
Author: Gopnik, Alison
Source: Science Magazine
Format: Article
Publication Date: 27 Sep 2012

AVAILABILITY
Article available for purchace [2]

Abstract:

New theoretical ideas and empirical research show that very young children's learning and thinking are strikingly similar to much learning and thinking in science. Preschoolers test hypotheses against data and make causal inferences; they learn from statistics and informal experimentation, and from watching and listening to others. The mathematical framework of probabilistic models and Bayesian inference can describe this learning in precise ways. These discoveries have implications for early childhood education and policy. In particular, they suggest both that early childhood experience is extremely important and that the trend toward more structured and academic early childhood programs is misguided.

Excerpts from press release:

New research methods reveal that babies and young children learn by rationally testing hypotheses, analyzing statistics and doing experiments much as scientists do.

Very young children's learning and thinking is strikingly similar to much learning and thinking in science, according to Alison Gopnik, professor of psychology and affiliate professor of philosophy at the University of California, Berkeley. Gopnik's findings are described in the Sept 28 issue of the journal Science. She spoke about her work in a video briefing with NSF.

New research methods and mathematical models provide a more precise and formal way to characterize children's learning mechanisms than in the past. Gopnik and her colleagues found that young children, in their play and interactions with their surroundings, learn from statistics, experiments and from the actions of others in much the same way that scientists do.

"The way we determine how they're learning is that we give them, say, a pattern of data, a pattern of probabilities or statistics about the world and then we see what they do," said Gopnik.

For example, in a series of experiments Gopnik and her colleagues used machines with the ability to light up and play music and asked young children to make them go.

"We found that like scientists, they tested hypotheses about the machines and determined which one was more likely," said Gopnik.

But before we rush to put toddlers on an earlier academic track, Gopnik's research shows that encouraging play, presenting anomalies and asking for explanations prompts scientific thinking more effectively than direct instruction.

"Everyday playing is a kind of experimentation--it's a way of experimenting with the world, getting data the way that scientists do and then using that data to draw new conclusions," said Gopnik. "What we need to do to encourage these children to learn is not to put them in the equivalent of school, tell them things, or give them reading drills or flash cards or so forth. What we need to do is put them in a safe, rich environment where these natural capacities for exploration, for testing, for science, can get free rein."

-reprinted from the National Science Foundation
Region: United States [3]
Tags: child development [4]
outcomes [5]

Links
[1] https://childcarecanada.org/documents/research-policy-practice/12/10/scientific-thinking-young-children-theoretical-advances [2] https://science.sciencemag.org/content/337/6102/1623.abstract [3] https://childcarecanada.org/taxonomy/term/7865 [4] https://childcarecanada.org/category/tags/child-development [5] https://childcarecanada.org/category/tags/outcomes