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Knowing the limits of one's understanding: The development of an awareness of an illusion of explanatory depth

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Abstract

Adults overestimate the detail and depth of their explanatory knowledge, but through providing explanations they recognize their initial illusion of understanding. By contrast, they are much more accurate in making self-assessments for other kinds of knowledge, such as for procedures, narratives, and facts. Two studies examined this *illusion of explanatory depth* with 48 children each in grades K, 2, and 4, and also explored adults' ratings of the children's explanations. Children judged their understanding of mechanical devices (Study 1) and procedures (Study 2). Second and fourth graders showed a clear illusion of explanatory depth for devices, recognizing the inaccuracy of their initial impressions after providing explanations. The illusion did not occur for knowledge of procedures.

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Introduction

As adults, we have all encountered situations where we thought we understood how something worked or why a phenomenon occurred only to be caught up short by a question that illustrated a huge gap in understanding. Despite our initial intuitions, it becomes apparent in these situations that our assessments of our own explanatory

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knowledge are not always well founded. This report examines how self-assessments of our naïve explanatory understandings develop in the elementary school years and how they contrast with self-assessments of other kinds of knowledge. We argue that insight into one's own explanatory prowess is governed by distinctive factors that lead to a different pattern of self-assessments than other kinds of knowledge, and that even young children are influenced by these features when judging their knowledge.

Hundreds of studies have explored children's knowledge about their own memory processes. In general, research has shown that children are poor at predicting their own performance in cognitive tasks, most often overestimating the level of their comprehension or abilities. In pioneering work on metacognitive development, for instance, large mismatches occurred between children's estimates of their ability to recall a sequence of serially presented pictures and their actual ability to recall. In some cases, preschoolers and kindergartners are confident about being able to recall well more than a dozen items while actually recalling only two or three (Flavell, Friedrichs, & Hoyt, 1970). The younger children are, the more they tend to overestimate their own memory for lists of items (Schneider & Pressley, 1997); second and fourth graders tend to be much more accurate than younger children, although their performance estimations are still not perfect (Flavell et al., 1970).

With more complex assessments involving comprehension of information, similar effects emerge. For example, children under 12 years old are often inaccurate when monitoring their own understanding of text passages; they think they have grasped a great deal more from a passage than they really have (Markman, 1977, 1979). Similarly, in the *judgment of learning* paradigm, children overpredict their own performance after studying materials. Second graders and younger children are more prone to being less accurate in both pretest and posttest estimations of test performance than older children; they tend to overestimate the level of their performance (Pressley, Levin, Ghatala, & Ahmad, 1987).

The judgment of learning work, however, is limited by its focus on predictions for recently learned information, such as for pairs of words and pictures or lists of items. In many other contexts, children must also reflect on their own understanding of more complex, long-standing knowledge that they already have. A child might be asked to estimate her understanding of how the sun disappears at night or how to make cookies—knowledge that may have been gradually built up over several years. How accurate is she in her initial estimates of how much she knows, and to what extent can she become aware of the gaps in her knowledge? To what extent do children have an appropriate sense of the depth and detail of their own intuitive theories of the world around them?

Intuitive or folk theories may underlie our understandings of natural phenomena (such as how the sun disappears at night), biological phenomena (such as how growth occurs), or mechanical processes (such as how a crossbow works). Folk theories have been argued to be present throughout much of development; from intuitive theories in infancy (Spelke, Breinlinger, Macomber, & Jacobson, 1992) and childhood (Gelman & Koenig, 2003), to our own adult theories in specific domains such as biology or psychology, these theories are seen as helping us interpret causal relation and engage in conceptual change.

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