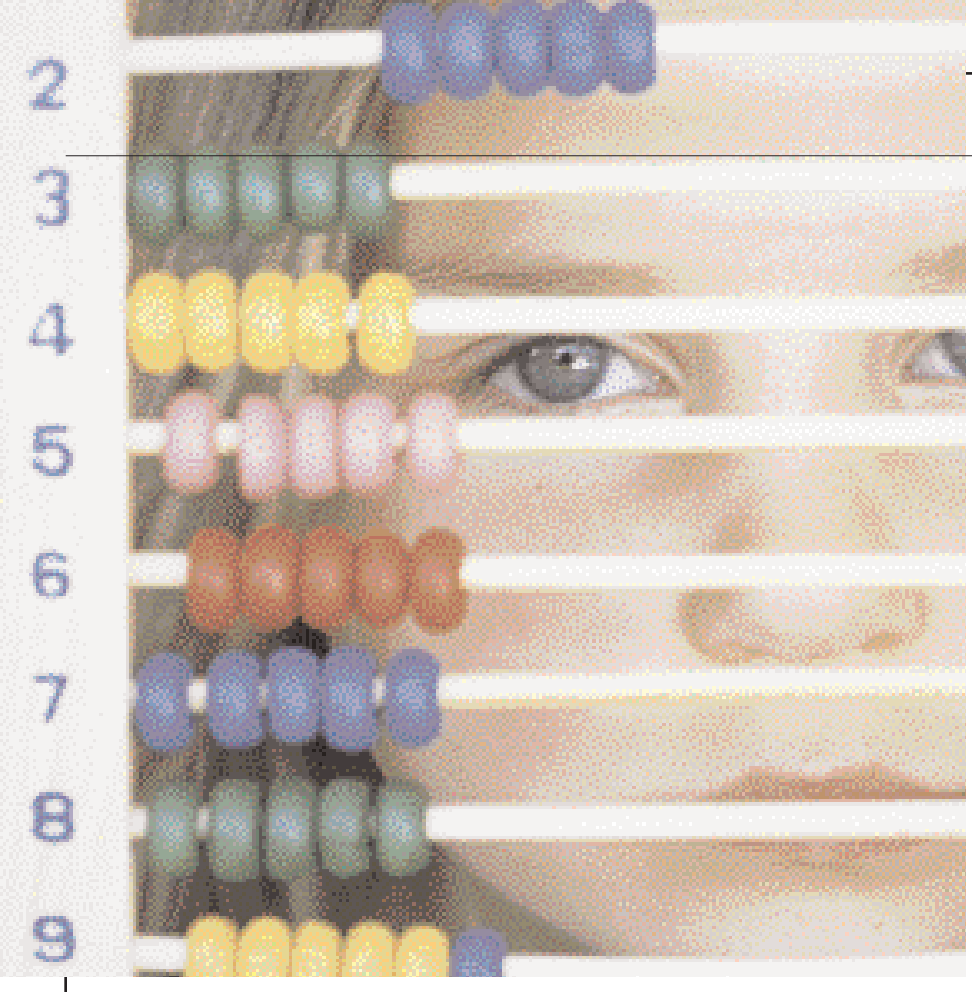

THE AGE OF DISCOVERY

New research tells us that "young kids are far smarter than we ever thought," says expert Alison Gopnik. Then why are so many kids falling behind? **By Nancy Cook**

Whether it's volcanoes or video games, as teachers we know that when children enjoy a subject, they are far more motivated to take charge of their education. But what we're learning now is that offering high interest topics may be less important than offering kids challenging tasks—new problems to solve—that tap into the way children's brains are wired to learn. Why can a child program the TiVo or build his own skateboard ramp?

"There's no congenital understanding of video wiring," says Alison Gopnik, a psychology professor at the University of California at Berkeley. "They know how to do it because they spent a lot of time messing around."

We recently spent some time talking with Gopnik—author of *The Scientist in The Crib* (1999) and the forthcoming *How Children Change The World*—about the way kids learn in the early years: how best to hold children up as complex thinkers, why teachers need to ask the big questions, and how school should be more like baseball.

What does the research tell us?

Over the past 30 years, developmental psychologists have completely changed our ideas about what young children are like. We used to think that kids were not able to understand logic or causal relationships—to use reason—until well into the school-aged years. It's not true. Even toddlers, we now know, show the capacity to make up their own theories, reason abstractly, and change how they think based on new evidence.

How do little kids show off these big skills?

In our cognitive development lab, we give four-year-olds machines that do all sorts of unexpected things. They light up and play music when you put certain blocks on them, but don't with other blocks. Children have to think, "Oh, if I put this kind of block and then this one, it will make noise!" The typical four-year-old figures it out even when it requires a lot of complex reasoning—the sort that computers use when data mining.

So what happens when this typical four-year-old starts school?

In many cases, our picture of learning is still that of a teacher giving a child knowledge through telling. What we see in young children is that they learn best actively exploring the real world around them and interacting with adults and their peers as they do that exploration.

Can you give an example of what you mean by exploration?

One fascinating example is that rural children and children on Indian reservations tend to have a much deeper understanding of biology concepts than city children, even when they've spent far less time studying it in school. Children who are doing chores and taking care of animals and hunting and looking at the natural world seem to spontaneously develop more sophisticated views of biology than the urban children who

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are in relatively more academic schools. That's evidence of how important that interaction with the real world is.

So the way kids learn and the way teachers teach doesn't match up?

I would say that is sometimes true for most teachers, for me too. There is a huge contrast between what I know from learning in the lab and the way I teach in the classroom where, I admit, I rely on books and lectures.

You've said the way sports is often taught is a good model.

Yes. With sports, kids play an active part in everything that's going on. The kids are really playing the game. They have a coach there all the time helping them get better, making adjustments. Think—what if we taught baseball the way we teach science. For the first 15 years or so, they'd read about baseball. Maybe sometimes, they'd be allowed to throw the ball to first base over and over again. When they got to college, then we'd start letting them reproduce famous baseball plays. In graduate school, they would finally get to play the game—do original work. It's absurd and yet true.

> "Rural kids have a deeper understanding of biology concepts than urban children, even when they've spent far less time studying it in school."

You talk about giving children the chance to make discoveries.

That's an experience kids don't have much in class. Teachers need to share their own problem-solving skills. They need to say, "Here's a new problem. A real problem. I'm not going to tell you how it works. But if you figure it out for yourself, exciting things will happen."

What can teachers do to tap kids' deeper thinking?

We have to begin with the expectation that children can make new discoveries—that they will come up with surprising or ingenious conclusions. And that means asking open-ended questions that encourage kids to use their imaginations, as well as what they know, to draw new conclusions. For example, if you are teaching kids about fish and how they have gills and so on, you could ask, "What do you think people would look like if they had evolved to live under water like fish?" You see right away that children have a deeper understanding of what you've taught if they can make the right kind of imaginary conclusions. It does so much more than asking kids to repeat the facts.

What are your thoughts on NCLB?

From a developmental point of view, this is the worst thing we could imagine. I don't know what a good solution is. At the very least, we need to persuade the authorities that testing for children's conceptual understanding and inductive reasoning is more effective than testing for information retention.

What's a good way, even informally, for teachers to measure children's conceptual understanding?

Here's a very simple thing: Ask children to explain their answers. It doesn't sound like a big deal, but there are quite a few studies that suggest it makes a huge difference when you ask students to dig deeper than the first answer, when you say, "Okay, well tell me why that's true?" That seems to be a very natural way for children to make these kind of conceptual leaps.

Is our new understanding of the brain the key to improving schools?

It's a start. We still have so many questions. Our children are literally, from an evolutionary point-of-view, designed to learn. And the big question for all of us is how can our families and schools give children the learning experiences they deserve? □