

Born to learn



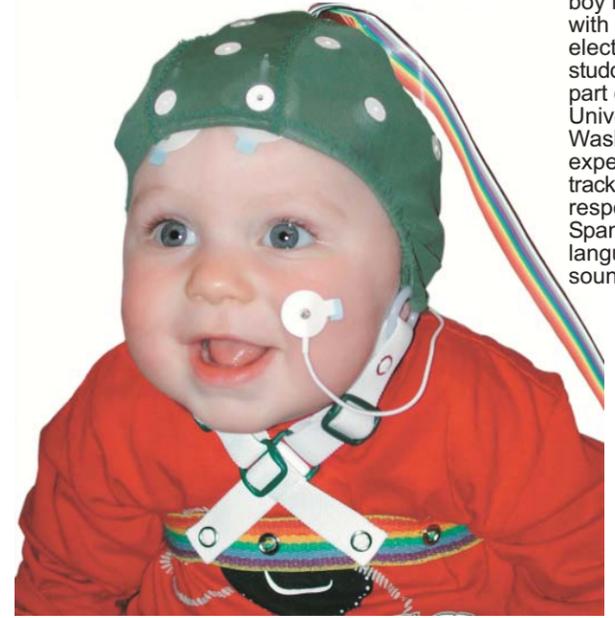
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Try on the mind of a baby. You'll find it surprisingly large. Strictly speaking, it can't be done. We have no recollection of our own

thinking in the first months of life, which is probably one of the reasons so many adults have assumed that infants are simply precious little human seedlings with not much going on upstairs. Until a few years ago, many scientists believed that newborns were effectively blind, incapable of feeling pain and certainly not in gear for learning such.

Today we know that such notions are as spectacularly mistaken as the ancient belief that the sun revolved around the Earth.

Thanks to recent breakthrough discoveries, we can now make some informed guesses about what's happening in the brains of very young children. Those brains are anything but passive.



A 7-month-old boy is fitted with an electrode-studded cap as part of a University of Washington experiment to track his brain's responses to Spanish-language sounds.

PATRICIA K. KUHL/UW Institute for Learning and Brain Sciences

A hunger for knowledge thrives inside a child from birth

From the day of birth, you are attuned to the world around you. You are a voracious learner, studying shapes, sounds, movements, colors, textures. Though speechless, you are fascinated by the sound of human voices - and absolutely riveted by your mother's voice.

Even in the crib, you analyze the objects around you, discovering how to distinguish one from another. You stare intently at faces, quickly learning to recognize Mommy and Daddy or other caretakers. You strain to learn what they and other adults can teach you, imitating them from the very day of your birth.

Within months, you are expert at parsing the meaning of facial expressions. You are rapidly picking up the syllables and rules of language. By the time you are a toddler, you are mastering the profound complexities of grammar, tone and context. A 3-year-old is capable of something no supercomputer has come close to achieving: decoding ordinary human conversation in a noisy environment.

MASTERS OF SCIENTIFIC METHOD

You constantly make observations, draw broad conclusions, then test the conclusions against experience. (These wonderful crayons work on the wall, too!) Through the earliest months and years of life, researchers have demonstrated, children are devising what can only be called hypotheses about the way the world operates. In a very real sense, they are using the scientific method.

Imagine a 2-year-old girl stumbling into a gathering of scientists somewhere on the campus of MIT. In terms of her raw capacity to learn, intensity of curiosity and drive to discover connections, that toddler may outshine the others in the room. Her brain is consuming twice the energy of the MIT brains around her. It has twice the synapses.

That's what the new science is telling us. These discoveries are revolutionary. They have vast implications for some of our most entrenched social problems.

Recently, this state learned that more than half of its 10th-graders flunked last spring's WASL. Worse, far worse, roughly a third of Washington's students drop out of high school, with blacks and Latinos abandoning classes at catastrophic rates. Boys in particular are at risk of tuning out of academics; their numbers are dwindling on college campuses.

One might get the impression that many of these kids simply lack an aptitude for education. Under the old paradigm, in which the ability to learn was something children gradually picked up as they got older, that might have made some sense. But we know now that ordinary children are hard-wired to learn, that they are 430-horsepower learning machines from the moment they arrive in the world.

Education - in its broadest sense, beginning with mother's baby talk - starts out with the most promising raw material known in the universe, a newborn infant. Whatever intervenes that can sometimes turn a creative and curious baby into a sullen, school-hating, class-cutting eighth-grader, it is not lack of inborn potential.

As it happens, one of the nation's major centers of research on early-childhood learning can be found in Seattle, at the University of Washington's Institute for Learning and Brain Sciences.

Housed in what once was the UW school of fisheries on Portage Bay, the institute brings together 50 scientists, post-doctoral fellows and graduate students from various specialties, including neuroscience, psychology, speech and computer science. They study cognitive, linguistic, social-emotional and brain development, focusing especially on children 5 or younger.

Some of the institute's researchers have made crucial contributions to the new understanding of children's minds. Its co-directors, Andrew Meltzoff and Patricia Kuhl - a husband and wife team - are internationally recognized as pioneers.

Meltzoff, for example, used videotape to make a stunning discovery: that infants can begin trying to imitate adults



CHRIS JORDAN/The (University of Washington) Daily Scientist Andrew Meltzoff, left, leads a study of joint visual attention with a 14-month-old and his mother.

with-in an hour of birth. Kuhl, a giant in the field of speech development, has done breakthrough work on the importance of what she calls "motherese" - the tender, musical, tonally exaggerated speech parents throughout the world use with their babies. Motherese turns out to be made to order for, among other things, teaching infants the sounds of their native language.

FIRST FIVE YEARS ARE KEY

Like most scientists, Meltzoff talks of his work with immense passion and excitement. In his case, the passion is focused on babies and small children, whose intellectual capacities he has convincingly demonstrated with his re-search.

The new brain science, Meltzoff said, has yielded two overarching insights.

"One of them is that early experiences last a lifetime. The second is that the environment, the culture and the relationship with caregivers reach in to sculpt and change the brain wiring which makes us who we are as adults."

The older belief, he said, was that the brain is "fixed by nature."

"The modern science says that's wrong - the brain wiring is actually sculpted by experiences early in development. The brain's structure and functioning is changing rapidly, especially during the crucial first five years of life. That's the period when people used to think that babies are just growing like a potted plant. We now think of those years as magic years - the time when their brain is under rapid construction and some of life's most important learning takes place!"

Beginning in the 1970s, pioneering neuroscientists discovered explosive growth in the brain that begins - driven by genetics - in utero. It continues furiously - driven by experience - through early childhood.

'CHILDREN ARE BORN LEARNING'

In 1979, for example, Peter Huttenlocher of the University of Chicago began publishing studies of the proliferation of synapses - the connections between individual nerve cells - in children he had autopsied. He discovered that synapses bloom rapidly at particular times in different parts of the brain, each on its own timetable. In one part, the visual cortex, he found roughly 2,500 synapses per neuron at birth - and up to 18,000 only six months later.

Those links were being established as the babies used their eyes, studying their surroundings: The visual cortex was being built physically in the very process of learning. Yes, their brains shaped their perceptions - but their perceptions also shaped their brains.

At birth, the human brain hits the ground running. "Children are born learning," Meltzoff said. "The most remarkable fact is not just that they're learning but that they engaged in active hypothesis-testing. There's a drive to understand that seems innate in human beings."

People commonly associate a passion for discovery with scholars, scientists and artists, he noted. "What we didn't realize is that the little 6-month-old, the 8-month-old and the 12-month-old also have that passion to try to explain and understand things. I call it an 'explanatory drive,' and in many children it is just as powerful as thirst or hunger. Humans are born curious and motivated to discover, understand, and make order out of the social and physical world around them. One of the reasons they fall so soundly asleep at the end of the day is they're just exhausted from trying to find things out."

WHAT MOM AND DAD CAN DO

What should society - parents, educators, lawmakers - do about these discoveries?

Early learning is, pardon the pun, an infant science, but its findings already offer some suggestions.

Some entrepreneurs, such as the Baby Einstein company, have jumped on the research to tout DVDs, tapes and other products they claim will enhance the intelligence and aptitudes of young children. Parents are made to feel guilty if they don't provide their babies with daily DVD time, en-roll their toddlers in enrichment classes and spend half their time doing something special (and, ideally, expensive) to cultivate those precious synapses.

But many people close to the science bridle at the sales pitches. They say the research is far too basic and preliminary to dictate particular programs, curriculums and products for toddlers.

Research does show that parents and caretakers build their children's brains simply by doing what comes naturally: affectionately talking and playing with their children.

Erica Stevens, assistant director of the UW's Institute for Learning and Brain Sciences, observed, "A baby's favorite toy is its parents?"

"We know that social interaction is extremely valuable for helping kids learning about the world," she said. "What's best is a rich environment with lots of social stimulation and lots of language."

The opposite of that is an environment where kids are not being cooed at and cuddled and touched and shown objects in the world - "The cup, look at the cup!" Things like that are necessary."

Babies and toddlers come geared to have their brains engaged and shaped and expanded by mommy, daddy and other loving adults.



PATRICIA K. KUHL/UW Institute for Learning and Brain Sciences UW lab assistant Denise Padden, left, uses a toy to prepare a 7-month-old girl for a study of her brain's responses to language.

BE A GOOD ROLE MODEL

As far as preparing children for school, Meltzoff cites a home truth that his own work has emphatically underlined: Children imitate. "The little babies desperately want to become like the adults in the culture," he said.

"Given that we know we're role models and given that we'd like to get books in the hands of 3-year-olds, 4-year-olds and 5-year-olds, this means having books around and reading the newspaper and books and caring about the written word. Even before that, caring about speaking to your child and having running dialogues with your child when you're walking around the lake. The children are absolutely paying attention."

"Having a book on your lap and reading to your child is the best form of preliteracy you can do?"

Hardly anything else in life is as important as nurturing children in this crucial boost phase of life. They arrive in the world hungry to learn; it is our job to preserve as much of that curiosity and drive to learn as possible.

The stakes could not be higher. As Meltzoff puts it: "Six-month-olds will turn into 16-year-olds very quickly. As a society, we reap what we sow."