



May 21, 2003

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Students use hand signals to show teachers they are ready to learn:

Teachers respond to the subtle gestures without realizing

University of Chicago researchers have uncovered important clues in gestures that explain how teachers recognize, without even consciously knowing, that their students have reached a teachable moment.

Educators have long been aware that students go through stages of learning as their brains develop and often spontaneously become ready to learn a new skill. Skillful teachers can tune into those moments as times to boost instruction.

A study of gesturing by Susan Goldin-Meadow, the Irving B. Harris Professor in Psychology at the University of Chicago, shows that teachers may pick up on these moments of teachability from the hand movements of their students. However, teachers most likely are unaware that these subtle clues are the way they become alert to students' receptiveness to new information.

"The children appear to be shaping their own learning environments just by moving their hands," wrote Goldin-Meadow and University researcher Melissa Singer in the article "From Children's Hands to Adults' Ears: Gesture's Role in the Learning Process," in the May issue of the journal *Developmental Psychology*.

Previous work by Goldin-Meadow and her colleagues has shown that children are poised to move to a new stage of learning when they make mismatches between what they say and their gestures. She expanded this research to determine if teachers pick up on the clues, even though they were not informed about the value of the mismatches, to predict students' abilities to learn new skills.

For the study, the scholars observed 38 third- and fourth-grade students from the Chicago public and parochial schools. The students failed a pretest on mathematical knowledge and were assigned to one of eight teachers who gave them five mathematics problems during 20-minute tutorials. The sessions were videotaped.

The researchers found that 24 of the students made mismatches either during the pretest or after instruction began. The remainder of the students made no mismatches. The researchers defined a mismatch as occurring when a student made a gesture while talking about a problem that did not parallel his or her verbal explanation.

"Consider for example, a child who is explaining how she solved the problem

$5 + 4 + 3 = _ + 3$. She says, 'I added the 5, the 4, the 3, and the 3 and got 15,' and thus in her speech displays no awareness that the equation has two sides divided by an equal sign. However, at the same time, she moves her hand under the left side of the equation, then breaks the motion and performs precisely the same movement under the right side of the equation," Goldin-Meadow said. The mismatch shows that the student is ready for instruction.

In order to determine if teachers picked up on the subtlety, Goldin-Meadow and Singer studied the tapes to see if there was a difference in the way the teachers responded to children who produced mismatches. They discovered that the teachers gave the "mismatches" more alternatives in how to approach the problem than they gave to students who did not make mismatches.

Further testing showed that the students who made the mismatches also were the ones to make the greatest gains in learning mathematics.

"Gestures are concrete manifestations of ideas for all the world to see," Goldin-Meadow said. Gestures provide useful clues to teachers because they allow students to express new information without having to disrupt their existing method of communicating, she said. Gestures also help students express ideas before they have connected their thoughts with the appropriate vocabulary.

Goldin-Meadow has published extensively on topics related to gesture. Her new book exploring language creation, *The Resilience of Language: What Gesture Creation in Deaf Children Tells Us About How All Children Learn Language*, will be published in April, and another book, *Hearing Gestures: How Our Hands Help us Think*, will be published in the fall. She also has co-edited a book, *Language in Mind: Advances in the Study of Language and Thought*, which was just published.

Goldin-Meadow is associated with the Center for Early Childhood Research at the University of Chicago, which is supported by the McCormick Tribune Foundation.

<http://www-news.uchicago.edu/releases/03/030521.goldin-meadow.shtml>
Last modified at 12:37 PM CST on Wednesday, May 21, 2003.

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