

Deaf children's gesture mismatches provide clues to learning moments

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In a discovery that could help instructors better teach deaf children, a team of University of Chicago researchers has found that a gesture-sign mismatch made while explaining a math problem suggests that a deaf child is experiencing a teachable moment.

Through a series of experiments with 40 deaf children, ages nine through 12, all of whom were fluent in American Sign Language, researchers were able to distinguish between ASL signs and gestures that look like the gestures hearing children produce when explaining the same [math problems](#).

The deaf students who expressed ideas in gesture that were different from the ideas they expressed in sign were ready to learn to solve the math problems, said UChicago psychologist Susan Goldin-Meadow. In previous work, she had shown that gesture-speech mismatch is a clue to teachable moments in hearing children.

"The juxtaposition of two ideas, one in gesture and the other in sign, highlights their [discrepancy](#), and this discrepancy might be what motivates the student to search for new information in the math lesson," noted Goldin-Meadow, the Beardsley Rumel Distinguished Service Professor in Psychology. She authored the paper, "The gestures ASL signers use tell us when they are ready to learn math," published on early view in the journal *Cognition*.

In the study, the team tested students' understanding of the equals (=)

sign through a series of math problems. The researchers coded students' explanations and counted the number of times a child produced a gesture-sign mismatch.

For example, for the problem $7+4+2 = 7+ _ _$, one child signed about how the numbers on the left side of the equation should be added to get the answer (incorrectly, 13), while gesturing about how the number on the right side should be subtracted from that total, which gives the correct answer (6).

Researchers then taught the children a math lesson and retested them. "The more mismatches children produced before the lesson, the more likely they were to improve after the lesson," said Goldin-Meadow. The team found that 65 percent of children who produced three or more mismatches before the lesson were successful after the lesson, compared with 23 percent of children who made fewer than three mismatches.

Educators have long been aware that students go through stages in learning a particular task, and often spontaneously become ready to learn the task. Skillful teachers are able to tune into those moments and recognize them as times to boost the impact of their own instruction, Goldin-Meadow said.

Teachers also frequently use their own gestures to help students learn. They can illustrate how numbers in an equation can be grouped, for example, to help students understand how to make both sides of an equation have the same value.

The ability to use the teacher's gestures is complicated for deaf children because they frequently learn in a classroom with hearing children and get their instruction through an ASL interpreter, who in many cases is looking at the child and not the teacher. As a result, the interpreter does not see the teacher's gestures and cannot relay the information conveyed

in those gestures.

The deaf child watching the interpreter will then miss any messages that the teacher sends in gesture and not in speech. "The gestures [hearing children](#) see during math instruction are often crucial parts of the lesson, turning [children](#) who are not ready to learn into learners," Goldin-Meadow noted.

[Deaf children](#), who frequently have difficulty learning [math](#), could profit from the gestures their teachers make, but only if their interpreters incorporate the information in the teacher's gestures into their own signs and gestures, she said.

Provided by University of Chicago

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