

## SILC Showcase

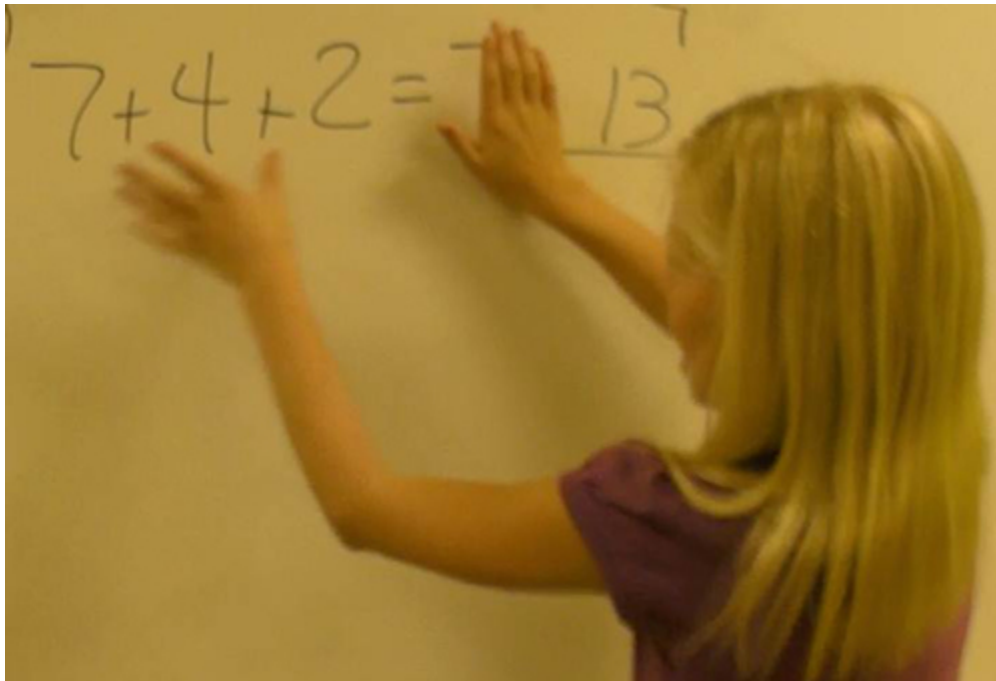
### Showcase April 2012: The gestures ASL signers use tell us when they are ready to learn math

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## The gestures ASL signers use tell us when they are ready to learn math

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*A deaf child conveying different information in sign (her left hand describes adding up the numbers on the left side of the equation) and gesture (her right hand describes taking away the number on the right side of the equation).*

**Outcome:** Deaf signers produce gestures when they explain their answers to math problems. They even produce gestures that convey different information from their signs. These gesture-sign “mismatches” predict which children will learn how to solve the problems after a math lesson. Mismatch thus predicts learning in deaf signers, just as it does in hearing speakers.

**Impact/Benefit:** Deaf children have documented difficulties in areas of mathematical reasoning. Gesture has been shown to be useful in teaching hearing children math. Our findings lay the groundwork for using gesture as a tool to teach math to deaf children.

**Explanation/Background:** Speakers whose spontaneous gestures convey different information from the information they convey in speech—gesture-speech mismatches—learn more from instruction than speakers whose gestures convey the same information as speech. Does gesture predict learning in deaf signers?

Although it is well known that signers gesture along with their signs, no one has examined the relation between the information conveyed in signs and the gestures that accompany those signs. We show that signers do produce gestures when asked to explain a math task, and that these gestures often convey different information from the information conveyed in sign—gesture-sign mismatches—for example, for the problem  $7+4+2=7+ \_ \_$ , signing about how the numbers on the left side of the equation should be added to get the answer (an incorrect one, 13), while gesturing about how the number on the right side of the equation should be taken away from that total, which gives the correct answer (6).

We have shown that deaf children who produce many gesture-sign mismatches are more likely to learn from instruction in the math problem than children who produce few mismatches, even though gesture and sign are produced in the same (manual) modality. The findings indicate that mismatch's ability to predict learning comes not from the juxtaposition of different information conveyed in distinct modalities (hand vs. mouth), but rather from the juxtaposition of different information conveyed in distinct representational formats (a mimetic, analog format underlying gesture vs. a discrete, segmented format underlying language, sign or speech). Our next goal is to extend these findings to educational practice for deaf children, paving the way for understanding the added benefit of gesture in teaching math both to hearing and deaf children.

**REFERENCE:**

Goldin-Meadow, S., Shield, A., Lenzen, D. Herzig, M. and Padden, C. (2012). The gestures ASL signers use tell us when they are ready to learn math. *Cognition*, 123(3), 448-453. [DOI]