



Gesturing Makes Learning Last

Daniel Ellers, Stuart Welch, Lauren Graves, Sam Troyer



Abstract

- The gestures children make when explaining a task predict whether or not they will learn that task
- Gestures reflect readiness to learn the task and plays a role in learning the task
- Experiment designed to require children to gesture while learning helped to retain knowledge during instruction. Requiring children to speak instead of gesture has no effect.
- Gesturing plays causal role in learning by allowing an alternative, embodied way of representing any new ideas
- Encourage children to move hands while learning for improved learning



Introduction

- People gesture with their hands when they speak
- The gestures produced while learning a task predict whether the task will be learned and/or mastered. These gestures not only help to retain the knowledge learned but also promote learning.
- Instruction that includes gesturing has the same effect
- Previous research has made it unclear whether gesturing reflects a readiness to learn new knowledge or is involved in constructing new knowledge
- Do hand gestures merely reflect one's existing knowledge? Will gesturing when encoding new information have any effect?
- In the experiment, children were provided instruction in a mathematical equation. They were to produce gestures or to speak during the problem solving strategy,. The improvement was compared.

Methods



84 3rd and 4th grade students were examined for this study.



All 84 answered
INCORRECTLY on the
pre-test...

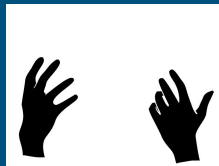
6 Equalizer Problems:

$$12+6+3 = 6+3+_$$

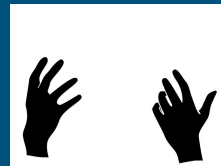
Methods (Pre-instruction)



29 in **SPEECH**
control group



30 in **GESTURE** control
group



25 in **SPEECH &
GESTURE** control
group

- NO answers were provided and no questions were solved during pre-instruction
- Instructor asked child to repeat “I want to make one side equal to the other side” for SPEECH condition
- Instructor asked child to move hand under left side *pause* then under right for GESTURE condition

Methods (Instruction)

$$12+6+3 = 6+3+_$$

For each 6 problems the assigned action was performed **before** and **after** solving the problem for a total of **12 times**.

Once again the same procedure was repeated.. except students made up their own problems this time.

If they tried to perform an action they weren't assigned to they were stopped.

Methods (Post-test and Follow up test)

- Finally one more test similar to the pre-test was given
- Four weeks later the students were given the same test, but at school with no mention of the experiment from their teacher

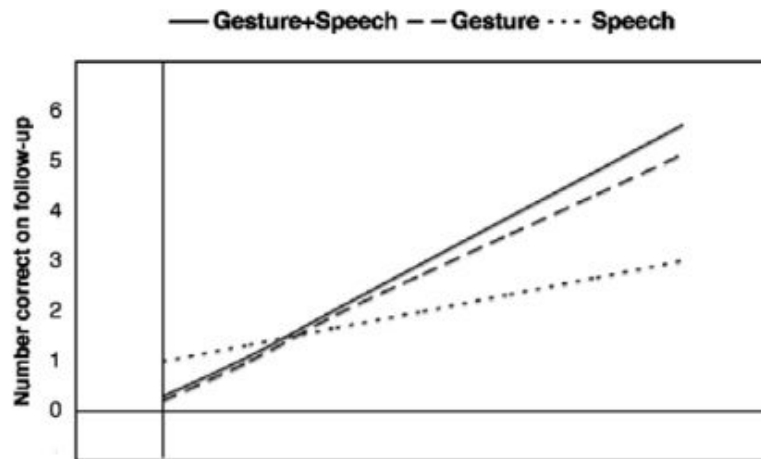


Results

- All three groups improved with instruction.
- Teaching method did not immediately affect learning ability.
- The difference was shown in retention rates.
- Children in the speech group showed a weak retention rate after four weeks.
- Gesture+Speech and Gesture alone were more likely to retain learning.
 - No statistically significant difference between the two.

Results cont.

- Retention rates for gesture($t=7.94$, $p<.0001$) and gesture+speech($t=12$, $p<.0001$) were higher than just speech ($t=1.89$, $p<.01$).
- Reiterating the teacher's words alone did not seem to help with retention rates to the same extent as gestures did.
- Retention rates for children who learned with gestures (85%) was higher than those who just learned via speech (33%).



Results cont.

- Confounding Variable

- Children who were assigned to the gesture group may have been predisposed to gesturing
- Likelihood to gesture was measured in a pretest and compared to posttest results
- Divided into two groups (gesturing and non-gesturing), data reanalyzed.
- Children who did not show a predisposition to gesture during the pretest still showed higher retention rates than those who were taught by speech alone.

Discussion

- *Gesturing makes learning last*
 - Findings support other literature, suggesting that using the body to represent ideas helps the construction and preserving of new information.
 - Possible that the “novelty” of the gestures are why the children retained what they learned
 - Children who were given the gestural script showed they retained the information a month later on the follow-up test.
 - May have retained knowledge because of sleep during the intervening period.
 - Gesturing appeared to aid in consolidation of knowledge.

Discussion cont.

- *How does gesture lead to learning that lasts?*
 - Representation of information using a gesture requires little effort, freeing resources for encoding information.
 - Less demand on working memory
 - Larger motor movements such as gesturing could promote encoding by producing stronger memory traces.
 - Bodily encoding
 - Using gestures may link new knowledge to relevant parts of the environment.

Discussion cont.

- *How general is gesture's effect on learning?*
 - Effects in the study do not appear to be limited to the specific gestures used.
 - Gesturing is most likely not general among all domains for facilitating learning.
 - Could hinder performance
 - Schwartz and Black (1996) studied adults solving gear problems using modeling through gestures. The group that did not use gestures were more efficient at solving the task.

References

Cook, S.W., Mitchell , Z., & Goldin-Meadow, S. (2008). Gesturing Makes Learning Last.
Cognition, 106, 1047-1058.