Learning from an avatar video instructor: Gesture mimicry supports middle school students’ algebra knowledge
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Background
Gestures have a profound effect on thinking and learning (Goldin-Meadow, 2005). Gesture mimicry may be particularly important. Students who spontaneously reproduced a teacher’s gesture on a math problem exhibited better learning than students who did not reproduce the gesture (Cook & Goldin-Meadow, 2006).

However, previous work on gesture mimicry has been done with live, human teachers.

Questions
Do learners mimic the gestures produced by a novel computer-generated avatar instructor? Do learners who mimic the gestures exhibit better learning than those who don’t?

Method
Participants
24 seventh- and eighth-grade students (M age = 13.2 years; 38% female; 75% white)

Design and Procedure
Students worked at an interactive smart board in a single one-on-one learning session.

Coding Gesture
After the lesson, students explained how to solve a target problem. We coded their gesture using ELAN annotation software.

Frequency: We tabulated the number of times each student produced a distinct gesture.

Mimicry: We compared whether the gesture sequences produced by the student matched those produced by the avatar.

Results
Pretest
Students had background knowledge (M = 67%, SD = 31%); but only one student correctly solved the target problem.

Explanation Episode
Explanations were 57 seconds in length (range = 9s to 4min). Students gestured 29 times (range = 4 to 108). Their rate of gesture was ~1 every 2 seconds. During the lesson, the avatar produced 15 gestures. Students mimicked 3 on average.

Posttest
Students displayed high knowledge on the five posttest items (M = 77%, SD = 28%), and 71% correctly solved at least one polynomial multiplication problem. There was a large main effect of gesture mimicry after controlling for pretest score and gesture rate, F(1, 20) = 4.93, p = .04, η² = .20.

Conclusions
Middle school students mimic the gestures produced by an avatar instructor.
Students who mimicked an avatar instructor’s gestures scored higher on a posttest than students who did not mimic the avatar instructor’s gestures.

Implications
Gesture has been shown to be helpful in supporting learning for a wide variety of content, including mathematics, language, and science (McGregor, 2008; Singer et al., 2008).

The current study extends prior work on gesture to suggest that gesture from a novel computer-generated avatar instructor can be helpful as well, at least in mathematics.

To our knowledge, this is the first evidence that students mimic the gestures of a non-human animated agent. This may have implications for mathematics instruction.

References