7 Approaching Learning Hands First

How Gesture Influences Thought

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The gestures that speakers spontaneously produce as they talk are acts of the body and, as such, have the potential to influence learning in the same way that bodily action does. But gesture differs from action in a number of important respects and, as a result, helps learners remember newly learned information and extend that information to new contexts better than action does.

When people talk, they move their hands. These hand movements, commonly called *gestures,* can convey substantive information that is related, but not always identical, to the information conveyed in that talk. Take, for example, a child telling a room full of adults that she ran upstairs. She says, *I runned up*, while at the same time moving her hand in an upward spiral. We know from her hands, and only from her hands, that she ran up a spiral staircase. Gesture thus has the potential to offer listeners – parents, teachers, clinicians, researchers – insight into a speaker's unspoken thoughts.

In fact, when a speaker's gesture about a task conveys different information from that speaker's speech, it signals that the speaker is open to instruction on that task. For example, a child who says she solved the mathematical equivalence problem, 2+5+3=__+3, by adding up the numbers to the left of the equals sign ("I added 2 plus 5 plus 3") while, at the same time, gesturing to all of the numbers in the problem (point at the 2, the 5, the 3 on the left, and the 3 on the right), is more likely to profit from a math lesson on the problem than a child whose gestures match her speech (point at the 2, the 5, and the 3 on the left). The gestures that a learner produces can thus reveal that the learner is in a transitional state and, in this sense, ready to learn.

But gesture can do more than reveal a speaker's thoughts – it can change those thoughts and, as a result, contribute to learning. More specifically, the gestures that learners see can help them learn, as can the gestures that learners produce. For example, children are more likely to learn how to solve a mathematical equivalence problem if their teachers gesture during the lesson than if they don't gesture. Children are also more likely to learn how to solve the problems if they are taught gestures that they themselves produce during the math lesson than if they are not taught gestures and are taught only words to say during the lesson.

Why does gesture have an impact on learning? One possibility is that gesture is part of a multi-modal production involving both hand (gesture) and mouth (speech). If this hypothesis is correct, then signers who use the same modality (the manual modality) to both sign and gesture should *not* show these learning effects. But they do – signers whose gestures convey different information from their signs prior to instruction in mathematical equivalence are more likely to learn how to solve the math problems than signers whose gestures convey the same information as their signs. And signers whose math teachers gesture along with their signs benefit from that instruction, just as speakers do when their teachers gesture along with their speech. It is not the juxtaposition of hand and mouth that gives gesture its power – it's more likely to be the gesture's ability to provide an analog representational format that co-occurs, and is coordinated, with the discrete representational format found in language, be it speech or sign.

Another possibility is that gestures are movements of the hand and, as such, actions of the body – in other words, gesture may affect learning because it is itself an action. Actions have indeed been found to affect cognition. For example, people are more likely to recall an action if they have done the action than if they have read a verbal description of the action. And learners are more likely to master a task if they produce an action relevant to the task than if they see others produce the action. Not surprisingly, when a task is learned by doing an action, motor areas in the brain are activated. What is more surprising is that these same motor areas are activated later when the task is done *without* action. This same process happens when a task is learned through gesture: Motor areas are activated after the task has been learned when it is performed without gesture. Acting while learning a task – be it acting on an object or gesturing in the air – thus has long-term effects on how the task is processed, even when the actions are no longer involved in doing the task.

But gesture differs from action in a number of important respects. First, gestures *refer* to the world and thus do not directly influence it. For example, producing a *hammer* gesture does not actually flatten the object – only physically hammering the object has this effect. Second, although gestures, particularly iconic gestures (i.e., gestures that look like what they represent), resemble actions, gestures vary in how closely they mirror the actions they represent. For example, a *hammer* gesture produced with a C-shaped hand simulating how the hammer would be held if it were moved up and down resembles the actual act of hammering more closely than a *hammer* gesture produced with a pointing hand. Gesture can therefore selectively highlight components of action that are relevant to a particular situation. This selectivity could allow gesture to play a different role in learning than action does.

As it turns out, gesture and action do play different roles, not in learning *per se*, but in retaining the knowledge gained and in extending that knowledge to new contexts. For example, when children are taught a novel word (e.g., *leeming*) along with either an action (e.g., squeezing the bulb of an object) or a gesture representing that action (e.g., squeezing performed near but not on the object), they are equally good at learning the new word. However, children who learned through gesture are more likely to generalize the new word to appropriate contexts (i.e., to other objects that have the potential to be *leemed*) than children who learned through action – and this difference widens over time.

As another example, consider a child who is either taught to solve mathematical equivalence problems by gesturing the grouping strategy (e.g., for the problem, 2+5+3=__+3, pointing with a V-hand at the 2 and the 5, the two numbers that should be grouped and summed, and then pointing at the blank), or by acting out the grouping strategy on plastic numbers that have been placed on the problem (e.g., picking up the 2 and the 5, and holding the two numbers together in the blank). Children are equally good at learning how to solve the mathematical equivalence problem whether they are taught through gesture or through action. But children who learned through gesture are more likely to generalize the knowledge they gained to new problem formats (e.g., 2+5+3=2+__, or 2+5+3=__+4) than children who learned through action. Both gesture and action help learners learn, but gesture helps them extend and retain that learning, two essential components of education.

These facts about gesture have implications for practice, in particular, for how gesture can be recruited in everyday teaching situations by parents and teachers. A good teaching tool is one that can be implemented broadly. If a tool is difficult to use, it is unlikely to be adopted. If the tool is costly, it may not be accessible to underprivileged communities. Gesture is an ideal teaching tool because it is ubiquitous, naturally produced, and universally accessible in both homes and schools. Moreover, gesture is not only used naturally, but its use can be increased in children, parents, and teachers with little effort. Adults can be told to use gestures when talking to children and will thus model gestures for them. They can also be told to ask children to produce gestures of their own. These practices have the potential to be particularly beneficial for children from lower socio-economic homes who tend to produce fewer spontaneous gestures than children from higher socio-economic homes. In addition, because children who have impairments in language often use gesture to compensate for their disabilities, harnessing gesture may be beneficial not only for typically developing children but also for children with special needs.

There are, however, at least two caveats to consider. First, gesture is a powerful tool that can be used to promote learning, but it can also be used to mislead. For example, a math teacher inadvertently pointed at all four numbers, without pausing at the equals sign, in the problem 2+5+3=__+3. In response, her pupil added up the numbers and gave 13 as his (incorrect) answer – he was misled by his teacher's gestures. As another example from eyewitness testimony, interviewers are told to ask open-ended questions (e.g., "What else was he wearing?"), rather than targeted questions (e.g., "What color was the hat he was wearing?"), to avoid influencing their witnesses. But an open-ended question produced along with a suggestive gesture (e.g., a donning-hat movement) results in as many incorrect responses (in this case, that he was wearing a hat even though he wasn't) as a targeted question produced without gesture. Gesture is a powerful tool that needs to be used thoughtfully.

Second, gesture may not always be *the* optimal tool. Although gesture often leads to more flexible learning than actions on objects, there may be times when action experience is more effective than gesture. For example, a child who has made very little progress in mastering a task may profit more from action than from gesture simply because acting on an object can provide a concrete, physical representation of a concept. Manipulatives are often used in math classrooms for this purpose. However, the danger in using action manipulatives exclusively is that learners may not be able to generalize what they have learned to new contexts. Offering learners gesture *after* they have used manipulatives to make progress on a task may, for some tasks and for some learners, be just the right teaching strategy to promote deep and lasting learning.

The facts about gesture described here also have theoretical implications for notions of embodiment. Gesture's impact on the learning process cannot stem exclusively from the fact that it involves the body – actions on objects are embodied, too, and they do not encourage learners to generalize in the way that gesture does. The body may be important for gesture to have an impact on learning not because it is embodied *per se*, but because it offers an analog format within which to represent ideas that are different from those supported by speech. Gesture thus promotes a second representational format that has the potential to lead to learning.

To summarize, gesture offers a unique window onto a speaker's thoughts, and provides a vehicle not only for changing those thoughts but also for promoting deep and lasting learning. Importantly, gesture can improve learning with little effort or cost. Simply telling children to gesture, or modeling gesture for them, puts gesture into the hands of the learners. And increasing child gesture improves learning by giving parents and teachers insight into a child's cutting-edge (albeit implicit) thoughts, and by helping the child consolidate those thoughts and make them more explicit. Along the same lines, simply telling parents and teachers to gesture, or modeling gesture for them, puts gesture into the hands of the teachers. And increasing teacher gesture not only increases child gesture, but also encourages teachers to express imagistic ideas that may be easier to grasp in the manual modality than in the oral modality. Gesture is a ubiquitous and easily accessible tool that should be harnessed for teaching and learning.

For Sources and Further Reading

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