

How can gesturing help in teaching and learning?

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How can gesturing bring out learners' implicit knowledge and help in teaching and learning?

People routinely gesture with their hands when they talk, and these gestures often convey additional information not found in their speech. This study investigated the impact on teaching and learning when 8-9-year-olds used hand gestures to solve maths problems

The authors wanted to know if gesturing would bring out implicit knowledge during problem solving; that is the knowledge that can be observed in pupils' behaviour but which they cannot not express verbally or explain.

As a result of a two-part experiment, involving over 170 children, the researchers found that telling children to gesture while explaining their solutions to novel maths problems can be beneficial in two ways. Firstly, some of the children were able to identify new and correct problem-solving strategies. Secondly, gesturing made the children more receptive to teachers' instructions on how to solve the problems, thus leading to learning.

The researchers' results and conclusions about problem solving will be interesting to all school practitioners particularly those involved with SEN children.

Keywords:

USA, gesture, implicit knowledge, problem solving

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What are the possible benefits of gesturing for teaching and learning?

The researchers based their study on the assumption that learners often know more about a problem than they reveal in their unsuccessful attempts to solve it. They tried to help children to use this implicit knowledge by encouraging them to actively use gestures when explaining their solutions of maths problems.

In this study 8-9-year old children were asked to solve mathematical equivalence problems of the following type: $6+4+5= _ +5$, and explain their solutions. The authors established that when children were told to gesture, without any specific training in gesturing either for the children or the teacher, they discovered and added new learning strategies for problem solving to their repertoire. Here are some of the gesture strategies discovered by the children:

“Equalizer” – Flat palm sweeps first under the left side of the problem and then under the right.

“Equal addends and grouping” – One flat palm covers the 5 on the left side of the problem and another covers it on the right; V-hand indicate grouping of 6 and 4 on the left side of the problem.

In the second part of their research the authors found that the children who were encouraged to gesture and then received instruction from the teacher on the problem solving were more receptive to instruction and were a lot more likely to learn from it. As a result, children told to gesture solved significantly more problems (after the intervention) than did children told not to gesture.

How can gestures reveal implicit knowledge?

Many researchers believe that hand gestures convey a lot of information. Gestures can represent both concrete images (e.g. actions or attributes of cartoon characters) and abstract concepts (e.g. mathematical concepts, such as quotients and factors). More importantly, speakers often convey information in their gestures that is not expressed in their speech. For example:

A child cannot solve a mathematical equivalence problem and gives a wrong answer verbally; but at the same time she reveals implicit knowledge of the task by showing grouping in her hand gestures.

The researchers suggested that gestures of unsuccessful learners reflect the steps they take on the road to mastering the task.

What is implicit knowledge?

Implicit knowledge of a task is the ability to perform it successfully without being able to articulate or explain how it was accomplished. The authors illustrated this with the following example:

Several people sit in front of the computer screen on which five balls and five boxes are displayed. The task is to remove each of the balls from its box. The participants are not told the rule for moving the balls (the rightmost ball can always move; other balls can be moved only if the balls to their right are in the boxes). The participants solve the puzzle, but many are unable to articulate what they have done to succeed.

In this case the correct performance signals an implicit understanding of the task.

Occasionally learners have accurate implicit knowledge even if they perform the task incorrectly. In such situations implicit knowledge can be accessed and revealed by judgement tasks. A judgement task is one where you offer your students a limited number of options and either ask them to identify the correct one or to “make a judgement” as to which options are true and which are false. For example:

The participants are asked to figure out the word associated with a triad of words (*card – playing, credit, report*). If they failed they were asked to judge if the triad was solvable (i.e. likely to have an associate). In most cases the participants performed the judgement task correctly; they had implicit knowledge that the triad was solvable.

Gestures are an alternative way to explore the implicit knowledge in learners who cannot yet perform a task successfully.

How was the study designed?

There were two parts to the research:

- Study 1 aimed to establish if forcing children to gesture would help them to express implicit knowledge;
- Study 2 focused on the benefits of gesturing for the subsequent instruction in problem solving.

106 pupils participated in Study 1; none of them could initially solve mathematical equivalence problems correctly. During the intervention phase, the children were randomly assigned into one of the three groups:

- *Told-to-gesture group;*
- *Told-not-to gesture group;* and
- *Control group.*

Children were asked to solve and explain six problems each; the researchers videotaped the procedure for later analysis of the strategies. These strategies were then compared to those children employed before the intervention. Children in the told-to gesture group added more strategies than did children in the control group and significantly more than the told-not-to-gesture group.

Similarly, 70 children who participated in Study 2 could not initially solve mathematical equivalence problems correctly. The initial intervention was identical to that of Study 1 but then was followed by a lesson in mathematical equivalence. During the lesson the teacher used vivid and expressive hand gestures (moving a flat palm first under the left side of the problem and then under the right side, stressing the idea of making them equal). Both the strategies employed by the children and the number of correct answers after the intervention were assessed. As in study 1, children from the told-to-gesture group added new strategies to their repertoire, while children from the other group did not. The number of problems solved correctly after the intervention also differed significantly between the groups: children told to gesture prior to the lesson solved considerably more problems correctly than did children told not to gesture.

What are the implications?

In completing this digest the authors began to ask the following questions about implications for practitioners:

- The research showed how gestures can portray information that people do not express verbally. You might like to analyse the use you make of gestures. When do you normally use gestures? Do they convey the thinking underneath the problem that helps to solve it? Would seeing your gestures and those of your students recorded on video tape help you to reflect on them?
- The researchers found that when children used gestures it helped them to identify new and correct problem-solving strategies. Why not use gestures more and encourage your pupils to do so? You could start with descriptive gestures: show how big, which shape, which way, position, and location. For example, if you are describing something happening to a small child, you might place your hand, palm down, a distance from the floor which would match their height. If you talk about something going up, you might raise your hand and move upward.
- The research found that using judgement tasks helped to access students' implicit knowledge and facilitated their learning. If your students can not find a solution to a problem or perform a task correctly, would it be helpful to try judgement tasks? You could present the correct solution as an option amongst several incorrect ones and encourage your students to make a judgement and identify the correct answer.

Where can I find out more?

Other digests

Engaging ADHD students in tasks with hand gestures: a pedagogical possibility for teachers

www.standards.dfes.gov.uk/research/themes/inclusion/adhd/

How teachers respond to children's eye gaze

<http://www.standards.dfes.gov.uk/research/themes/thinkingskills/howteachers/>

Helping children think: deliberately averting your gaze as a learning strategy

<http://www.standards.dfes.gov.uk/research/themes/thinkingskills/Helpingstrategy/>

Other research

Improving learning through cognitive intervention

http://www.gtce.org.uk/teachers/rft/learn_cog0601/

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Stevanovi, E., Salmon, K. (2005) giving memory a hand: Instructing children to gesture enhances their event recall. *Journal of Nonverbal Behavior*, 29, 217-233.