

Children can learn arithmetic faster and better

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During the first two years of primary education children can learn to do arithmetic faster and better with the help of a more systematically structured educational programme. For older children, teaching arithmetic with the systematic use of visual aids, such as blocks and strings of beads, has many advantages. This is apparent from the review study by NWO researchers Egbert Harskamp and Annemieke Jacobse from the University of Groningen, The Netherlands.

Harskamp and Jacobse investigated the effect of new forms of instruction in arithmetic education. They examined the outcomes of 40 experimental studies aimed at improving arithmetic skills. Their findings revealed, for example, that a standardised and clearly structured programme that employs a variety of methods enables young children to learn arithmetic quicker and better than they do under the methods commonly used now, most of which do not offer a structured programme. Good methods include the use of picture books about arithmetic, group discussions, arithmetic games and songs. Short, focused board games or computer games also contribute to an improved development of young [pupils](#)' counting skills and number comprehension.

'Visualisation is a good method for slightly older children,' says Egbert Harskamp, endowed professor of effective learning environments at the University of Groningen. 'For addition and subtraction up to 100 it was found, for example, that offering rows of blocks or a string of beads in a ten structure considerably improved the arithmetic performances, as long

as the teaching method used had a clear structure. The teaching methods for arithmetic currently used in Dutch schools contain some visual models for addition and subtraction but these are not usually presented in a coherent manner. This unstructured use can be confusing for pupils.'

The use of the computer in arithmetic education was also found to be effective. Dutch arithmetic teaching methods do not treat different types of calculation in a structured manner and various subjects are offered in a single lesson. Educational computer programs, however, have the advantage of a consistent structure that offers the material subject by subject. Moreover, well-designed computer programs provide instruction, testing and feedback components for pupils, and allow teachers to register how the pupils are progressing and where additional guidance is needed.

The studies were done in English-speaking countries. They covered number comprehension, basic operations, measurement and geometry, ratio calculations (percentages, fractions and ratios) or the solving of applied problems. A total of more than 6800 pupils from [primary education](#) were involved. The review of these studies has been presented in two publications: A Meta-Analysis of the Effects of Instructional Interventions on Students' Mathematics Achievement and Effective arithmetic instruction with the help of computers. The second publication is mainly aimed at teachers.

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