Graphing by hand promote understanding of algebraic formulas

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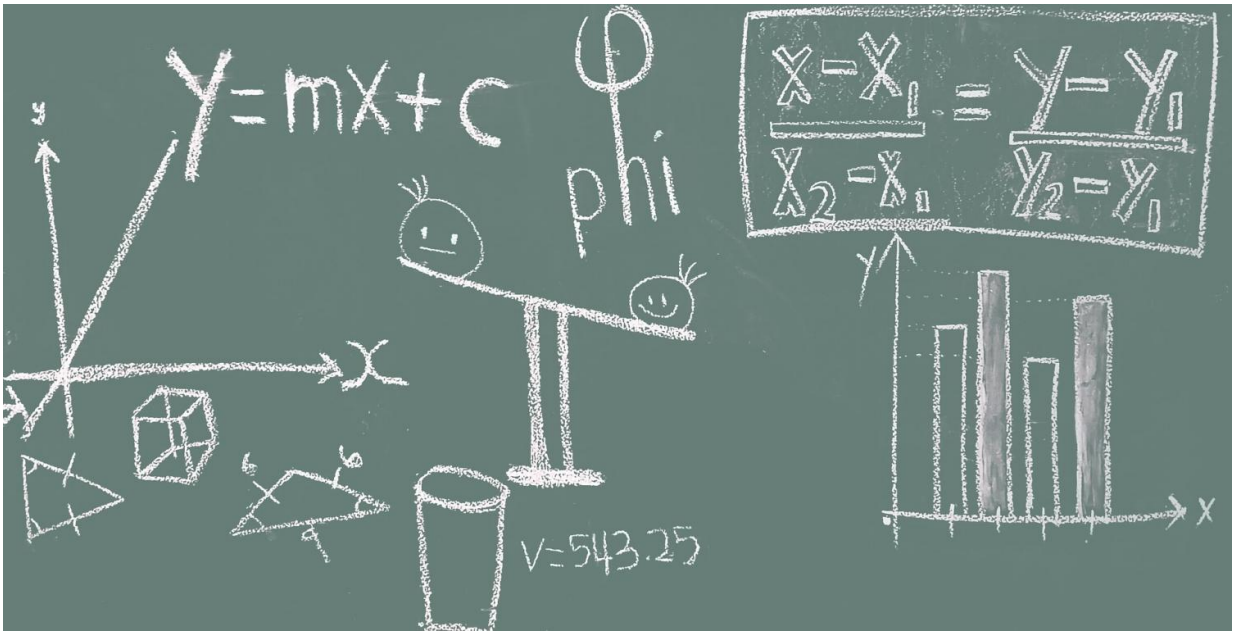

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For many students, algebraic formulas are "abracadabra": they lack symbol sense. Symbol sense includes identifying the structure of algebraic formulas, giving meaning to them, and reasoning with and about formulas. Besides basic skills, symbol sense is needed to solve algebraic problems and it is not known how to teach symbol sense systematically.

Sketching graphs

In his thesis, "Graphing formulas by hand to promote symbol sense: Becoming friends with algebraic formulas," Peter Kop explored how teaching graphing formulas by hand (i.e. sketching a graph of a formula) could promote grade 11 and 12 students' symbol sense. The GQR-design (Graphing formulas through recognition and qualitative reasoning),a series of lessons about graphing formulas, is based on expert research and pays explicit attention to recognition of basic function families and features, and to qualitative reasoning, that focuses on the global shape of a graph, with global descriptions and ignoring what is not relevant. These aspects get little attention in regular education, that often focuses on algebraic manipulation.

Symbol sense

Kop found that students improved their insight into formulas and found a positive correlation between students' abilities to graph formulas and their abilities to solve non-routine algebra problems with symbol sense. The students were able to use essential aspects of symbol sense, learned in the context of graphing formulas, such as taking a global view for recognition, qualitative reasoning, and questioning a formula, when solving algebra problems. Students themselves thought that they understood formulas better after the intervention.

In the future, when technology will take over the manipulation of algebraic formulas, symbol sense will become even more important. Graphing formulas could promote students' symbol sense in upper secondary school, and therefore deserves a prominent place in the mathematics curriculum.

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