

The Case for Teaching Mathematics Through Computing

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1. Computer programming provides a meaningful context for using mathematics. If our goals are no more ambitious than improving test scores on the existing math curriculum, we would teach kids to program. Much of the existing math curriculum has no application outside of computing or engineering contexts.
2. Programming requires a child to teach the computer how to perform at a formal/algorithmic level. Such “teaching” builds and reveals understanding.
3. Computer programming concretizes mathematical abstractions.
4. Debugging is a powerful 21st Century skill readily afforded by computing and essential to mathematical reasoning.
5. In 1989, the National Council of Teachers of Mathematics stated that “50 percent of mathematics has been invented since World War II.” That’s the result of computation and the social sciences’ demand for number. Barely any of that new mathematical knowledge is made available to students in a non-computational context.
6. New branches of mathematics are made accessible to children via computer programming.
7. Mathematics is a way of making sense of the world and computing is how mathematics is made.
8. Computing allows children to be mathematicians, develop the intellectual habits of mathematicians, and do mathematics, rather than just being taught school math.
9. Computing makes project-based learning possible in “math class.”
10. No pedagogical innovation of the past century has had a significant impact on math education. That stasis is ultimately corrosive to the entire educational enterprise. Computing changes that.
11. Children are motivated by computing and therefore willing to engage in activities that develop mathematical knowledge.
12. The noted mathematical and scientist Stephen Wolfram points out that every discipline X, currently or will soon have a branch called, *Computational X*. That field will be on the frontiers of the discipline and in vocational terms represent the most lucrative career options.
13. Using CS as a way of teaching mathematics creates opportunities to explore multiple sets of educational standards simultaneously.
14. We spend several years teaching children to be cheap imitations of a \$2 calculator. Computing changes this by shifting agency to the learner. When you make simple things easy to do, you make complexity possible.
15. The sum is greater than the parts. Teaching mathematics and computer programming simultaneously or teaching mathematics through computer programming is practical and efficient. Students learn mathematics and computer science better together. This approach may also inspire teachers to reconsider long-standing practices and serve as a basis for more wholesale school reform.

Contact Gary Stager (gary@stager.org) for minds-on school professional development and consulting. His expertise includes computer programming, physical computing, electrifying children’s mathematics, project-based learning, 1:1 computing, and the Reggio Emilia approach. Learn more at professorgarystager.com.