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Math 303
October 8, 2010

Appropriate Use of Technology in Math Instruction

Technology has an important place is today's classroom. The NCTM standards even state that technology is "essential to teaching and learning mathematics" (NCTM Principles and Standards, p. 11). At first glance, society might fear that technology threatens to displace thinking—that technology is just an expensive crutch. However, experience shows that when used properly, technology (such as calculators and computer software) actually helps students learn math better than they would without those tools. In addition, computers can make math more accessible to students from diverse backgrounds and with a variety of abilities. Most of all, when teachers integrate computers into math instruction, they are being faithful to their obligation to prepare students to live successfully in a world that is saturated with technology.

Technology should have a prominent place in math instruction, as long as there is a real instructional purpose for it. Technology for its own sake is counterproductive. The push in the 1990s to plug every classroom into the internet seemed overzealous, as though the mere presence of the computer would make kids smarter. If teachers can barely create a suitable task that involves a calculator or other form of technology, the class is probably better off with more traditional instruction. As stated in the NCTM Principles and Standards, "Technology should not be used as a replacement for basic understandings and intuitions" (p. 25). What kind of teaching can be enhanced by technology? There will always be a need for drill and practice, especially at the

elementary grades. At their most basic level, computer programs and calculators offer easy ways to practice basic math facts that are more fun and interesting than many traditional forms or drill and practice. These tools help children develop number sense.

But technology can help with much more than drill and practice. Calculators and computer software can free up students' time and mental energy to for higher-level processes. Teachers who use technology as part of problem-based lessons can lead students to discover some concepts they would probably not discover any other way. For example, geometry software from *Navigations* allows students to explore shapes more fully than is possible with physical manipulatives (e.g., slicing a 3-D shape). Another example is the computer's ability to graph expressions instantaneously so that students can quickly understand the effects of manipulating a variable.

Math instructional technology can reach students who might otherwise flounder in a math class. Pedagogically sound and engaging software can help improve students' dispositions toward and math. Computers often serve students with disabilities very well (e.g., Virtual manipulatives are more accessible to students with mobility problems). Some instructional software can even provide customized ELL support. Instructional software adapts to students' changing abilities. In this sense, technology is a great equalizer and a real boon for students from disadvantaged backgrounds. When selecting technological tools, educators have much to consider. Along with pedagogical concerns (e.g., ease of use, content not obscured by frills), educators must account for biases in technology. Educators must ask many questions before buying software. Are the scenarios appealing to children of both sexes and many cultures? Do girls relate

differently to technology than boys? The American Association of University Women released the following statement:

> Girls have developed an appreciably different relationship to technology than boys … and technology may exacerbate rather than diminish inequities by gender as it becomes more integral to the K–12 classroom… More boys have and use technological tools and toys. Boys more often perceive themselves as going into careers, such as engineering, that require technology like calculators and computers. They can envision a payoff for learning to use these tools. We need to be sensitive to past and present inequities when structuring opportunities for all children.

If teachers strive to account for such biases, their classrooms stand to gain a great deal by embracing drawing programs, graphing tools, spreadsheets, probability tools, and the like.

Today's society demands that students be mathematically and technologically literate. Whether or not students pursue higher education in a math-related field, successful daily living requires competence in dealing with math-related technology. Preparing students means helping them become very comfortable with technological tools, and this requires classroom time.

Technology by itself is not the answer. It is certain that no matter what inventions come along, "the effective use of technology in the classroom depends on the teacher" (NCTM Principle and Standards p. 25). But if *effective* teachers know how to use technological tools *well*, students will truly understand math. Students of all backgrounds will be able to progress in their math classes, and all students will be prepared to live a technologically-driven society.