

## Strategic Use of Technology in Teaching and Learning Mathematics

A Position of the National Council of Teachers of Mathematics

### Question

What is strategic use of technology in the teaching and learning of mathematics?

#### NCTM Position

Strategic use of technology in the teaching and learning of mathematics is the use of digital and physical tools by students and teachers in thoughtfully designed ways and at carefully determined times so that the capabilities of the technology enhance how students and educators learn, experience, communicate, and do mathematics. Technology must be used in this way in all classrooms to support all students' learning of mathematical concepts and procedures, including those that students eventually employ without the aid of technology. Strategic uses support effective teaching practices and are consistent with research in teaching and learning.

Strategic use of technology strengthens mathematics teaching and learning (Dick & Hollebrands, 2011). Strategic use does not imply continuous use of technology. Rather, it refers to teacher and student use of technology tools as determined through decision making that keeps mathematics, and not technology, as the focus of instruction. As they make choices about technology use, teachers and curriculum developers capitalize on capabilities of available tools and attend to possibilities presented by emerging technology, while maintaining a focus on mathematics learning goals, considering instructional settings, and responding to learners. Strategic uses are not limited to those required for external assessments but also include uses of technology to develop students' by-hand procedures.

Strategic use applies to both content-specific and content-neutral technological tools and in both synchronous and asynchronous settings. Content-specific mathematics technologies include computer algebra systems; dynamic geometry environments; interactive applets; handheld computation, data collection, and analysis devices; and computer-based applications. Content-neutral technologies include communication and collaboration tools, adaptive technologies, and Web-based digital media.

Used strategically, content-specific mathematics technologies support students in exploring and identifying mathematical concepts and relationships. Effectively applied content-neutral technologies increase students' access to information and ideas and enhance student–student and student–teacher interactions to support and enrich sense making. Strategic use of technological tools can support learning of mathematical procedures and skills as well as the development of advanced mathematical proficiencies, such as problem solving, reasoning, and justifying (e.g., Gadanidis & Geiger, 2010; Kastberg & Leatham, 2005; Nelson, Christopher, & Mims, 2009; Pierce & Stacey, 2010; Roschelle et al., 2009, 2010; Suh & Moyer, 2007).

Teachers are orchestrators and coaches of strategic use, and curriculum plays a critical role in achieving strategic use of technological tools (King-Sears, 2009; NCTM, 2014; Roschelle et al., 2010; Suh, 2010). Teachers and curriculum developers must be knowledgeable decision makers, skilled in determining when and how technology can enhance students' learning (International Society for Technology in Education, 2008). Programs in teacher education and professional development must continually support practitioners in their development of knowledge of technology and its application to support learning.

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