



Preparing Teachers to Use Technology to Enhance the Learning of Mathematics

A Position of the Association of Mathematics Teacher Educators

AMTE POSITION

The Association of Mathematics Teacher Educators (AMTE) supports the National Council of Teachers of Mathematics' (NCTM) Technology Principle: "Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning." Mathematics teacher preparation programs must ensure that all mathematics teachers and teacher candidates have opportunities to acquire the knowledge and experiences needed to incorporate technology in the context of teaching and learning mathematics.

- *What is meant by the use of technology in the context of teaching and learning mathematics?*

Technology in this context includes computers with appropriate mathematical software, Internet and other digital resources, handheld computing tools and their extensions, and future and emerging forms of similar devices and applications. Technology can be used in a variety of ways to improve and enhance the teaching and learning of mathematics. It can be used to facilitate mathematical discovery, understanding, and connections that may be difficult or impossible without its use. The computational and graphical capabilities of current technologies enable users to efficiently generate and manipulate a variety of representations of mathematical ideas and processes. Activities that engage students in connecting multiple representations (e.g., graphical, numerical, algebraic and verbal), and those that invite students to analyze or create images, visualizations, and simulations provide wide-ranging opportunities for mathematical exploration and sense-making. Instruction that takes full advantage of what technology has to offer can encourage, foster, and support students' construction of mathematical knowledge in a variety of ways. Technology can also improve mathematical communication, facilitate more efficient use of mathematical resources, and raise the quality of mathematical products and presentations.

- *What is AMTE's position on the preparation of mathematics teachers to teach with technology?*

AMTE recognizes that technology has become an essential tool for doing mathematics in today's world, and thus that it is essential for the teaching and learning of mathematics. For

mathematics teacher candidates to be able to implement appropriate uses of technology in the teaching of K-12 mathematics they should have:

- a deep, flexible, and connected conceptual understanding of K-12 mathematics that acknowledges the impact of technology on what content should be taught;
- a research-based understanding of how students learn mathematics and the impact technology can have on learning;
- a strong pedagogical knowledge base related to the effective use of technology to improve mathematics teaching and learning; and
- appropriate experiences during their teacher preparation program in the use of a variety of technological tools to enhance their own learning of mathematics and the mathematical learning of others.

By the completion of their preparation, new mathematics teacher candidates should be able to:

- demonstrate flexibility with high-quality and creative instructional techniques, both with and without technology, to help students explore and learn mathematics, develop mathematical thinking and communication abilities, and solve complex real-world problems;
- understand, by reflecting on how technology affords and constrains student actions and thoughts, when and how use of technology can advance learning and critical thinking, and when it can hinder the mathematical development;
- efficiently troubleshoot technology difficulties in both student and teacher use; and
- incorporate a variety of assessment techniques, including the use of technology to evaluate students' understanding of important mathematical concepts.

With the needs of future teachers of mathematics in mind, mathematics teacher educators should provide opportunities for teacher candidates to strengthen their knowledge of how to incorporate technology to facilitate student learning of mathematics through experiences that:

- allow teacher candidates to explore and learn mathematics using technology in ways that build confidence and understanding of the technology and mathematics;
- model appropriate uses of a variety of established and new applications of technology as tools to develop a deep understanding of mathematics in varied contexts;
- help teacher candidates make informed decisions about appropriate and effective uses of technology in the teaching and learning of mathematics; and
- provide opportunities for teacher candidates to develop and practice teaching lessons that take advantage of the ability of technology to enrich and enhance the learning of mathematics.

If technology is used to improve the learning of mathematics at all levels, students will be better prepared to use technology appropriately, fluently, and efficiently to do mathematics in the techno-rich environments in which they will study and work in the future.

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