EMTP 3 - Use and Connect Mathematical Representations

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According to NCTM, “effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.”

A student’s ability to solve math problems often comes down to how well they can move within and between different representations of the mathematics. Good problem solvers can see connections between diagrams, equations, and physical models. Research shows that this ability is crucial for deep understanding and effective problem-solving. Teachers should select or design tasks that allow students choice in how to represent and solve problems, encouraging creativity, flexibility, and ownership of their learning.

Students need opportunities to visually explore mathematics in different ways and make connections between those representations. For example, they might start with a diagram to understand a concept and then use an equation to solve the problem. This process strengthens students’ understanding of the concept and can help them justify their reasoning.

Teachers need to be intentional about highlighting connections between representations that students may not see on their own. They may do this by asking questions that prompt students to notice similarities and differences when comparing their thinking to another student’s. A teacher might ask: “Where do you see your solution in Manny’s work?” or “Where do you see the tens and hundreds in these two representations?”

Teachers can model ways to examine different representations with students. A teacher might pose a problem and then share three different representations and ask, “which of these representations best fits the situation? Why?” This allows students to think critically about the different representations they could choose to solve a given problem. This flexibility in moving within and between representations fosters adaptability and strengthens problem-solving skills.

When students are empowered to explore, choose, and move fluidly between different representations they deepen their conceptual understanding and develop the confidence and flexibility needed to tackle new problems.