

KATM Board Position Statement: High-Quality Mathematics Instruction

KATM Board¹

Abstract: In this position statement, the Kansas Association of Teachers of Mathematics (KATM) Board articulates a vision of high-quality mathematics instruction that requires more than direct instruction. While acknowledging the value of direct instruction, we caution against prioritizing procedural fluency at the expense of conceptual understanding and meaningful mathematical engagement. Instead, mathematics education must extend beyond computation and procedural skills to develop students' conceptual understanding, reasoning, and problem-solving abilities. We advocate for research-based instructional practices that center student thinking, inquiry, collaboration, and flexible problem-solving. We call for a shared vision of mathematics education that supports teachers and empowers all students as mathematical thinkers.

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The Kansas Association of Teachers of Mathematics (KATM) brings forth this statement to highlight the need for mathematics education stakeholders (e.g., policymakers, administrators, educators, and parents) to find common understanding about best practices for teaching and learning mathematics. Our recommendations are grounded in a large body of research describing mathematics teaching, learning, and the nature of mathematics itself—a field characterized by abstract concepts, logical reasoning and deduction, creative problem solving, and far-reaching applications. Importantly, the Kansas Mathematics Standards not only focus on what students

need to *know* (content standards), but also incorporate what students should be able to *do* (practice standards). Accordingly, we advocate for instruction that reflects the progress the field of mathematics education has made in understanding the rich nature of effective instruction and how teachers and students learn best.

Mathematics is more than computing and finding answers to problems. We echo mathematicians and mathematics education researchers to call for a broad view of mathematics that includes reasoning, sense-making, problem-solving, and creative exploration. While explicit and systematic

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instruction can be valuable—especially for students with disabilities, and for summarizing inquiry, interventions, or reteaching—it is insufficient on its own for building rich knowledge for the broader population of learners. Indeed, while the Science of Math movement, often spearheaded by special education scholars, has rightly highlighted the importance of explicit instruction for students with learning disabilities, we advocate that explicit instruction should not be the first or sole instructional approach in Tier 1 instructional settings. We caution against proposed frameworks that emphasize early procedural fluency and standardized skill benchmarks that potentially lead teachers to overemphasize speed or rote learning at the expense of reasoning, problem-solving, and conceptual understanding—knowledge and skills essential for navigating today’s world. We support a more balanced approach that ensures students develop procedural fluency *from* deep understanding of mathematical concepts, along with the ability to apply them meaningfully and build on prior understanding to deduce new knowledge.

We know that all students can understand, apply, and retain important mathematics through effective learning opportunities; and teachers need opportunities to stretch their pedagogical approach with research-based and inquiry-oriented instructional techniques. As such, students should have opportunities to actively engage with quantities, examine relationships among quantities, identify patterns to gain insights into abstract concepts, and apply logical reasoning and deduction to form new understandings. Instruction should support students to make connections among mathematics concepts and skills. Algorithms and procedures should be understood and taught in ways that can be explained conceptually and not just applied blindly

without connections. Additionally, instructional activities should explore problems that promote connections between mathematics and the world around us, often grounded in ways that support personal agency and community problem solving. Through such instruction, students not only learn mathematics but also develop the positive mathematical dispositions and identities that are also tied to mathematical proficiency.

We do not advocate for these learning opportunities at the expense of procedural fluency and skill development, but resist the notion that fluency only means procedural skill and instant recall of facts. Rather, we acknowledge procedural fluency that encompasses efficiency, flexibility, and accuracy—where students can select appropriate strategies, solve problems in a reasonable amount of time, trade out and adapt strategies, apply strategies to new problem types, complete steps accurately, and get correct answers—all of which require conceptual understanding and knowing more than one way to solve a problem. When teachers introduce and model a particular way to address and solve a problem, students often think that way is the *only* way to understand and solve that type of problem. Alternatively, teachers can invite students to consider a problem and apply their conceptual understanding to formulate a solution. Students may not initially select the most efficient methods, but their solutions will be rooted in their own thinking, strengthening their developing understanding. In fact, seeking multiple solutions to problems is a hallmark of what mathematicians do. We trust that teachers and students work towards the goal of procedural fluency with understanding, but starting at procedural fluency is not the only way to get to understanding and often is not the most efficient for long-term memory.

Instead, understanding relies on connections among concepts and processes, which develop iteratively when students explore problems with guidance and support but not rigid direction.

With the amount of turnover and attrition the teaching profession faces, we must allow our teachers to grow as we allow our students to grow. We acknowledge and appreciate the aims and intentions of initiatives like the Science of Math. However, moving well-established instructional strategies designed for Tier II and Tier III settings to Tier I (general education) settings is not aligned with the research-base around effective mathematics teaching. Furthermore, we acknowledge that teaching and learning math is important and challenging work that develops with professional learning opportunities and practice. Module-based professional development can be impactful and efficient for reaching areas of the state outside of hubs. Evidence demonstrates that teachers benefit more from practice-based professional development and sustained professional learning communities that focus on refining and expanding their pedagogical approach through activities such as book studies and lesson studies. We must give our teachers time to plan, grow, and learn together in collaborative ways that model what we aim to see across Kansas classrooms.

As our state grows in advantageous ways towards improving mathematics education, we understand that developing mathematics knowledge does not happen in the same way for all learners. Therefore, we advocate for instruction that appeals to learners with various learning needs so that all students can become mathematically literate. Below, we identify key priorities shared across the field of mathematics education as means to build a shared understanding of the phrase “high-

quality mathematics instruction” across general and intervention settings:

Active Engagement

Students should be actively engaged in learning experiences, not merely passive receivers of information. Learning should be driven by curiosity, exploration, and investigation. Teachers should act as facilitators, posing open-ended questions, providing resources, and guiding students to apply creativity, logical reasoning, and deduction to solve problems and construct shared understandings.

Prioritize Student Thinking and Discourse

Lessons should be learner-centered and accessible to different types of learners. Teachers should prioritize ways to anticipate and uncover student thinking through purposeful problems and questioning. Group and class discussions should invite students to ask questions, share their ideas, refine their thinking, and critique the reasoning of others. For example, teachers can use “Number Talks” across K-12 education to encourage students to share their strategies for solving problems and engage in mathematical discourse. Cognitively demanding tasks should be focal and facilitated using the *5 Practices for Orchestrating Productive Mathematics Discussions*.

Multiple Methods

Teachers and students should celebrate creative and invented approaches to solving problems, acknowledging the advantages of efficiency with understanding. Students should observe and enact multiple methods as they learn to operate with numbers, analyze shapes, construct and graph functions, and engage in data literacy. Students who practice modeling and reasoning about quantities and operations develop flexible number sense and confidence to tackle new problems.

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Multiple Representations

Students should explore multiple representations of mathematical concepts prior to and alongside learning computational or algebraic processes. As often as possible, students should experience new ideas concretely, then visually, and then symbolically, having opportunities to verbally explain concepts and frame problems within real-life scenarios or stories during this process. In this work, *concrete representations* are the physical objects including cubes and tiles, students *semi-concrete* or *visual representations* include drawings, sketches, graphs, number lines, and *abstract representations* are the numerals, variables, symbols used in mathematics. Instruction that incorporates multiple representations appeals to all students, particularly those who have varied learning preferences and background knowledge, by offering multiple lenses through which they may make sense of the focal mathematics in a lesson.

Mathematical Reasoning

Instruction and assessments should prioritize valid mathematical reasoning over rote memory or skill performance, while not dismissing the ways in which recall and correctness are needed. Today, we have a myriad of technologies to compute and find answers, so we need humans to focus on analyzing and reasoning about problems and understanding the reasonableness of such answers through number sense. Therefore, mathematics instruction should help students develop as mathematical thinkers who can collaborate and communicate to explain their reasoning and work toward solutions. Lessons should focus on interesting, place-based problems that require mathematical reasoning and skills. Research confirms that students who learn skills in the context of interesting problems are more motivated and

more likely to retain skills than students who study skills separately from interesting problems.

Asset-based Instruction

Asset-based instruction recognizes the knowledge, strengths, talents, and experiences students bring to the learning environment. Students share their thinking, and teachers help students build on their prior knowledge to construct new understandings and increase their skills. Lessons should incorporate culturally relevant tasks that leverage students' funds of knowledge and are connected to real-world contexts. For example, students who work with small gas engines with their parents (in landscaping with a lawnmower or recreation with a motorbike), may already know about ratios from having to mix gas and oil for these small engines. Rather than assuming that they know nothing about the importance of a ratio, understanding their existing knowledge and leveraging it for more sophisticated contexts both honors their existing knowledge, the out-of-school mathematical understandings they already have, and provides a touchstone for continued learning.

Collaboration

Students should work on mathematics together. They should discuss their thinking about problems, listen to others' thinking, and develop their skills to communicate about mathematics. Teachers and students should explain their own understandings and expand their own patterns of thinking based on what they learn from others.

Fostering Positive Math Identities

Instruction should explicitly address the affective domain by fostering positive attitudes, beliefs, and identities related to mathematics. This includes creating inclusive classroom environments, promoting growth mindsets, addressing math anxiety, and

showcasing the diversity of mathematics and mathematical ideas.

Conclusion

Teaching is a complex endeavor, and we trust that teachers are professionals who have a stake in their students' futures and the futures of their community and our state as they make instructional decisions. *High-Quality Mathematics Instruction* requires a multifaceted approach that goes beyond explicit and systematic instruction. By prioritizing conceptual understanding, meaningful inquiry, aligning instruction with students' assets, and intentionally balancing explicit instruction with other evidence-based strategies, we can empower all students to become confident, competent, and creative mathematical thinkers who are prepared to tackle the challenges our state will face in the 21st Century.

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