

Aurora Public Schools Mathematics Framework

Problem-Based Curriculum

"Mathematics teachers must teach students not only to solve problems but also to learn about mathematics through problem solving." (OME, 2005).

By posing an appropriate problem to the students and then allowing them to use their own ideas to craft solutions, teachers encourage students to do their own thinking.

Teachers:

- provide the appropriate tools for solving the problem
- give students opportunities to talk and write about their thinking
- ask guiding questions
- provide time to refine and reevaluate their processes.

"Teaching mathematics through problem solving is a method of teaching mathematics that helps children develop relational understanding . . . As children do mathematics – make sense of cognitively demanding tasks, provide evidence or justification for strategies and solutions, find examples and connections, and receive and provide feedback about ideas – they are simultaneously engaged in the activities of problem solving and learning." (Van de Walle, 2014)



Standards for Mathematical Practice

We seek to develop the following in all of our students:

- 1: Make sense of problems and persevere in solving them
- 2: Reason abstractly and quantitatively
- 3: Construct viable arguments and critique the reasoning of others
- 4: Model with mathematics
- 5: Use appropriate tools strategically
- 6: Attend to precision
- 7: Look for and make use of structure
- 8: Look for and express regularity in repeated reasoning (CCSM)

Colorado Academic Standards

Common Core Standards are embedded in the Colorado Academic Standards

"Standards are written for mastery. The proposed revisions to standards define mastery of concepts and skills. Mastery means that a student has facility with a skill or concept in multiple contexts. This is not an indication that instruction at a grade level expectation begins and only occurs at the grade level. Maintenance of the previously mastered concepts and skills and scaffolding future learning are the domain of curriculum and instruction – not standards." (CDE, 2010)



Philosophy and Core Beliefs

Mathematics education in the Aurora Public Schools is founded on high expectations, equity, and support to accelerate all students. The following core beliefs drive decisions about teaching and learning.

- Teachers have a powerful, long-lasting influence on students' learning.
- Every student should believe that mathematics makes sense.
- Problem solving develops "mathematical power."
- When students learn in the context of solving problems, their concepts and procedures develop together and remain connected in a natural and productive way.
- Assessment, instruction, and standards are inseparable.

The instruction is coherent, rigorous and focused on standards-based mathematics.



Procedural Fluency

Memorizing procedures without the underlying development of understanding can lead to a cycle of memorizing and forgetting that can continue for years. Students who understand mathematics can reconstruct meaning in new situations.

"Wherever the word fluently appears in a content standard, the word means quickly and accurately. It means more or less the same as when someone is said to be fluent in a foreign language. To be fluent is to flow: Fluent isn't

halting, stumbling, or reversing oneself. A key aspect of fluency in this sense is that it is not something that happens all at once in a single grade but requires attention to student understanding along the way. It is important to ensure that sufficient practice and extra support are provided at each grade to allow all students to meet the standards that call explicitly for fluency." (PARCC)

"There are many good teaching strategies for encouraging fluency in math, but the ones that are effective are those that simultaneously develop number sense—the flexible use and understanding of numbers and quantities—without instilling fear and anxiety. Strategies that involve reasoning about numbers and operations, such as the pedagogical approach called "number talks," are ideal for developing fluency with understanding." (Boaler, 2012)