

"[The Ontario Mathematics Curriculum] is based on the belief that students learn mathematics most effectively when they are given opportunities to investigate ideas and concepts through problem solving and are then guided carefully into an understanding of the mathematical principles involved. At the same time, it promotes a balanced program in mathematics. The acquisition of operational skills remains an important focus of the curriculum."

The Ontario Curriculum, Grades 1-8, Mathematics, p.4

Balanced Mathematics Instruction, K-12

"Today's mathematics curriculum must prepare students for their future roles in society. It must equip them with an understanding of important mathematical ideas; essential mathematical knowledge and skills; skills of reasoning, problem solving, and communication; and, most importantly, the ability and the incentive to continue learning on their own."

The Ontario Curriculum, Grades 11 and 12, Mathematics, p.4

Attitudes to Math

A growing body of research (e.g., Dweck, Boaler, et. al.) demonstrates that the beliefs that educators and students have about math is critical to student achievement in math.

We believe that all students can learn math. We believe that all teachers are numeracy teachers in the same way that all teachers are literacy teachers. We believe that effective math instruction promotes risk-taking, perseverance, and confidence. We believe that effective math instruction makes connections across disciplines. We believe that math instruction must support all pathways.

"Students who believe that intelligence or math and science ability is simply a fixed trait (a fixed mindset) are at a significant disadvantage compared to students who believe that their abilities can be developed (a growth mindset)." (Carol Dweck, "Mindsets and Math/Science Achievement")

Approaches to Instruction/Assessment

Teachers design math instruction/assessment to support learners in achieving the expectations of The Ontario Curriculum.

A comprehensive mathematics program includes a variety of instructional/assessment approaches in rich learning contexts, and focuses on the development of conceptual and procedural understanding, skill development and problem-solving. A balanced program begins with the learner profile and includes guided/direct instruction, as well as opportunities for student inquiry in which students generate their own solutions. A variety of groupings for collaborative learning with peers as well as time for independent learning are essential.

Key Transformational Practices (e.g., 3-Part Lesson) are used in all math classrooms.

"Students in a mathematics class typically demonstrate diversity in the ways they learn best. It is important, therefore, that students have opportunities to learn in a variety of ways." (The Ontario Curriculum Grades 9 and 10, Mathematics, p.23)

Teaching Through Problem Solving

Teaching through problem solving is not the same as solving word problems. When students engage in problematic situations, they become curious; motivated to explore and generalize mathematical ideas. Problems are carefully selected and differentiated to be accessible yet challenging for all students.

"[Problem solving] can be used as the means of introducing concepts rather than simply engaging students in applying or practicing mathematical procedures." (The Report of the Expert Panel on Mathematics in Grades 4-6, p.11)

A problem solving approach also develops what Fullan characterizes as a vitally important 21st century teaching and learning skill. Students must engage in "Critical thinking and problem solving...[to] think critically to design and manage projects, solve problems, make effective decisions using a variety of digital tools and resources." (Great to Excellent, p. 9)

Purposeful Practice

A balanced math program provides opportunities for students to practice and consolidate skills and procedures.

Purposeful practice strengthens the connection between skills, concepts, strategies and thinking. It improves speed and accuracy and helps students remember concepts, facts and procedures.

Once conceptual understanding has been established, purposeful practice helps students develop computational and procedural fluency.

"Children need time to practise and consolidate skills, balanced with time to put those skills to use in a problem solving context." (The Report of the Expert Panel on Early Math in Ontario, p.31)

The important thing is that practice is purposeful and responsive to each individual student's needs.

A balanced math program uses games effectively to facilitate purposeful, responsive, and individualized practice.

Basic Facts and Operational Skills

Operational skills and basic facts are important because they support efficiency and the ability of students to judge the "reasonableness" of a solution in mathematics. Therefore, students are expected to master basic facts and operational skills. The Transformational Practice "Teaching Basic Facts and Operational Skills" is a key starting point for planning instruction/assessment.

Operational skill is more than fast recall on math drills. It involves understanding why a fact or procedure makes sense and how it connects to other concepts and skills. Students use mental math to calculate, estimate, and visualize math concepts and strategies. When students develop both fluency and understanding, skills become tools to help them solve problems.

"Skills and understanding are especially critical when tackling challenging problems." (C. Sealy, Balance is Basic in Faster Isn't Smarter, 2009, p.2)

Purposeful Use of Resources

A variety of resources and tools are used to engage students and support learning. Resources and tools are selected thoughtfully, informed by curricular expectations and responsive to student learning needs.

Manipulatives (i.e., thinking tools), technology, media, textbooks, and professional materials (e.g. Guides to Effective Instruction, TIPS, Edugains.ca) are all valuable resources. Using a resource purposefully is different than following the resource lesson by lesson.

"Manipulatives...are central to effective instruction and have the capacity to greatly improve and deepen student understanding." (The Report of the Expert Panel on Mathematics in Grades 4-6, p. 25)

The important thing is that any resource or tool is used purposefully to respond to the needs of the learner.



A comprehensive math program balances skills, concepts, strategies, and thinking.