

GREATER ESSEX COUNTY DISTRICT SCHOOL BOARD

The Basics about Back to Math Basics

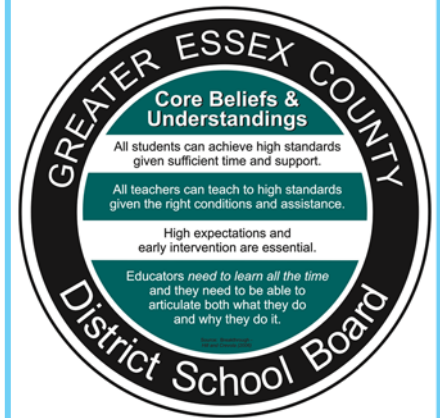
The GECDSB believes that the current challenge for educators is teaching mathematics that is rooted in, but not limited to, the “basics.” Although mathematics has a practical value as a life skill, it is also applied to an array of other disciplines and is a creative and abstract science of numbers, space, and relationships between objects. The current paradigm of mathematics education must to be grounded in a definition of *mathematical proficiency* and our conversations need to extend beyond fundamentals and aim toward excellence.

The Greater Essex County District School Board provides mathematics education that engages and empowers students through collaboration, communication, inquiry, critical thinking, and problem-solving, to support each student’s learning and nurture a positive attitude towards mathematics.

GECDSB, A Vision for Mathematics, 2016

The purpose of these learning briefs is to share the research, discussion and insight garnered from the intensive work of the Greater Essex County District School Board’s Math Task Force. These papers are rooted in the GECDSB core beliefs, the Full-Day Early Learning-Kindergarten program and the Ontario Mathematics Curricula for grades 1-8, 9-10, and 11 & 12. The briefs are meant to elevate, enrich and extend the discourse of mathematics education with the intention of encouraging a positive and productive disposition toward mathematics for all learners.

Each paper provides a list of sources to extend the professional conversation and enhance the learning. In addition, live links appear at the end of the papers with connections to various resources.



THE BASICS ABOUT BACK TO MATH BASICS

We agree: math is everywhere and plays an important role in our lives. Basic understanding of mathematics is essential, and a necessary function of our schools is to prepare children with these foundational concepts and skills. The National Research Council's publication, *Adding it Up: Helping Children Learn Math*, articulates that, "(mathematics) is so much a part of modern life that anyone who wishes to be a fully participating member of society must know basic mathematics" (NCTM, 2001, p.15). In addition, a range of literature has demonstrated that early numeracy skills are a significant predictor of later academic achievement: perhaps even greater than early literacy skills (Duncan, Dowsett, Claessens, Magnuson, Huston, Klebanov, Pagani, Feinstein, Engel, Brooks-Gunn, Sexton, Duckworth, & Japel, 2007).

There is little argument that success in mathematics is imperative for 21st century learners, and most would agree that proficiency implies a foundation of basic mathematics. Yet the 'back to basics' argument continues in popular media, distracting public discourse from the deeper and significantly more complex issues of 21st century mathematics teaching and learning. Although teaching 'the basics' is a function of our schools, the real challenge for educators is teaching mathematics that is rooted in, but not limited to, 'the basics'. The current paradigm of mathematics education must be grounded in a definition of *mathematics proficiency* and our conversations need to extend beyond fundamentals and aim toward excellence.

Defining Mathematical Proficiency

The experience that we understand best is our own. Our experiences with mathematics are shaped by our learning and in turn our learning shapes our experiences. Depending on who you ask, the question of 'what it means to do math' is answered three different ways and each of these explanations has implications for the teaching and learning of mathematics. The first description refers to mathematics as an

everyday skill. From basic banking to baking, we use mathematics to function in our everyday living. Although mathematics certainly has a practical value, there is significant danger in only defining mathematics as a 'life skill'. We do not define literacy as having a merely functional value. We expect students to develop an array of literacy skills that exceed a basic level. We believe that students should have access to rich texts with vivid discourse and critical thought. Why would we lower the bar for mathematics?

Mathematics is also distinct for its application to other disciplines, trades and professions. Modern areas of applied mathematics include medicine, business, technology, engineering and architecture as well as the sciences and others. Applied mathematics is not only relevant to most professions, it is crucial. People know and understand the math they experience in their professional lives, and sometimes reflect on this application as a definition of what it means to use and be skilled in mathematics.

Although both of these explanations are dimensions of math, they do not encompass the sum of mathematics as a creative, esoteric, abstract science of number and space. Mathematics is a rich and diverse discipline that dates to the beginning of recorded history. The goal of mathematics education should comprise this depth and richness. The Ontario Mathematics Curriculum states that:

Learning mathematics results in more than a mastery of basic skills. It equips students with a concise and powerful means of communication. Mathematical structures, operations, processes, and language provide students with a framework and tools for reasoning, justifying conclusions, and expressing ideas clearly (The Ontario Curriculum Grades 1-8: Mathematics, 2005).



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The History of School Mathematics

The question of 'what should be taught in schools' has sparked debate by education philosophers since the time of Plato. During the first half of the 20th century, mathematics skill focused on computational procedures of arithmetic. In the 1950s and 1960s, the focus of mathematics education began to shift to include the structures of mathematics. From this shift was born the 'back to basics' movement which is described in *Adding it Up*, as "a returning to the view that success in mathematics meant being able to compute accurately and quickly" (National Research Council, 2001, p. 115). This view of mathematics as simply arithmetic computations is incomplete and incompatible with the modern goals of education. Basic skills of mathematics are developed in service of the richness of mathematics, but they are not its entirety.

The authors of, *Adding it Up* indicate that "recognizing that no one term captures completely all aspects of expertise, competence, knowledge and facility in mathematics, we have chosen *mathematical proficiency* to capture what we believe is necessary for anyone to learn mathematics successfully." The Greater Essex County District School Board's, Vision for Mathematics is based on the extensive evidence in mathematics education research that identifies five interdependent skill-sets which work together in the development of mathematical proficiency (Figure 1). Each of these strands represents distinct and important aspects of the whole of what it means to be proficient in mathematics.

Mathematics for 21st Century Learning

In order to inform practices and policies for school mathematics it is imperative that we look beyond our personal experience and critically examine evidence provided by research. Our Ontario Mathematics Curriculum grounds us in this conversation and states:

An information- and technology-based society requires individuals who are able to think critically about complex issues, analyse and adapt to new situations, solve problems of various kinds, and

communicate their thinking effectively. The study of mathematics equips students with knowledge, skills, and habits of mind that are essential for successful and rewarding participation in such a society. To learn mathematics in a way that will serve them well throughout their lives, students need classroom experiences that help them develop mathematical understanding; learn important facts, skills, and procedures; develop the ability to apply the processes of mathematics; and acquire a positive attitude towards mathematics. (The Ontario Curriculum Grades 1-8: Mathematics, 2005)

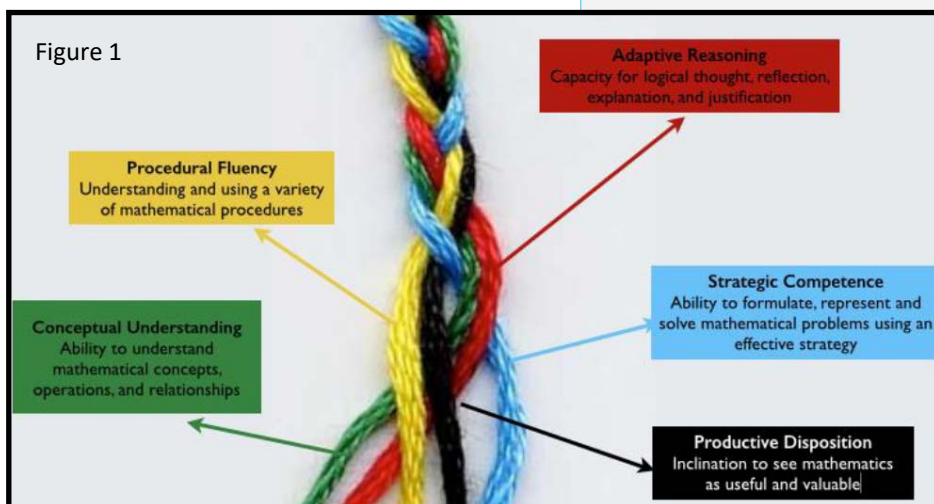
We educate for excellence! We must extend our discourse to honour the essence of mathematics because in every classroom sits an artist, writer, builder, scientist and mathematician. It is the fullness of the educational experience that reaches the heart of every learner. Our purpose as educators is not to count the limited prospects but to inspire the infinite possibilities.

If you deny students the opportunity to engage in this activity – to pose their own problems, to make their own conjectures and discoveries, to be wrong, to be creatively frustrated, to have an inspiration, to cobble together their own explanations and proofs – you deny them mathematics itself.

(Lockhart, 2009)

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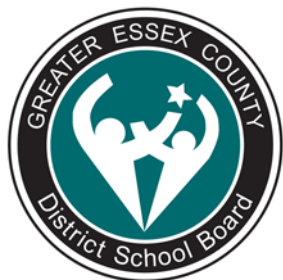


Greater Essex County District
School Board

451 Park Street West
P.O. Box 210
Windsor, ON
N9A 6K1

Phone: 519-255-3200
www.publicboard.ca

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LINKS

MARIAN SMALL—THE ART OF MATHEMATICS

<https://vimeo.com/103956482>

CATHY FOSNOT—BASIC FACTS OR CONCEPTUAL UNDERSTANDING: WE NEED BOTH

<https://vimeo.com/104110510>

DAN MEYER—MATH CLASS NEEDS A MAKEOVER

http://www.ted.com/talks/dan_meyer_math_curriculum_makeover

CHRIS SUURTAMM—PLANNING MOVES FOR TEACHERS

<https://vimeo.com/136750780>

CATHY BRUCE—MATH TALK

<https://www.youtube.com/watch?v=yplXNE4PRQQ>

CREATING CONDITIONS FOR MATHEMATICS LEARNING

<http://www.curriculum.org/k-12/en/projects/creating-the-conditions-for-learning-mathematics>

DAN MEYER—REAL WORLD MATH

<https://www.youtube.com/watch?v=jRMVjHjYB6w>