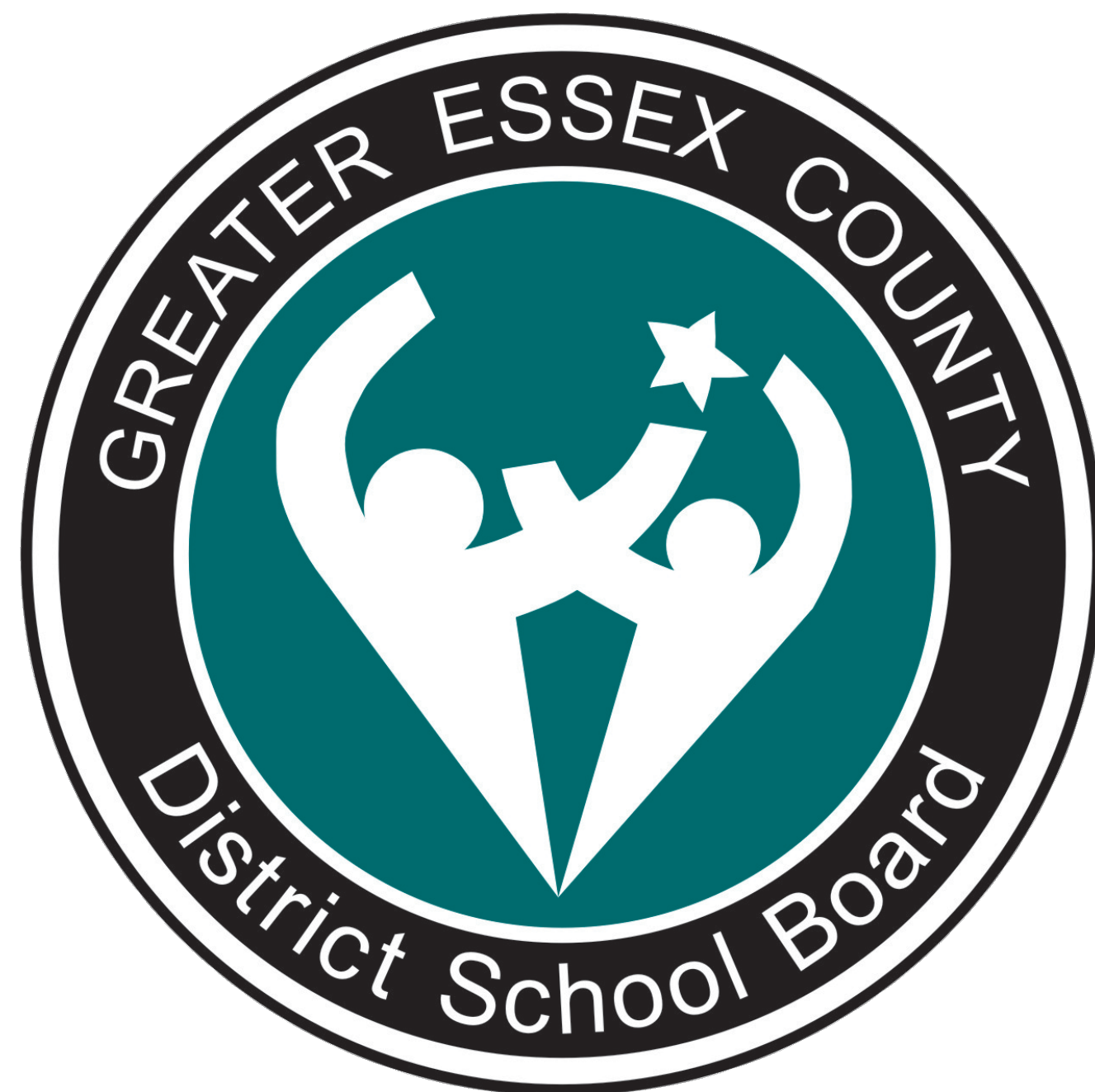


GUIDE

to the

MATH VISION



A Summary of the GECDSB
Mathematics Vision

Everyone can be successful using math!

We can all learn math. At the Greater Essex County District School Board, we believe that every student can become numerate just as they will become literate.

In the world our students are entering, understanding mathematics will be critical for their future success.

Learning Mathematics Is Important. Here's Why:

Mathematics is a way of thinking. Just as learning a new language develops thinking skills in the brain, so does learning and using mathematics.

Recognizing patterns and relationships. The world around us is full of patterns and relationships that we can make sense of through the use of mathematics in order to make better decisions and think creatively.

Number Sense and Flexibility. Building mathematical skills increases self-confidence and allows for thinking flexibly.

Career Opportunities. Not only does building skills and confidence in mathematics create critical thinking skills, but these skills are also a prerequisite for many of the jobs that will be available for students when they enter the workforce.



Mathematics Education Journey

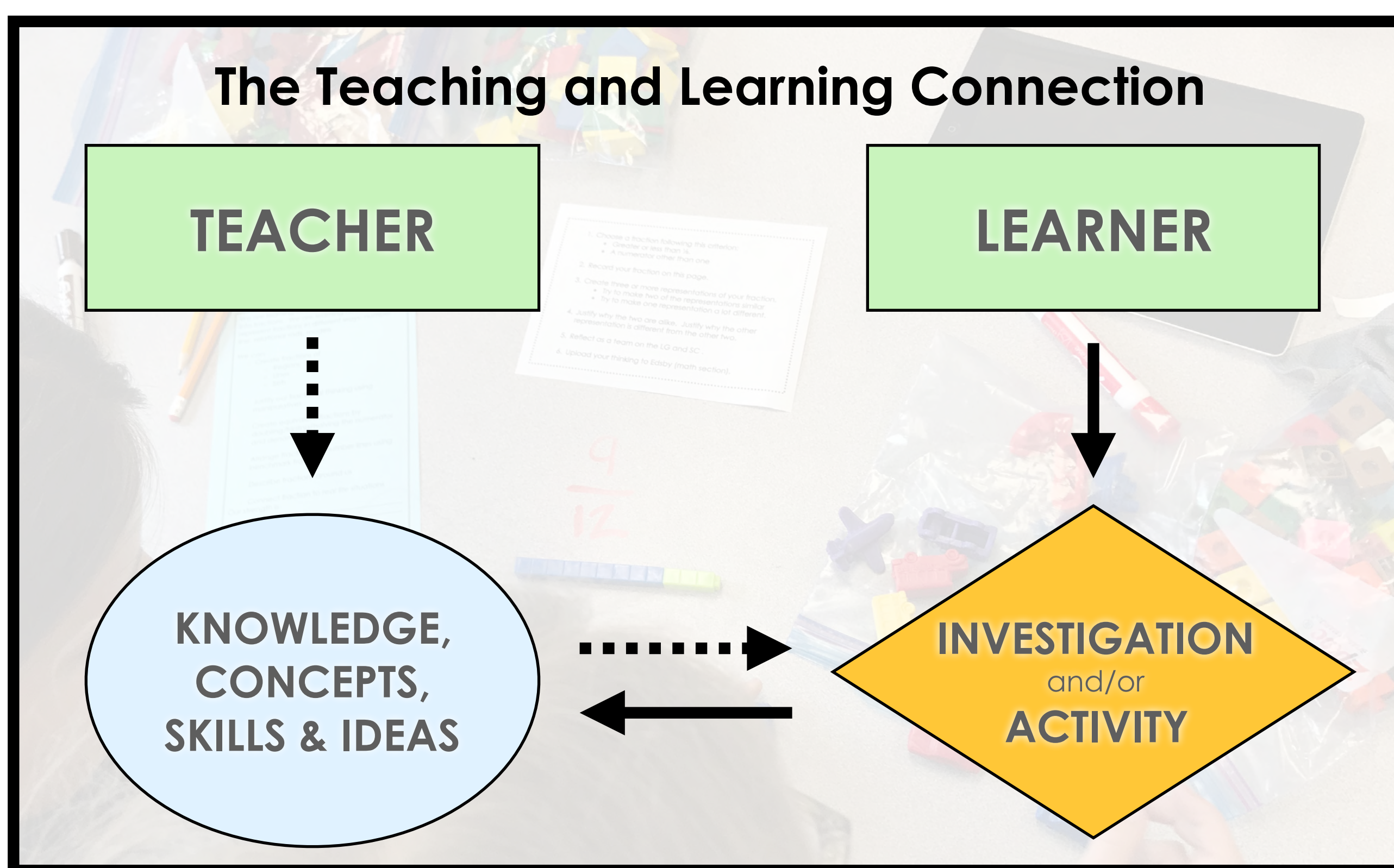
"I do and I understand, is an adage that applies nicely to mathematics."

Research tells us that young people learn best by using concrete materials, by playing, modelling and by visualizing mathematical concepts. "I do and I understand," is an adage that applies nicely to mathematics. It is very important that children become responsible for their own learning and that the environment of the mathematics classroom enhance the involvement of children in this learning.

We can provide students with a rich mathematical learning experience by teaching through engaging investigations and activities that provide opportunities for students to construct their own understanding of concepts and skills.

The Teaching and Learning Connection

Teaching and learning are one in the same; where there is teaching, there is learning. Many perceive effective teaching as an act of show and tell. However, providing an opportunity for students to inquire and investigate prior to explicitly modelling provides a deeper, more meaningful learning experience.



In order to provide children with opportunities to experience mathematics, teachers spend a significant amount of time planning investigations and activities that will connect to the new knowledge, concepts, skills and ideas outlined in the Ontario Mathematics Curriculum. Manipulative kits, with a large variety of materials, are provided for all teachers from Kindergarten through Grade 12 to access and integrate in their math program. Some of the common manipulatives used in our classrooms include arithmetic racks, square tiles, connecting cubes, 10-frames, base-10 blocks, relational rods and algebra tiles.

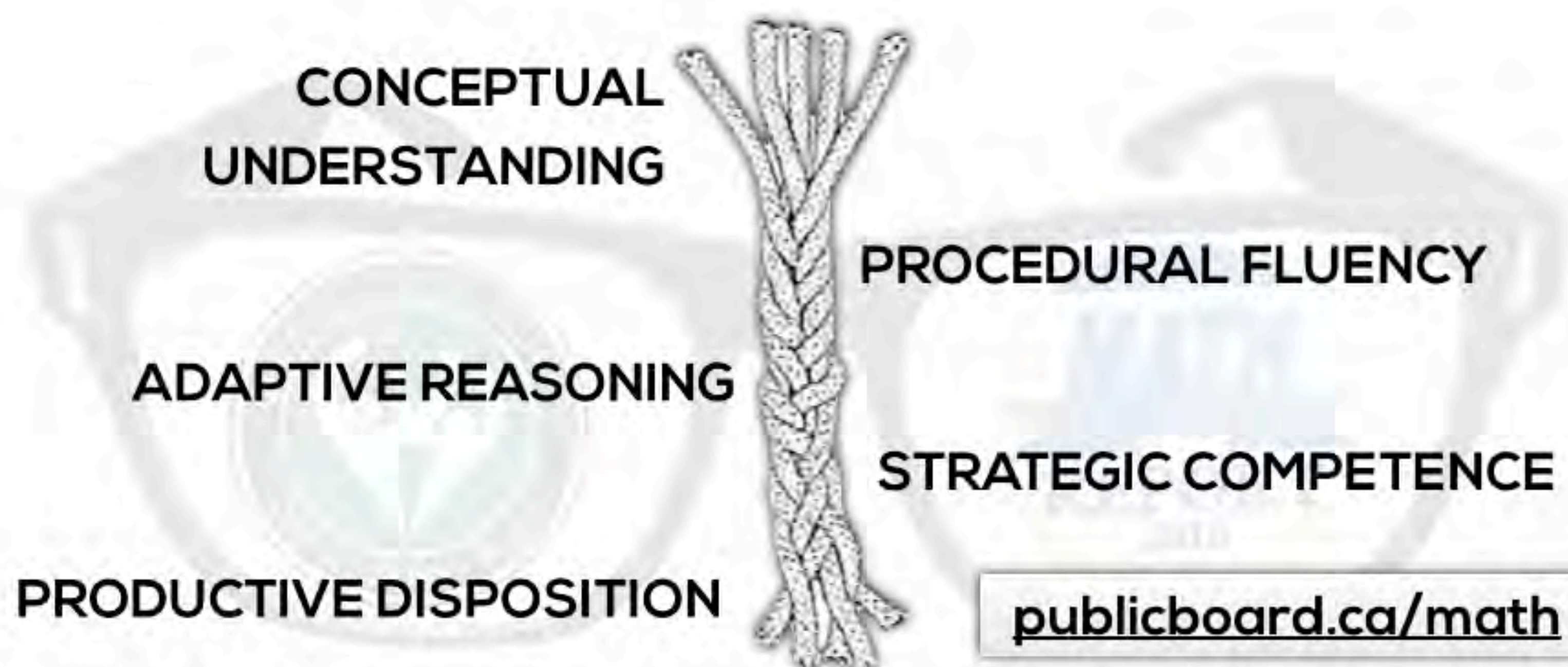
Through the use of these tools, we can help students build an understanding of mathematics first through **concrete** experiences, then using **visual/pictorial** representations and finally, using **abstract/symbolic** notation.

WHAT IS THE MATH VISION?

“To provide mathematics education that engages and empowers students through collaboration, communication, inquiry, critical thinking, and problem-solving in order to support each student’s learning and nurture a positive attitude towards mathematics.”

WE SEE THE MATH VISION THROUGH THE 5 MATHEMATICAL PROFICIENCIES

Our Mathematics Vision recognizes the 5 Mathematical Proficiencies as highlighted by the National Research Council (NRC) in *Adding It Up: Helping Students Learn Mathematics*.



National Research Council. 2001. *Adding It Up: Helping Children Learn Mathematics*. Washington, DC: The National Academies Press.

In order to begin any conversation around improving mathematics education we need to share a common understanding of mathematical literacy.

- **Conceptual Understanding** - Ability to understand mathematical concepts, operations, and relationships;
- **Procedural Fluency** - Understanding and using a variety of mathematical procedures;
- **Adaptive Reasoning** - Capacity for logical thought, reflection, explanation, and justification;
- **Strategic Competence** - Ability to formulate, represent & solve mathematical problems using an effective strategy; and,
- **Productive Disposition** - Inclination to see mathematics as useful, valuable and worthwhile.

While these brief descriptions can be helpful to gain a basic understanding of the 5 mathematical proficiencies, much more learning is required to fully appreciate the value that each brings to build a complete mathematical understanding for educators and our students.



MATHEMATICS LEARNING COMMUNITIES

Educators are building their mathematics classes into communities of learners. They are encouraging children to work collaboratively on problem solving, projects and assignments, while also promoting students seeking feedback from peers on individual tasks.

They are building communities of mathematical learning where logic and mathematical evidence are used to verify solutions; allowing students to conjecture, investigate and problem solve; connecting mathematics, its ideas and applications instead of presenting mathematics as a body of isolated rules and procedures.

In our mathematics learning communities, the educator is not the sole authority for determining the correctness of an answer.

Learning mathematics is a vibrant and exciting area that promotes 21st Century Competencies when we focus on building number fluency, automaticity and resilient problem solvers rather than rushing to the memorization of facts, rules and procedures without understanding.



To do all of this effectively, a variety of resources and techniques are required. Educators encourage the sharing of student generated strategies and push learning further by modelling additional strategies during the consolidation of an activity or investigation.

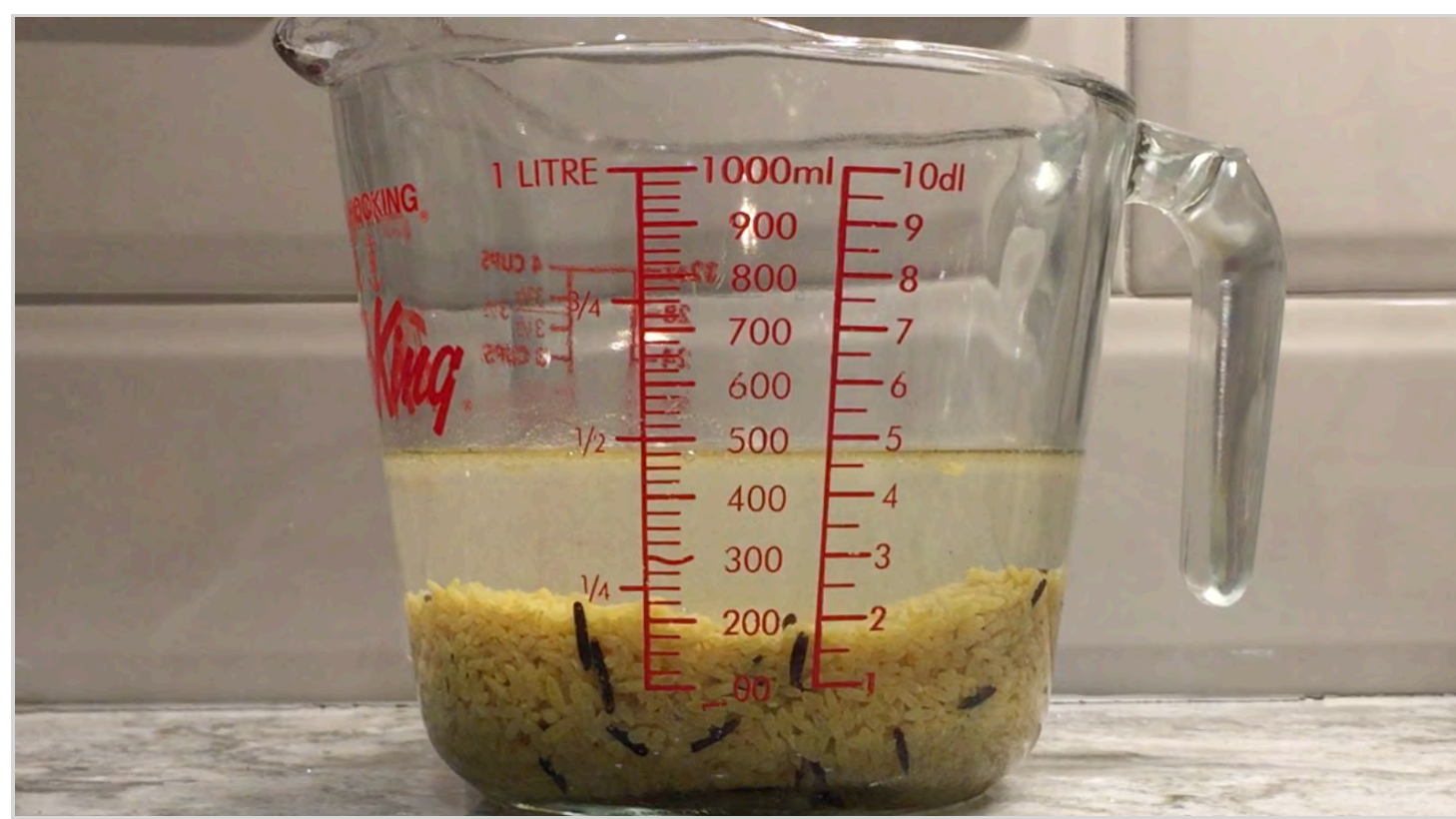
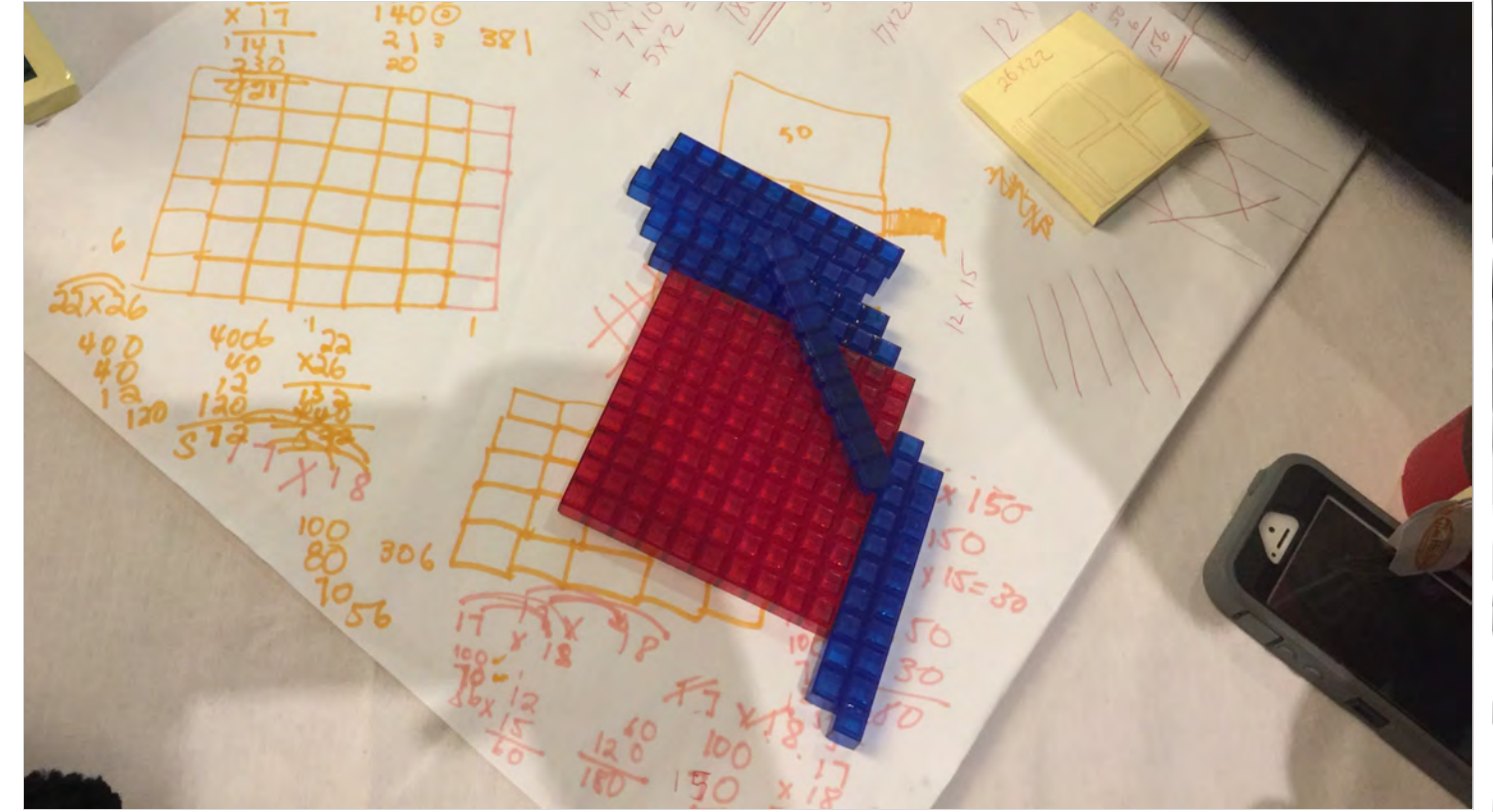
We believe there should be a balance of teacher directed and student driven activities on a regular basis.

Resources such as the textbook are essential to inform teachers during long-range and day-to-day planning, but are not relied on solely as the plan for daily mathematics instruction.

Big Ideas of Elementary Math

Number Sense and Numeration

- reading, representing, comparing, ordering and counting by/with whole numbers, decimal numbers, fractions, integers and positive exponents;
- solving problems involving addition, subtraction, multiplication and division using a variety of strategies;
- solving problems involving proportional reasoning using ratio, rate and proportional relationships.

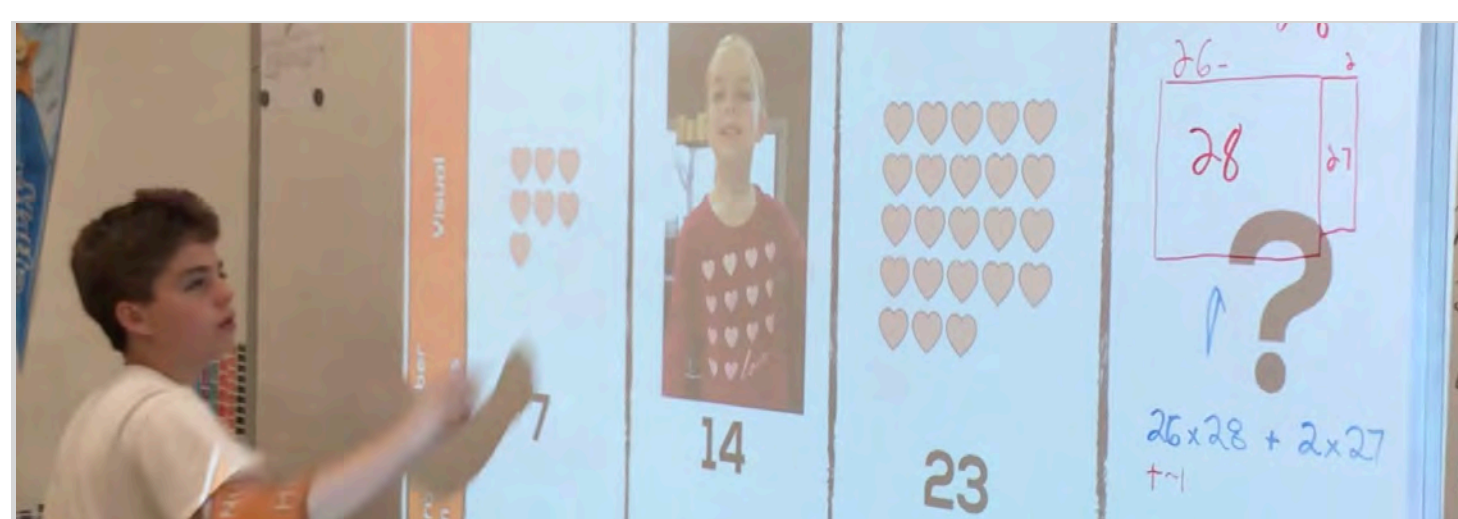


Measurement

- comparing objects using measurable attributes and non-standard units;
- estimate, measure, and record perimeter, area, volume, temperature change, time, elapsed time using non-standard and standard units and a variety of strategies;
- determine relationships among units and measurable attributes such as perimeter, area and volume.

Geometry and Spatial Sense

- sorting and classifying two-dimensional shapes and three-dimensional figures by attributes, side and angle properties;
- identifying and constructing nets of prisms & pyramids;
- identify and describe location using cardinal directions, translations and transformations on the Cartesian coordinate plane with connections to the real world.



Patterning and Algebra

- creating and extending repeating, growing and shrinking patterns to determine relationships using tables, graphs, algebraic expressions and equations;
- model linear relationships and solve equations.

Data Management and Probability

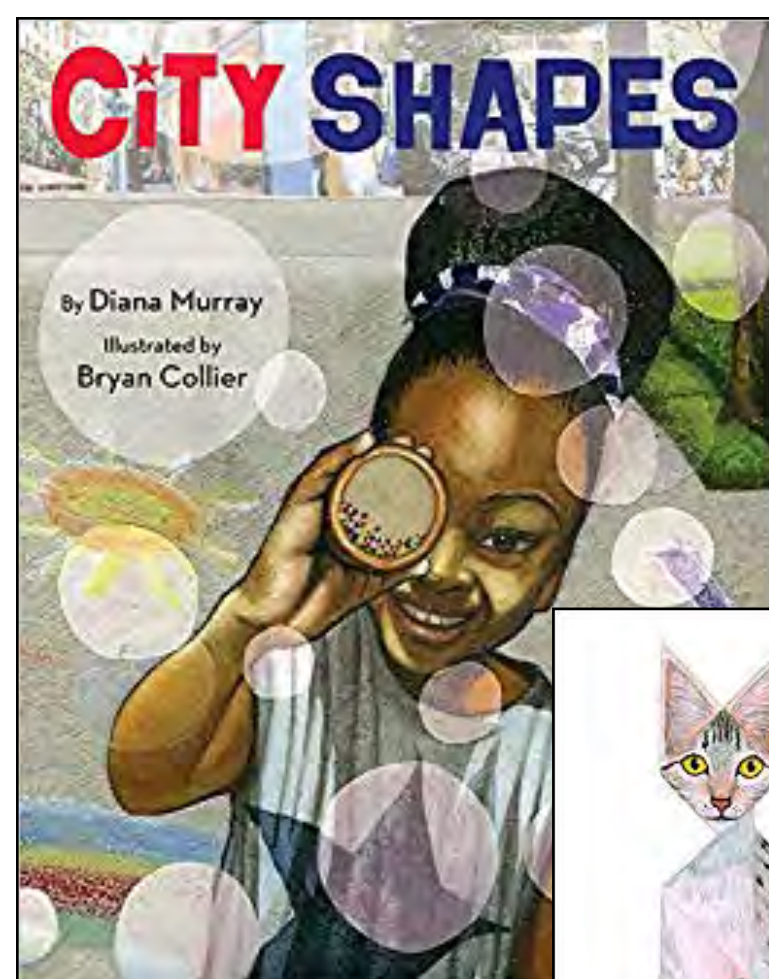
- collecting and organizing discrete, continuous and categorical data and display using a variety of charts and graphs;
- reading, describing and interpreting data;
- represent and describing probability in simple experiments.



Secondary Mathematical Processes

Processes:	Process Expectations in Grades 9 to 12:
Problem Solving	<ul style="list-style-type: none"> develop, select, apply and compare [grades 9 and 10] as well as adapt [grades 11 and 12] a variety of problem-solving strategies as they pose and solve problems and conduct investigations, to help deepen their mathematical understanding;
Reasoning and Proving	<ul style="list-style-type: none"> develop and apply reasoning skills (e.g., recognition of relationships, generalization through inductive reasoning, use of counter-examples [grades 9 and 10] as well as use deductive reasoning and construction of proofs [grades 11 and 12]) to make mathematical conjectures, assess conjectures, and justify conclusions, and plan and construct organized mathematical arguments;
Reflecting	<ul style="list-style-type: none"> demonstrate that they are reflecting on and monitoring their thinking to help clarify their understanding as they complete an investigation or solve a problem (e.g., by assessing the effectiveness of strategies and processes used, by proposing alternative approaches, by judging the reasonableness of results, by verifying solutions);
Selecting Tools and Computational Strategies	<ul style="list-style-type: none"> select and use a variety of concrete, visual, and electronic learning tools and appropriate computational strategies to investigate mathematical ideas and to solve problems;
Connecting	<ul style="list-style-type: none"> make connections among mathematical concepts and procedures, and relate mathematical ideas to situations or phenomena drawn from other contexts (e.g., other curriculum areas, daily life, current events, art and culture, sports);
Representing	<ul style="list-style-type: none"> create a variety of representations of mathematical ideas (e.g., numeric, geometric, algebraic, graphical, pictorial representations; onscreen dynamic representations), connect and compare them, and select and apply the appropriate representations to solve problems;
Communicating	<ul style="list-style-type: none"> communicate mathematical thinking orally, visually, and in writing, using mathematical vocabulary [grades 9 and 10], using precise mathematical vocabulary [grades 11 and 12] and a variety of appropriate representations, and observing mathematical conventions.

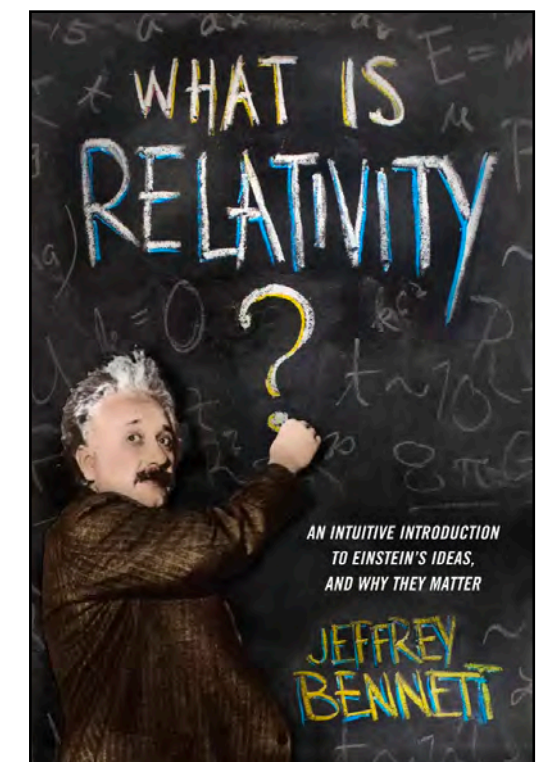
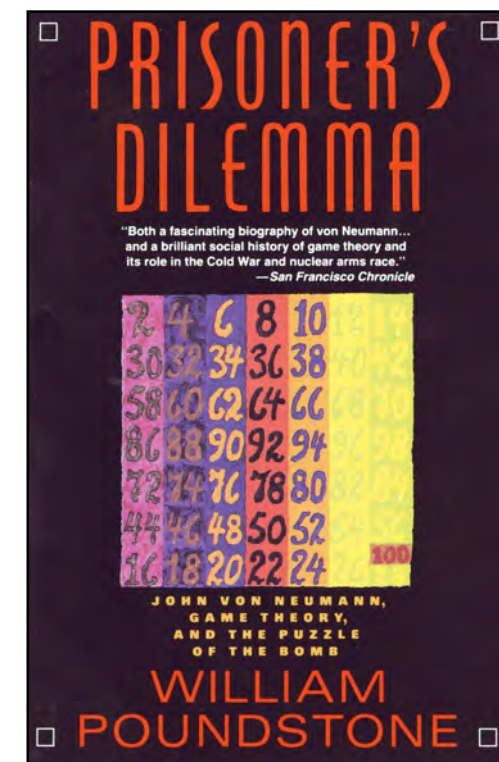
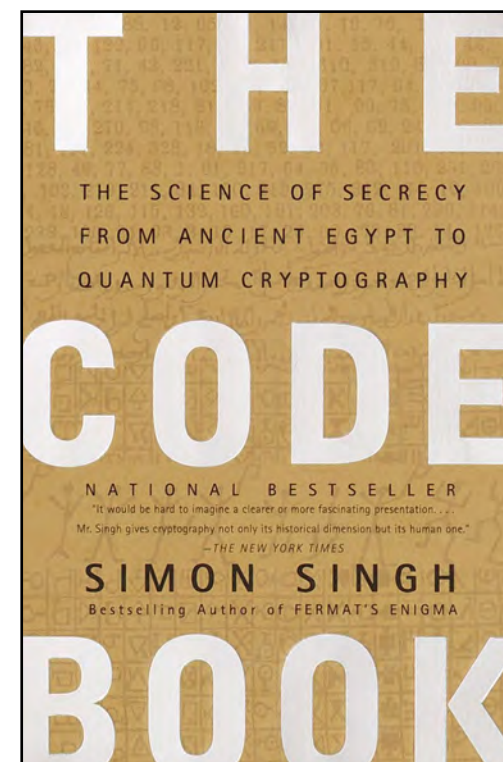
FUN MATH BOOKS FOR KIDS



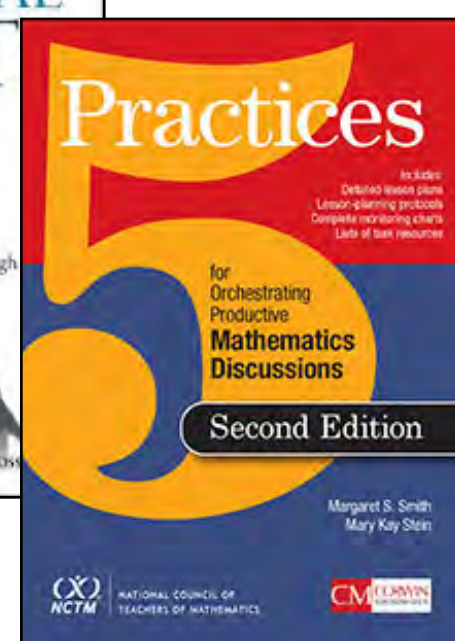
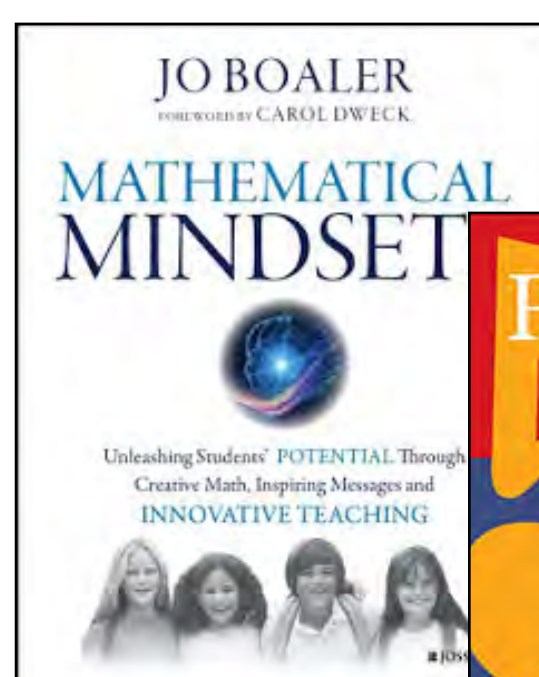
- *Counting on Snow* by Maxwell Newhouse
- *City Shapes* by Diana Murray
- *One* by Kathryn Otoshi
- *Actual Size* by Steve Jenkins
- *Charlie Piechart and the Case of the Missing Hat* by Eric Cornstock and Marilyn Sadler
- *Hat Tricks Count: A Hockey Number Book* by Matt Napier
- *Math Fables* by Greg Tang
- *Chatangram* by Maranke Rinck & Martijn van der Linden
- *La vie des animaux en chiffres* by Lola M. Schaefer
- *En une seconde* by Steve Jenkins
- *7 souris dans le noir* by Ed Young
- *Math Before Bed* by Jon Orr

MATH BOOKS FOR SECONDARY STUDENTS & PARENTS

- *A Beautiful Mind* by Sylvia Nasar
- *The Code Book* by Simon Singh
- *Hidden Figures* by Margot Lee Shetterly
- *Nearly Gone* by Elle Cosimano
- *What Is Relativity?* by Jeffrey Bennett
- *How to Lie with Statistics* by Darrell Huff
- *Prisoner's Dilemma* by William Poundstone

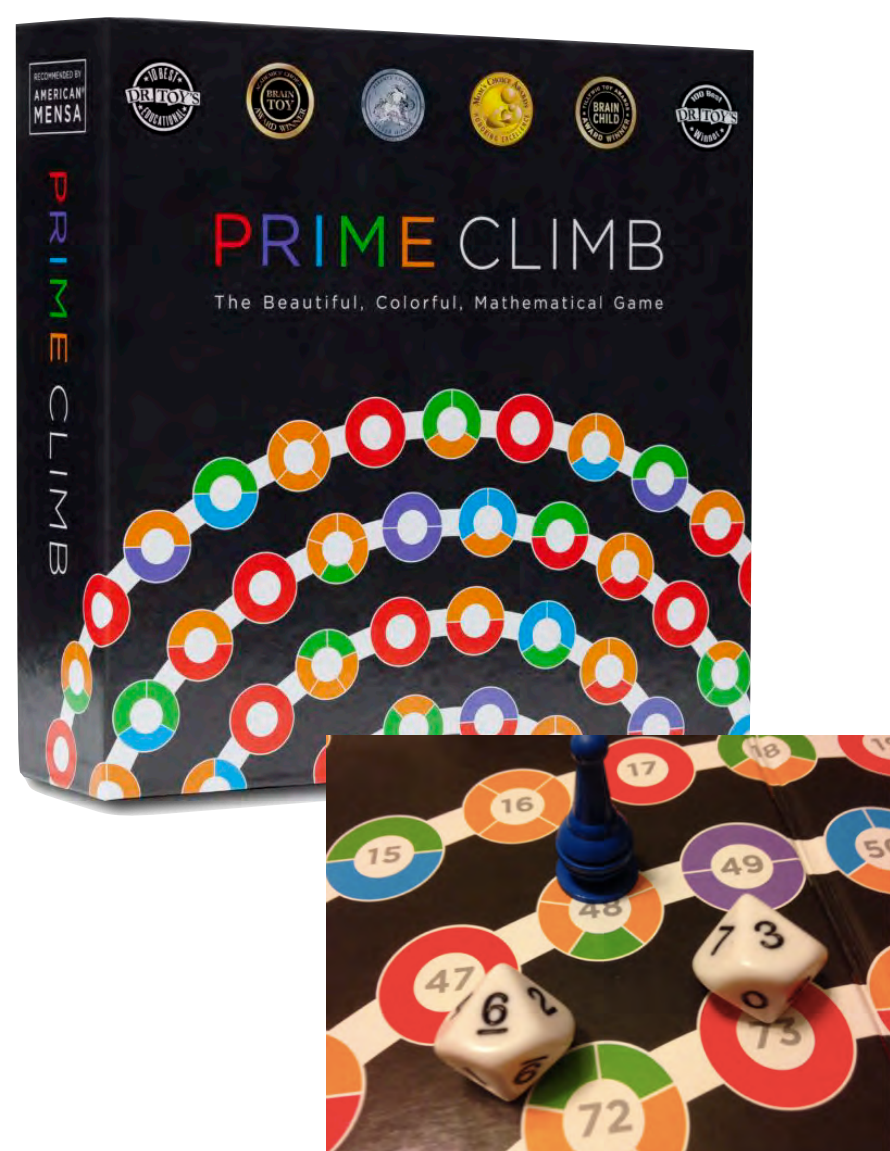


MATH BOOKS FOR TEACHERS



- *Mathematical Mindsets* by Jo Boaler
- *Making Math Meaningful* by Marian Small
- *Number Talks* by Sherry Parrish
- *Minilessons* by Catherine Twomey Fosnot
- *5 Practices for Orchestrating Productive Mathematics Discussions* by Mary Kay Stein, Margaret Schwan Smith
- *Becoming the Math Teacher You Wish You'd Had* by Tracy Zager
- *How We Learn* by Benedict Carey
- *A More Beautiful Question* by Warren Berger

MATH BOARD & CARD GAMES



- *Tiny Polka Dot* www.tinypolkadot.com
- *UNO!* www.ubisoft.com/en-ca/game/uno
- *Sequence Numbers* www.jaxgames.com/sequence-numbers-4
- *I Sea 10!* <https://shar.es/aaAEPS>
- *Sum Swamp* <https://shar.es/aaAELY>
- *Sumoku* <https://continuumgames.com/shop/sumoku/>
- *Spot It!* www.mastermindtoys.com/15351-Spot-It-Game.aspx
- *Super Genius Multiplication*
www.blueorangegames.com/index.php/games/super-genius-multiplication
- *Prime Climb* primeclimbgame.com
- *Set Game* www.setgame.com
- *Albert's Insomnia* www.albertsinsomnia.com

INTERNET RESOURCES

- **MPower** - Free Game-Based Kindergarten to Grade 6 Math Practice Tool:
<https://mpower.tv.org/parents/#/login/>
- **Zorbis Math Adventure** - K-3 Game-Based Kindergarten to Grade 3 Math Practice Tool
Licensed For Use By GECDSB Students: www.zorbismath.com
- **Knowledgehook** - Grade 3 to 10 Math Practice Tool and Instructional Guidance System
Licensed For Use By GECDSB Students: www.khmath.com
- **Netmath** - Grade 3 to 11 Math Learning and Practice Tool Licensed For Use By GECDSB
Students in French: <https://www.netmath.ca/fr-ca/entente-ontario/>
- **Mathify** - Free 1-On-1 Online Math Help With Ontario Teachers for Grades 7 to 10
Students: www.tvomathify.com
- **Mathies** - Free Digital Manipulatives and Math Tools: www.mathies.ca
- **Math Learning Center** – a great interactive resource for you and your child:
www.mathlearningcenter.org
- **Math Before Bed** - We read before bed; why not math?: www.mathbeforebed.com
- **Math Is Visual** - Visual animations to better understand math concepts:
www.mathisvisual.com
- **Desmos** - Free online graphing calculator with free teacher activities to use with
students: www.desmos.com
- **CK-12** - Free tool to create digital classrooms, customize textbooks, and learn K-12 STEM
concepts: www.ck12.org