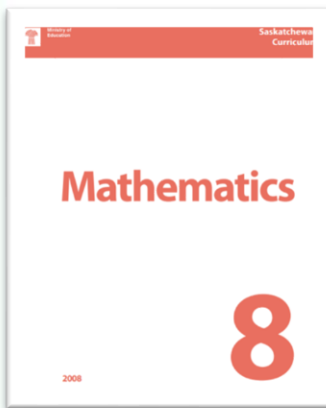


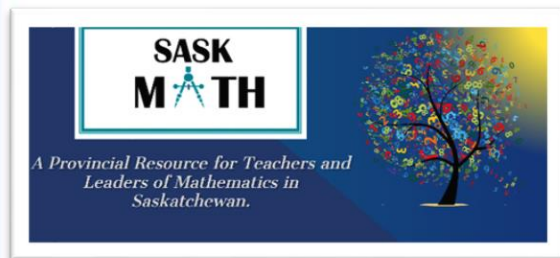
Our Math Classrooms



How do we decide what matters?

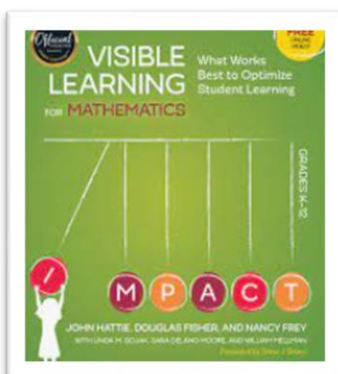


Saskatchewan Curriculum outlines practices in math class that support student achievement. Notably the mathematical processes: Communication, Connections, Visualizing and Representing, Reasoning and Problem Solving, Mental Math and Estimation (fluency).



SaskMath is a provincial website that creates a framework for quality math instruction. First Nations ways of knowing are a main theme, and within this philosophy there are guidelines for lesson structure, differentiating, Concrete-Representational-Abstract continuum (C-R-A),

assessment, interventions, classroom design, guided math, research-based practices, and growth mindset. www.saskmath.ca



In his book *Visible Learning in Mathematics*, John Hattie has researched what teaching practices have the highest impact on student achievement.

Other sources include Jo Boaler, *Mathematical Mindsets*, Peter Liljedahl, *Thinking Classrooms*, National Council of Teachers of Mathematics, and writing and research by Marian Small, John VandeWall, Nicki Newton, Debbie Dillar, Robert Marzano, and many others.



Critical Characteristics of Mathematics Education

The following sections in this curriculum highlight some of the different facets for teachers to consider in the process of changing from covering to supporting students in discovering mathematical concepts. These facets include:

- organization of the outcomes into strands
- seven mathematical processes
- the difference between covering and discovering mathematics
- development of mathematical terminology
- First Nations and Métis learners and mathematics
- critiquing statements
- continuum of understanding from concrete to abstract
- modelling and making connections
- role of homework
- importance of ongoing feedback and reflection.

Communication, Making Connections, Visualizing, Representing, Reasoning and Proof, and using Technology

Providing students with opportunity to construct meaning, find patterns and relationships, rather than teaching "rules" and "procedure"

Explicitly teaching generative Vocabulary

CRA Continuum
<https://christtheteacher.ca/ctt/cttcs-mathhub/cttcs-math-pathway/>

See [Saskmath.ca](https://saskmath.ca)

Formative Assessments that include specific non-graded feedback
Effect size = 0.75



Marzano's 9 Effective Instructional Strategies

Dr. Kimberly Tyson
@tysonkimberly

9 Effective Instructional Strategies

Effective instruction is key to improving student learning. These 9 instructional strategies help students achieve at higher levels.

1

Identifying Similarities & Differences

The ability to break a concept into its similar and dissimilar characteristics allows students to understand complex problems by analyzing them in a more simple way.

2

Summarizing & Note Taking

These skills support increased comprehension by asking students to identify what's essential and then put it in their own words.

3

Reinforcing Effort & Providing Recognition

Teachers need to help students see the relationship between effort, achievement, and recognition.

4

Homework and Practice

Practice supports learning, homework needs to be intentional and have a specific goal or outcome.

5

Non-Linguistic Representations

Incorporate visuals, images, piktographs, and pantomimes to reinforce concepts and vocabulary.

6

Cooperative Learning

Research shows that organizing students into cooperative groups yields a positive effect on overall learning.

7

Setting Objectives & Providing Feedback

Set objectives that are adaptable to student learning goals & provide feedback toward those goals.

8

Generating & Testing Hypothesis

Have students predict and test hypothesis and explain the outcomes.

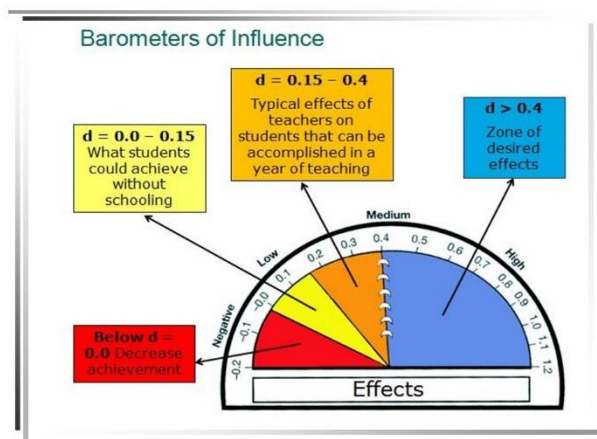
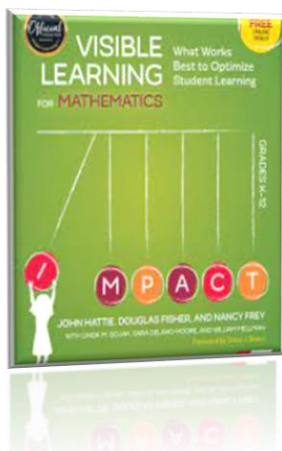
9

Questions, Cues, & Advance Organizers

Use questions, cues, and advance organizers to help students tap into their background knowledge to make sense of information.

Effective Practices in Mathematics

Here are the most effective practices in math class according to John Hattie.



Effect Sizes

Talk

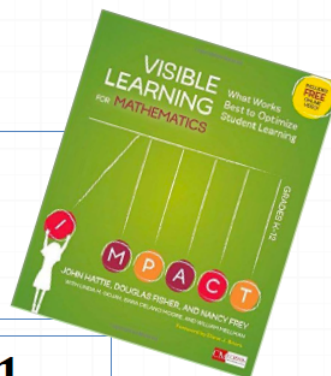
- Questioning – 0.48
- Classroom Discussion – 0.82
- Self-questioning – 0.64

Tasks

- Spaced vs. Mass Practice – 0.71
- Problem-Solving Teaching – 0.61
- Meta-Cognitive Strategies – 0.69

Clarity

- Teacher Clarity – 0.75
- Self-Reported Grades/Student Expectations – 1.44
- Classroom Cohesion – 0.53

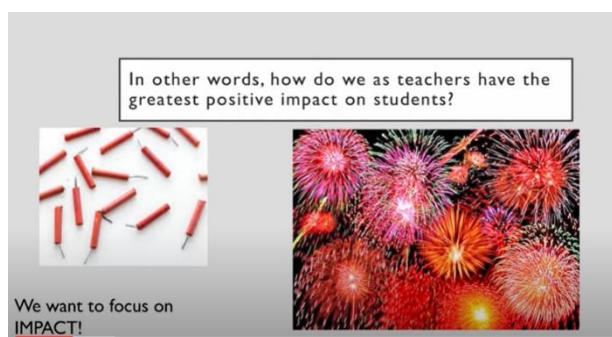


A note about Hattie and Teacher Classroom Research

A note: John Hattie created a list of effects on student learning, rated from most effective to least effective, based on met-analyses of over 50 000 educational research studies. Hattie says that an average student in an average classroom has an achievement improvement of about 0.4 ES. (ES = Effect Size, a statistical measurement). Anything over 0.4 is better than average instruction/method/student learning/success. Less than 0.4 is not effective.

<https://youtu.be/HIYAMTrk82s> . This work helps us prioritize those things that help our learners the most. <https://youtu.be/mncRifUZhig>

I've included the first two pages of the appendix of "Visible Learning in Mathematics" (following two pages). *This is a very poor way to use this research*, and Hattie cautions us to read the book for context around each of the listed effects; however, I thought by including it I could explain some of the rationale for the design of this book, and perhaps interest you in reading Hattie's work. It makes a great staff book study! Note that there are 3 more pages of this appendix—I only included the top effects.



Collectively these effects prioritize **student-centred assessment and goal setting, formative assessment, communication, guided math, spaced practice, growth mindset, using concrete-representational-abstract continuum** (C-R-A, constructivist learning, using math manipulatives—sometimes called C-P-A, concrete-pictorial – abstract).

Making learning visible means helping students see their learning through evidence. This does not only apply to students, but teachers as well! Teachers need to become students of their own practice! How do we determine if what we do in the classroom is working?

Hattie's message is "Teacher, know thy impact".

What we want for students we should want for teachers. Does our school instructional leadership allow/expect teachers to become learners? Can our teachers set goals, and be graced with "teacher-centred learning"? Are teachers able to use student learning data and feedback to be continuous learners and to continually improve their practice? Can teachers choose how to demonstrate their learning and highlight their strengths while acknowledging where further learning is required?

What are you doing that is working well?
How do you know?
What are things you'd like to change?
How will you accomplish change?
What would your goal be?
How will you monitor your progress?
What will be your criteria of success?

