

Flow of the Lesson

Hands On/Minds On

There are many models for how to structure a math lesson. One imperative component is beginning math with enthusiasm and respect for the subject. As teachers, our job is to ignite passion in our students. Society has some negative attitudes associated with math, and we need our teachers to reinforce positivity, student agency, comfort with the subject, and growth mindset. There are many engaging ways to begin a math class, and one of the most effective is using Number Talks.

Teachers may feel that these opening activities waste time, or do not help address the content, but new research tells us that memories are formed by engaging as many senses as possible. Even if the activity does not directly produce the learning that is required in the topic, it is still an activity that creates a "hook" to tie the learning to, or in other words helps create and strengthen new neural pathways. Furthermore, some activities do help students conceptualize math concepts or connect them to themselves and real life.

Many resources come with ideas for starting each lesson, such as the "Explore" in Math Makes Sense, or the "Minds On" in Math UP, or Number Talks that are explorations. Frequently these experiences are skipped, and in worst case scenario, our class begins with "we are on page 48", or "lets go through the worksheet from yesterday" or similar. Yes, we are short of time, or we may not have a great comfort level with math, there are conflicting priorities, but our job is to spark interest and engage learners. There is nothing wrong with exploring together with students! Even a very simple "what do you notice, what do you wonder" task opens up mathematical thinking and dialog.

There is a wealth of numeracy routines, like Number Talks, Morning Meetings, Math Warm Ups, etc, that engage students, stimulate thinking, foster meaningful math dialog, lower math anxiety, and provide multiple entry points so that all learners can participate.

In some cases the "Minds On" may involve using manipulatives or digital visualizations (such as Mathisvisual.com, SPLAT, Desmos, Polypad, etc) to foster conceptual understanding. Students are introduced to concrete models to help them reason with the mathematics. This may be manipulating fraction pieces, integer tiles, measuring tasks, exploring circle relationships, multiplying with groups of objects, creating arrays to explore prime numbers, using algebra tiles and/or scales to balance equations, using graphing calculators to explore functions and relationships, timing and measuring activities to graph, gathering data to explore statistics and probability, performing experiments to understand probability, etc. Too often these immersive activities are omitted, and students are simply directed to diagrams and questions in text books. Remember: We need to engage as many senses as possible, and provide physical movement.

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The lesson may proceed with direct instruction (see direct instruction section to understand that this is a dynamic class conversation, not “chalk and talk”), or the students may be grouped as in guided math, or they may proceed to independent practice or journaling.

Direct instruction is usually followed by independent practice or collaborative learning. There may be peer coaching, or students working through problems in groups or pairs. Differentiation is evident here, as students may receive adjusted assignments, different projects or tasks, or work with an EA on alternative tasks.

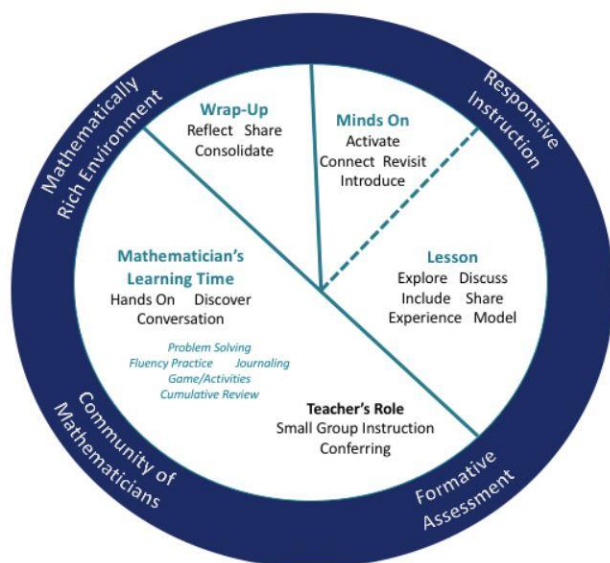
Lessons may last one day or several days.

Practice, brain scientists say, leads to the development of neural pathways so that some actions become automatic.

–Association of Teachers of Mathematics

“Consolidation is an important part of every lesson. Through consolidation we are able to bring together the disparate parts of a lesson and help students to reify their experiences into a cohesive conceptual whole” –Liljedahl

Consolidation is critical at the end of the lesson. What should students understand, how does the learning connect to other math concepts, what are students responsible for, and how will they need to demonstrate their learning.



Mathematician's Workshop Model, from SaskMath, designed by Saskatoon Public math teachers and J.Brokofsky.

<https://saskmath.ca/mathematicians-workshop/>

Explore

- Provide an opportunity for students to interact with the concept.
- May be an activity, exploration, question, debate, challenge, video, manipulatives, game, etc.

Learning Intention

- Make the learning intention (target) clear. Present the learning intention before the bulk of the learning, and check in during and after (formative assessment, lesson summary)

Modeled and Shared Math

- Explicit Instruction
- Punctuated by opportunities for thinking, conjecture, dialog and collaboration.

Guided Math

- Small group instruction for differentiation
- in-depth reteaching, enrichment, intervention, independent practice, and triangulating assessment evidence

Summary

- Refers to learning target
- Formative assessment

Spaced Practice

- Concepts are brought back periodically for review
- New concepts are continually connected to prior learning

