

Moving Forward In Mathematics

Supplementary Document

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Prepared by the Department of Education and Early Childhood Development

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Teachers and learners are offered the exciting possibility of a fresh start at the beginning of each school year – a time to get to know our students and to set the stage for how learning mathematics will look, sound, and feel in our classroom. This is also a time to shape the mathematical classroom community by cultivating positive attitudes and beliefs about learning and doing mathematics. This is an opportunity to position students to believe that their voice is valued and heard. This work demands careful attention and purposeful planning. Ultimately, the goal is to create a classroom community where we learn by valuing learners, shared experiences and doing deep and meaningful mathematics together.

Teaching and learning might need to look different this fall due to our collective efforts to reduce the spread of COVID-19. One thing that won't change, however, is that teachers will be working hard to create a space that is safe and welcoming for all learners. The first weeks will still be a time to welcome students back, develop safe routines and practices, establish a sense of community, engage learners in rich interactive experiences to promote critical thinking, and create opportunities for collaboration and discussion. This is an opportune time to develop a culture and a climate for mathematics learning conducive to collaboration, risk taking, and inquiry. By setting the stage for students to be seen, and to see themselves as thinkers and doers of mathematics, content learning will come more easily.

When planning for new groups of learners (P-12), it is important to consider that:

- opportunities to learn were different for students during at-home learning and this scenario increased disproportional access and opportunities for some students;
- learning about our students' thinking may be challenging – we may need to consider the sequence of learning, consolidate big ideas, and;
- identifying how much and what each student has learned since March 2020 will vary significantly for a variety of reasons.

Aim for Growth, Not Perfection

Pause and reflect on what works and what doesn't (for teachers and students), modify, and take another step forward.

First Step

Develop a positive culture and safe climate for learning.

Ask students to explore their community (or home) and identify things that make them think of mathematics - numbers, shapes, patterns, sequences, etc. Invite students to take/draw pictures or create models/representations of their mathematical observations. Create a space within your classroom for students to engage with each other, to wonder and ask questions while sharing these observations with their peers.

For students to feel confident in taking risks when sharing their observations and wonderings, it is critical to establish welcoming environments while also setting high expectations. These routines and expectations will have the greatest impact on learning when co-created through ongoing conversations with the classroom community. The following are additional examples of learning experiences easily adapted for learners from grades Primary to 12 that will allow you to create space for students to participate in establishing norms for mathematics class while also promoting a positive and culturally responsive climate, regardless of the location of the classroom.

Superheroes!

Co-create a list of superpowers and/or superheroes with learners.

Ask: If you could have one of the following superpowers or be one of these superheroes which one would you choose and why?

Reflect/Discuss: Invite learners to answer using a mode of their choice (picture, text, video) and create opportunities for sharing in small groups (virtually or in person). Establish norms for how to take turns speaking and listening in your “classroom” so all learners feel valued and respected.

Connect to mathematics: Invite students to suggest how they might create a graph or visual model to display the data gathered from the class. This gives an opportunity to access prior knowledge and identify areas of focus moving forward.

Which One Doesn't Belong

When choosing a *Which One Doesn't Belong?* set from the website wodb.ca, select a set that is accessible to engage all students in the discussion and to activate critical thinking. Establish routines to ensure all learners' feel safe to take risks and know that their contributions and voices are valued. Bridge from prior knowledge and lived experiences to specific mathematical language and concepts relating to the image by validating and affirming all responses.

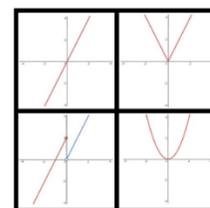
Additional tips and suggestions can be found here:

<http://www.meaningfulmathmoments.com/which-one-doesnt-belong-wodb.html>



SHAPE 20

from Annie Forest



GRAPH 16

Lucky Numbers

Ask: What is your favourite/lucky/special number? How many different ways can you represent it?

Reflect/Discuss: Invite learners to use a blank page, virtual white board to draw, cut and paste, or record their ideas using video. Create a slide deck with a page for each student to share their work.

Connect to mathematics: Ask students what they notice about the numbers that were represented. How are they the same? How are they different? What visual could be created to show what they notice and/or wonder? Do you notice, or could you create, any patterns?

Next Steps

Get to know your students as mathematicians.

Once a safe learning environment has been created, begin to identify where students are with their learning, using open ended learning experiences that are accessible to all students by providing multiple means of engagement, multiple means of representation, and multiple means of action and expression. The goal: expert learners who are purposeful and motivated, resourceful and knowledgeable, strategic and goal-directed.

When introducing a new topic, it is beneficial to start by validating the learners' ideas first. Bridge the thinking that students currently have with the thinking needed to understand the learning targets. It is essential to identify strengths and to view students through an asset lens (what they do understand) rather than a deficit lens (gaps in understanding). When we seek out our students' strengths, we tend to believe they are capable, and our students also come to see themselves, and mathematics, in a more positive light.

The learning experiences described in **First Steps** and the following extensions can be used to validate and affirm student thinking and make explicit connections to curriculum outcomes.

Superheroes!

SUPERHEROES extension: How does the information gathered in the initial activity align with the outcomes in your grade/course? Learn more about students by inviting them to select an area of personal interest to gather data or seek out opportunities to create cross-curricular connections and integrate next steps with another content area. These conversations can take place in small groups or individually. This would be a great opportunity to introduce approved online tools that you will be using in class to facilitate these conversations. Introducing technology tools earlier on will assist if move to a learning from home scenario in the 2020/21 school year.

Which One Doesn't Belong

WODB extension: The website <https://wodb.ca/> has a variety of other examples that will allow you to gradually dig deeper with engaging conversations and create opportunities to engage in a variety of great mathematical discussions that address specific curriculum outcomes for your course. Learning concepts can be consolidated by inviting students to create their own examples to share with others. This sharing can take place either synchronously in real time in class or students could be working asynchronously on this at different times in your Google Classroom, Moodle or using another approved technology tool. This is also an excellent way to gather evidence of learning.

Lucky Numbers

LUCKY NUMBERS extension: What numbers are students exploring? Select an appropriate range of numbers (e.g. a number from 20 to 100 or a decimal number less than one tenth) or type of number (e.g. a fraction or a radical) and ask students to pick a specific number from that set and represent it in as many ways as they can. When learners share their work, encourage them to notice **how** other students have represented their numbers.

Refer back to the suggested prompts listed on the previous section as a starting point to incite deeper thinking and flexibility in number sense (e.g. 12, full egg carton, $\sqrt{144}$, one dozen, 2×6 , value of x in $y=4x+2$ when $y=50$).

Best Practice

Implement effective lesson planning and instructional strategies.

"Every student can learn with enough time, practice and equitable and responsive teaching." (EECD, 2019)

Create ways to meet regularly to interact with small groups and individual students. This can help to ensure that learners have equitable access to support and will receive timely and individualized feedback. When planning lessons, be intentional and ensure that all learners have a choice in demonstrating achievement of the learning goals.

The following table offers a **suggested framework with guiding questions** to consider when planning mathematics lessons for a variety of instructional methods. The intent of this framework is to identify the actions of both students and teachers within the lesson that help to support student growth.

Suggested Framework for Planning Mathematics Lessons P-12		
	Teacher and Learner Actions	Guiding Questions
The Lesson Opening	<p>The lesson opening engages the learner by connecting prior learning and personal experiences to the learning target(s) for the lesson.</p> <p>Learning targets describe in student friendly language what learners are expected to know, understand, and do.</p>	<p>Warm Up How will you engage students' minds to prepare them for math for the day?</p> <p>Posing The Task How will you spark curiosity, highlight essential questions, and ensure understanding of the task?</p>

The Lesson	<p>Lessons might be planned to:</p> <ul style="list-style-type: none"> ▪ Explore a new concept ▪ Practice a skill ▪ Reinforce/consolidate learning ▪ Develop connections <p>Learners may work independently or in small groups. Groups can be made up of learners who are seated in proximity of each other or can occur through the use of online tools.</p> <p>Gathering evidence of learning (formative or summative) relating to the learning targets</p>	<p>Student Work Time</p> <p>How will you use this time to listen for student understanding and provide feedback? What probing questions could support students' in their learning?</p> <p>Sharing</p> <p>Why and how will you have students present their ideas?</p>
The Lesson Closing	<p>Ask questions to help students clarify their own understanding of the math concepts embedded within the problem and identify connections with prior learning.</p> <p>Collaboratively, the teacher and students reflect on and analyze the success of the learning.</p>	<p>Debrief/Exit Ticket</p> <p>How can students be given opportunities to actively reflect on their learning and consolidate the learning targets from the lesson?</p> <p>Reflect/Connect</p> <p>What concepts or understandings do you want students to reflect on?</p>

Additional resources available to support planning

Additional resources available to support planning.

Foundational Outcomes for the 2020-21 school year have been identified. These have been prioritized from the current learning outcomes for the consideration of teachers. The Back to School plan recognizes that 2019-20 was not a normal school year and that curriculum outcomes need to be adjusted moving forward.

[Foundational Outcomes for 2020-2021 can be found here for P-6](#)

[Foundational Outcomes for 2020-2021 can be found here for 7-12](#)

For additional suggestions to support lesson planning and updated information and e-learning supports, consult the following Department of Education and Early Childhood Development Resources:

Learning Continuity Plan <https://www.ednet.ns.ca/backtoschool>

eLearning Tips <https://sites.google.com/gnspes.ca/elearning/elearning-tips>



Moodle sites: Mathematics Learning Commons P-3, 4-6, 7-9, 10, 11, 12

Let your students in grades 7-12 know that the Nova Scotia Homework Hub is available to support them with resources (e-text, videos, practice, vocabulary, graphing calculator...) and in the evenings with live free tutoring. This is accessible to students from the GNSPES landing page. It is a good idea to introduce students to this resource in your mathematics classroom.

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