# TLC-33: Interactive, Inquiry-based Applied Mathematics in 1:1 BYOD Environment

*Online version (most up-to-date): http://bit.ly/tlc33*

## *MFM1P Resources*

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***Please note that all student learning materials have been adapted from the Ontario Ministry of Education TIPS4RM resources unless otherwise noted.*

Professional development learning goals for this project:

- *To determine how to effectively use a variety of tablets and computers with Wacom writing tablets to engage students in Applied Mathematics through **inquiry and the math processes**. This is in a BYOD environment where students have a variety of devices.*

- *To create **inquiry-based and interactive class activities** that can be used in a 1:1 BYOD environment to support problem solving and deeper learning in applied mathematics.*

# Overview

Through this project we realized the biggest impact on student learning, achievement and classroom culture came through a renewed focus on assessment. We broke the curriculum up into 22 learning goals and assessed each of those across the achievement categories. Each learning goal was assessed in multiple ways.

Assessments (tasks, projects, observations, conversations, tests, etc.) assess multiple learning goals together. By tracking student grades based on 22 learning goals instead of categories such as “tests” and “quizzes” ensured that we were always assessing curriculum expectations and that students understood what they needed to improve on. It also let us provide opportunities for students to reassess in specific learning goals as needed. At the end of the course, we don’t care if a student mastered a concept by the time we held the test or task. We care that they got it by the end of the reporting period (semester). If a student needed more time with a concept, they could choose to reassess a concept after the formal class assessment and that mark would override the previous one for that learning goal.

We used a variety of tools to help with assessment:

- MFM1P Learning Goals and Assessment Overview – http://bit.ly/mathLG
- SesameHQ and Sesame Snap App - https://sesamehq.com/
    - used to create digital collections of day-to-day work (images, video, notes) to use observations and conversations as assessment
    - students or teachers can add to feed
- Activegrade - http://activegrade.com/
    - used for assessment and grades
    - standards-based assessment (our 22 learning goals)
- Knowledeghook - http://www.khmath.com
    - we used this to help students “level up” their learning on certain topics
    - multiple choice questions with video help/instruction
    - broken into challenges corresponding to curriculum
    - live tracking for the teacher to see student progress and option to run live “game shows” in class
- OneNote – *http://bit.ly/1GZV9B8*
    - we used this as a OneNote ClassNotebook (Sharepoint and O365) where students have work areas in addition to the teacher “content” area and collaboration spaces
    - we often use this tool with the drawing abilities and Wacom tablets to take notes and collaborate
    - all student “paper” assessments are scanned into OneNote to archive/portfolio in addition to links to digital work

# Intro Unit

| | |
|---|---|
| | Diagnostics<br>Growth Mindset |
| Day 01 | Problem: Popcorn Picker<br>Lesson: Volume of a Cylinder<br>Practice: Volume of a Cylinder |
| Day 02 | Problem: 24 Linking Cubes (from TIPS4RM)<br>Lesson: Volume of Prisms<br>Practice: Volume of Prisms |

Resources:

- ClassFlow File: Growth Mindset – http://goo.gl/UFr2Ov ** this is an interactive lesson
- ClassFlow File: Intro Unit – http://goo.gl/2x95dr ** this is an interactive lesson file with materials for the whole unit
- Nearpod Diagnostics
    - Integers
    - Solving Equations
    - Proportional Reasoning
    - Fractions
    - Powers and Roots
    - Algebra

# Unit 1 - 2D and 3D Geometry

Resources:

- Unit 1 Student Book
- ClassFlow File: Unit 1 – http://goo.gl/umqANQ
- Volume of Physical Objects activity
- Kahoot – Matching shapes and formulas
- Cut & Paste Activity (create-your-own composite shape and make a problem for classmates with your solution for assessment)
- Assignment: The Container
- Mindomo Mind Map Assignment – Unit 1 big picture framework
- Unit 1 Test

# Unit 2 - SImplifying Expressions and Solving Equations

Resources:

- Unit 2 Student Book
- Game to discover some basics of solving equations: DragonBoxEDU
- ClassFlow File: Unit 2 – http://goo.gl/IRJa2B
- Polynomial Practice
- Unit 2 Quiz
- Socrative Activity: Adding, Subtracting and Multiplying Polynomials SOC# #:15427763 (use SOC# to import quiz to your own account)
- Solving Equations Practice
- Desmos Activity: Central Park
- Unit 2 Test

## Unit 3 - Rectangle Optimization

Resources:

- Student Unit Book
- Task
- Investigation

## Unit 4 - Relationships and Trends

Resources:

- Unit 4 Student Book
- Quiz
- PearDecks – Interactive Lessons (used the pro version to use draggable and draw slides)
    - Unit 4 Relationship Pear Deck (Day 1)
    - Unit 4 Relationship Pear Deck (Day 5 – First Differences)

## Unit 5 - Proportional Reasoning

Resources:

- Unit 5 Student Book
- Pear Decks (interactive lessons when used with pro PearDeck account)
    - Sugar Packets (Ratios)
    - Super Bear (Ratios)
- Dan Meyer Problems
    - Sugar Packets
    - SuperBear
    - Nana's Chocolate Milk
- Digital Resources/Programs Used for Creating Scale Models
    - MinecraftEDU
    - TinkerCad

## Unit 6 - Linear Relationships

Resources:

- Unit 6 Student Book
- ClassFlow File Unit 6: http://goo.gl/ZLz4qg
- Graphing Stories
- PearDeck (interactive lesson): Graphing Stories
- Quiz
- PearDeck (interactive lesson): Modelling Linear Relations with Equations
- Investigation: Stacking Cups (with Desmos)
- Investigation: Barbie Bungee
- Investigation: VroomVroom!
- Desmos: Polygraph Lines
- Unit Practice
- Unit 6 Test

## Unit 7 - Linear Part 2

Resources:

- Unit 7 Student Book

## Unit 8 - Plane Geometry

Coming Soon!

## EQAO Practice

Pear Deck interactive practice sessions (pro version required to have access to drawing and draggable slide features)

*will require access to this EQAO file with exemplars to project and help students self-assess their solutions as Code "10", "20", "30" or "40"

- EQAO Practice 1
- EQAO Practice 2
- EQAO Plane Geometry Practice

Mid-Course EQAO Questions Practice – ClassFlow Assessment (link soon). Works after Unit 5.

## Final Task

Final task to be a series of activities where students design a new school. It will incorporate most concepts from the school.

## Math and Culture

These activities are designed to help incorporate some First Nation, Metis and/or Inuit culture into math class. Archery will be done on an outdoor education field trip at Enhaatig Lodge. Dreamcatchers will be done with our FNMI Student Advisor.

- Dreamcatcher Math
- Feel the Force. Math in Archery – Linear Relations (coming soon)
- Inuit String Games and plane geometry (coming soon)

# Other Digital Programs Used

## Educreations

- students record their voices and drawing on the screen
- great for BYOD because it works on laptops in the browser and on iPads

## Knowledgehook

- for practice and “levelling up” a learning goal

## DragonBoxEDU

- used in unit 2 for students to “find” algebra rules out and we then connected it to using symbols and algebra tiles

## MinecraftEDU

- used as an alternative to manipulatives for optimization of rectangles, creating scale models and diagrams, rate of change

## Desmos Activities:

- Central Park
- Polygraph Lines

## Padlet - digital collaborative brainstorming

## Skype – for collaborating with other classes

## Voicethread - for collaboration and voice commenting on math images

## Edmodo - *used as a “home base” and for class virtual collaboration,* parents also have a code to access updates and resources

## Dan Meyer-ish Problems *(investigations or problems to do before learning a concept, to guide learning and provide context)*

- Popcorn Picker
- Will it Overflow?
- Sugar Packets
- SuperBear
- Nana’s Chocolate Milk
- Graphing Stories
- Stacking Cups
- VroomVroom! (Jon Orr)
- Usain Bolt
- Flaps! (Jon Orr)

# Physical Resources

- Taped to student desks:
  - number line
  - multiplication table
  - success criteria for a “great solution”
- On the walls in classroom:
  - large EQAO formula sheet posters
  - multiplication tables and number line posters
  - anchor charts for solving two-step equations, add/subt polynomials, multiplying polynomials, etc.
  - word walls for each big idea (2D/3D geometry, linear relations, scatterplots and trends, proportional reasoning, etc.)
- Whiteboards – *(2' x 2') from HomeDepot (1 per table group)*
- Wacom tablets (24 available for students to use with their BYOD laptops)
- BYOD Laptops and Tablets – every student brings a laptop or tablet
- Extra computers and Tablets – for specific project use (ex. Minecraft, DragonBoxEDU, Turtle Art) and when student devices fail