

# Coding Unplugged

Michele Mellow



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Presentation Outline

What is coding unplugged?

Computational thinking

Algorithms, Programs, Events, Loops,  
Debugging

Curriculum connections

Assessment

Resources



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Who Are You?

How experienced are you with unplugged activities?

1. Never used them before
2. Heard of them but have not used them
3. Have used them once or twice
4. Experienced user of unplugged activities



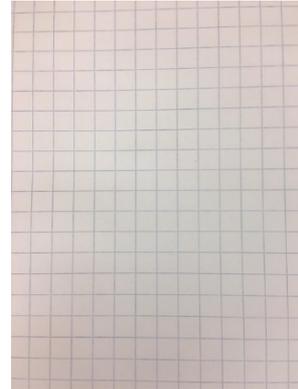
**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# What is CS Unplugged?

Introduces students to computational thinking without the use of a computer.



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION

WEB EXPERIENCE

# What is computational thinking?

Watch this video for another explanation.

[Brian Aspinall Computational Thinking](#)



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# What is computational thinking?

“Computational thinking is about looking at a problem in a way that a computer can help us to solve it and then we’ll use technical skills (like a coding language) to tell the computer what to do to solve it.”

*From [teacherslearningcode.org](http://teacherslearningcode.org)*



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# What is computational thinking?

- Logical reasoning
- Abstraction
- Algorithms
- Decomposition
- Patterns



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Algorithm

A list of instructions that you can follow to finish a task.

*From code.org*



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Algorithm

- ❑ Computer is only as smart as the person programming it
- ❑ Need to practice giving step-by-step instructions—algorithmic thinking
- ❑ Programs are a series of algorithms

*From [playgroundcomputing.com](http://playgroundcomputing.com)*



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Algorithm

What are the instructions for entering a comment in the Chat/Discussion bar?



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Algorithm

## Classroom exercise

1. Place students in pairs: computer, programmer.
2. Programmer moves computer around classroom.



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Algorithms in Math Class

## Primary

using location/direction words

## Junior

movement with coordinate grid on floor

students rotate  $45^\circ$ ,  $90^\circ$ , or  $180^\circ$



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION

WEB EXPERIENCE

# Algorithms and Math

- solve problems involving the addition and subtraction of two-digit numbers, with and without regrouping, using concrete materials (e.g., base ten materials, counters), student-generated algorithms, and standard algorithms;
- multiply two-digit whole numbers by two-digit whole numbers, using estimation, student-generated algorithms, and standard algorithms;

*Grade 2 and 5 expectations, p. 44 and 79 of Ontario Math Curriculum*



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Program

An algorithm that has been coded into something that can be run by a machine



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Program Activity

## 4X4 Graph Paper Programming

	X		
			End

What instructions would you need to write to move the X to the bottom right corner?

From <https://code.org/curriculum/course2/1/Teacher>



**MATH**  
Mondays!

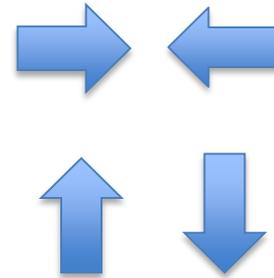
ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Program Activity

How do the instructions change if you use arrows instead of words?

	x		
			End



From <https://code.org/curriculum/course2/1/Teacher>



**MATH**  
Mondays!

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Programs and Math

**Primary**—movement and location

Gr 3 Start at swings. Move to slide.

**Junior**—movement on a grid

Gr 4 Start at A3. Move to C1.

Gr 6 Start at (1,1). Move to (4,3).



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Event

An action that causes something to happen.



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Event

Clap hands = one block right

Snap fingers = one block left

Tap nose = one block up

Tap chin = one block down

*From <http://thefoos.com/coding-resources-for-you>*



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Events in Math

## Patterning

Students create a pattern using 2-3 different events

## Measurement

Touch nose = draw 5cm line

Touch chin = draw 5 mm line

## 2-D Geometry

Touch nose = draw square

Touch chin = draw parallelogram



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Loops

A set of instructions that is repeated over and over again.



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Loops

Clap hands three times  
Snap fingers once  
Pat your head twice  
Clap hands three times  
Snap fingers once  
Pat your head twice  
Clap hands three times  
Snap fingers once  
Pat your head twice

OR

Repeat 3 times  
Clap hands three times  
Snap fingers once  
Pat your head twice



MATH  
Mondays!

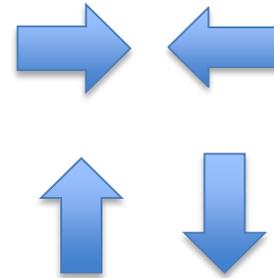
ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Loops Activity

Write instructions using loops.

x			
			End



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
**Catholic**  
**Teachers**  
ASSOCIATION



# Loops and Math

## Drawing a square

Draw a 5 cm line. Turn your paper 90 degrees.  
Repeat three more times.

What instructions would you need to draw a pentagon?



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Debugging

Finding and fixing the errors in algorithms or computer programs



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Debugging and Math

## Look Back at the Solution

- ▶ check the reasonableness of the answer
- ▶ review the method used: Did it make sense? Is there a better way to approach the problem?
- ▶ consider extensions or variations

**Communication:** describe how the solution was reached, using the most suitable format, and explain the solution



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
**Catholic**  
**Teachers**  
ASSOCIATION



# Other Curriculum Connections

**Social Studies** movement on a map

**Oral Communication** communicate in a clear, coherent manner

**Writing** procedures, prepositions

**Learning Skills** collaboration, independent work, responsibility, initiative, organization, self regulation

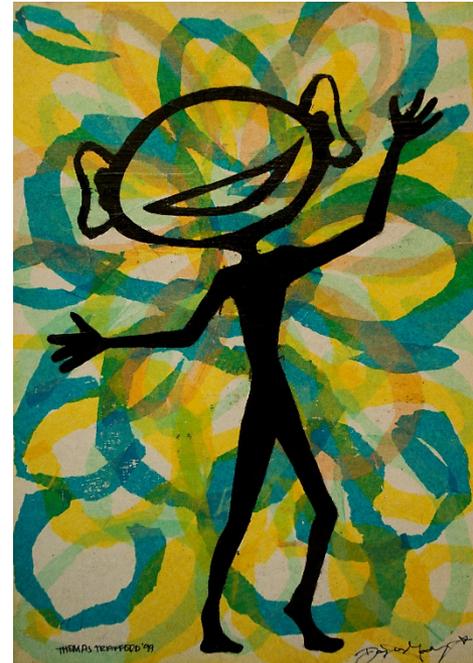
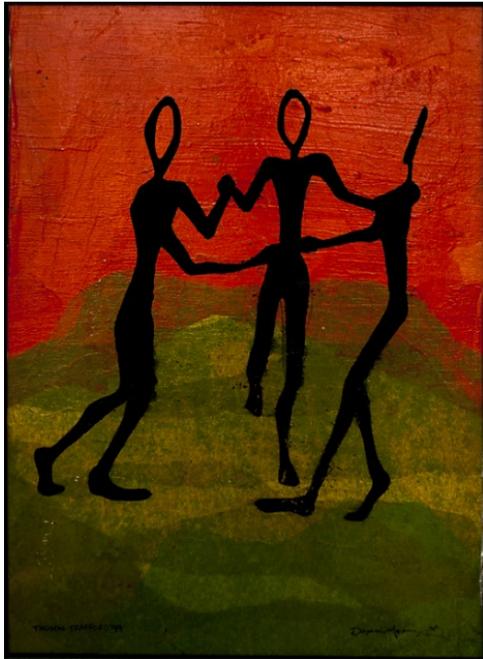


**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Ontario Catholic Graduate Expectations



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
**Catholic  
Teachers**  
ASSOCIATION

WEB EXPERIENCE

# Assessment

<b>Independent work</b>	I remain focused on the group task.	I follow instructions the first time they are given to me.
<b>Collaboration</b>	I do my fair share of the work.	I show respect to others through my words and actions.
<b>Responsibility</b>	I help my group clean up.	
<b>Organization</b>	I record what I learned in my journal without being reminded.	
<b>Initiative</b>	I am not afraid to try things that are new to me.	I enjoy experiencing new challenges.



**MATH**  
Mondays!

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Further Activities

## Unplugged Activities to Introduce Computer Science Concepts

Unplugged Activities to Introduce Computer Science Concepts : Activities		
24		<a href="#">Rosie's Runtime</a>
25	<b>Events</b>	<a href="#">Code.org Studio Course 1 &amp; 2 - The Big Event</a>
26	<b>Loops</b>	<a href="#">Code.org Studio Course 1 &amp; 2 - Getting Loopy</a>
27		<a href="#">Code.org Studio Course 4 - For Loop Fun</a>
28		<a href="#">Rosie's Runtime (Grades 3-5)</a>
29	<b>Conditionals</b>	<a href="#">Code.org Studio Course 2 - Conditionals with Cards</a>
30		<a href="#">If/Then Backyard Coding Game</a>
31		<a href="#">Playground Computing - Robotic Board Game</a>
32	<b>Variables</b>	<a href="#">Code.org Studio Course 3 - Functional Suncatchers</a>
33		<a href="#">Code.org Studio Course 4 - Envelope Variables</a>
34	<b>Functions (Procedures)</b>	<a href="#">Code.org Studio Course 3 - Functional Suncatchers</a>
35		<a href="#">Code.org Studio Course 3 - Songwriting</a>
36		<a href="#">Code.org Studio Course 4 - Songwriting With Parameters</a>
37		<a href="#">Rosie's Runtime (Grades 3-5)</a>
38	<b>Debugging / Error Detection</b>	<a href="#">Code.org Studio Course 1 - Building a Foundation</a> Really about persistence
39		<a href="#">Intel: The Journey Inside - Bugs and Debugging</a>
40		<a href="#">CS Unplugged - Card Flip Magic</a>
41	<b>Abstraction</b>	<a href="#">Code.org Studio Course 4 - Mad Glibs</a>
42	<b>Other/General</b>	<a href="#">Kodable Smeeborg Learning Guide</a> NOTE: Kodable now has a curriculum with many unplugged activities available through Teacher's Dashboard.
43		<a href="#">The Kodable World</a> Mostly the Kodable Smeeborg story with pictures
44		<a href="#">CS Unplugged</a>
45		<a href="#">Programming Unplugged</a>
46		<a href="#">Computing at School: Beyond Computing</a> Course menu of the topic above. Account Required. Free



**MATH**  
Mondays!

# Resources

## **Programming in the Primary Grades: Beyond the Hour of Code**

Sam Patterson, Lanham, Maryland : Rowman & Littlefield Publishers. 2016. eBook. (available at oct.ca)

Code Spark

<http://thefoos.com/coding-resources-for-you>

Teachers Learning Code

<http://www.teacherslearningcode.com/en>

Computer Science Unplugged

<http://csunplugged.org>



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Resources

Code.org

<http://code.org>

Playground Computing

<https://playgroundcomputing.com/>

Visions by Vicky (activities spreadsheet)

<https://sites.google.com/site/visionsbyvicky/home>



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION



# Resources—People to Follow

[Brian Aspinall](#)

@mraspinall

[Lisa Anne Floyd](#)

@lisaannefloyd

Teachers in your 21 Century Learning department



**MATH**  
*Mondays!*

ONTARIO ENGLISH  
Catholic  
Teachers  
ASSOCIATION

