

# Computational Thinking in Mathematics Education *Community of Practice*



# Why CT + Math?

- It's a *back-to-the-future* idea
- Math + CT was the focus in the 1970s/1980s, with Logo: Papert (1980) said, *Logo is to math what living in France is to learning French.*
- Today we have a CT (or coding) focus, but it's mostly not connected with math
- Math and CT share complementary affordances
- For example, here are 5 CT affordances that support math teaching/learning: *agency, access, abstraction, automation, audience*



Cover image of Papert's (1980) book *Mindstorms*.

**I'm going to make my own.  
I'm not going to copy what's  
on the screen. I'm going to do  
something new. Then I'll call  
you and say "Watch this!"**

*Grade 3 student*

**We're impressed he is learning  
geometry using a computer program  
and getting excited about math.**

**My daughter is excited about her  
ability to code and is very keen to  
learn even more.**

**She enjoys the strategy of trial and  
error.**

*Grades 3-5 parents*

# CoP Sites 2017

- **Wellington CDSB**, Grades 3-6 [Jeff Cummings, Bryan McMillan, George Gadanidis, Chantal Buteau, Erin Clemens]
- **Rainy River** [Bev Caswell, Joan Moss]
- **St Andrews PS, TDSB** [Ralph Walker, Bev Caswell, George Gadanidis, Joan Moss]
- **Western Faculty of Education** [PJ/JI/IS math + CT course instructors]

# Related Projects

## SSHRC PDG on CT in Mathematics Education

- 10 universities across Canada, 6 international
- K to undergraduate mathematics
- In process of applying for much larger grant
- [ctmath.ca](http://ctmath.ca)

## ORF app development/research

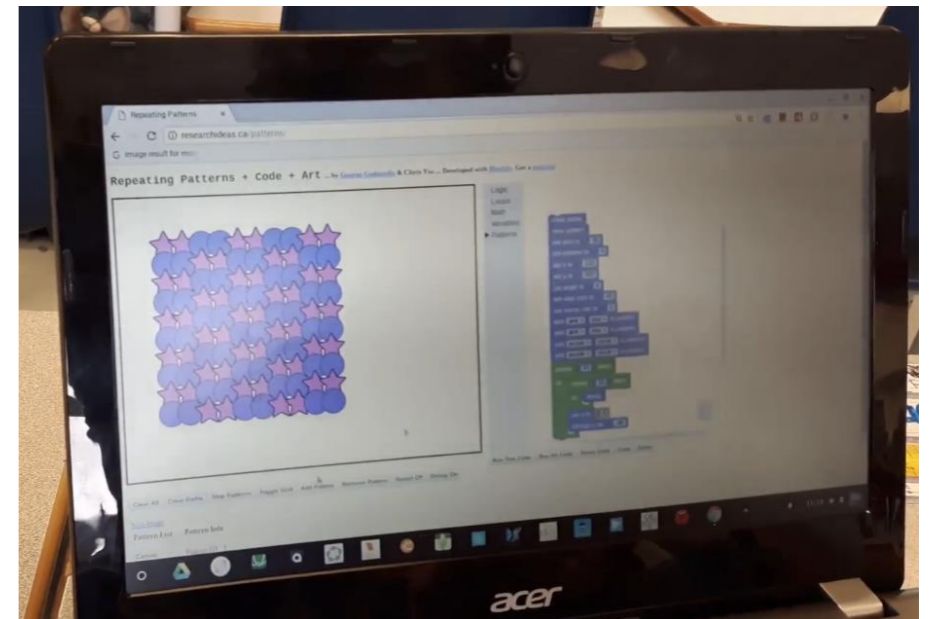
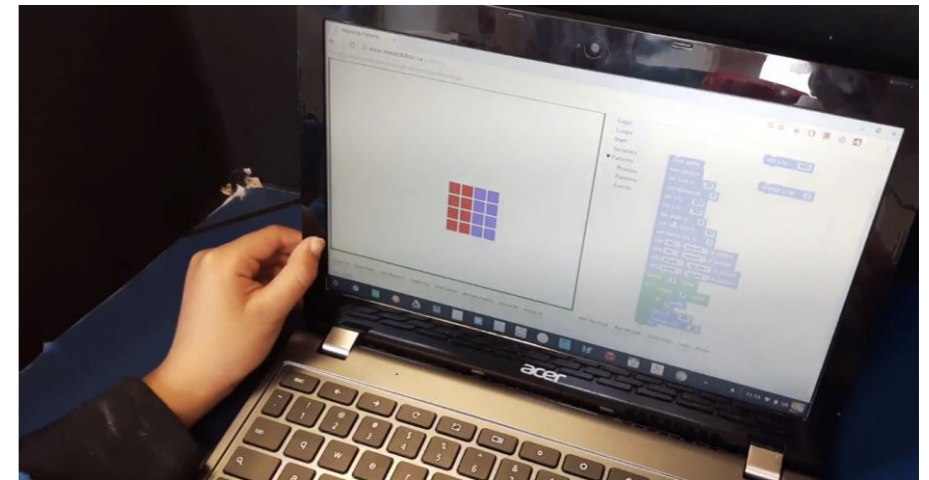
- 1/3 of story-based, math + CT apps
- [eduapps.ca](http://eduapps.ca)
- [researchideas.ca/sym/s1/](http://researchideas.ca/sym/s1/)

```
reset to initial symmetries
set trails to off
set size to 25
set speed to slow
set direction to 45 degrees
set theme to mars
set background to mars
set collision effect to create splatter
set music to mars
repeat 2000 times
do step
```



# 2017-2018

- **Wellington CDSB:**
  - Elementary: Leadership Projects
  - Secondary: Grade 10 Math + Comp.Sci. Cohorts
- **St Andrews PS + Rainy River collaboration**
- **Western Faculty of Education:** refined Math + CT integration
- Offer mathematics-based activities for **hour of code**. How do we “sell” this?
- Expand our Ontario, national and international partners



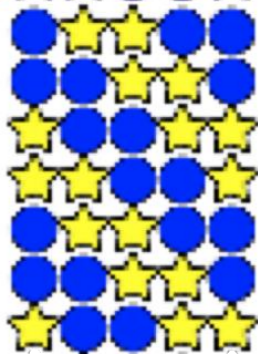
Wellington CDSB



**Student:** In our first attempt, we figured out we had to change the position, that is, x and y. So, our first try was 500 and 295. Then, we figured out that to start from right to left, we had to change the direction angle from 0 to 180.

**Teacher:** Did that work?

**Student:** Not exactly, you see?



Brazil

# Elementary Leadership Project in Math + Coding

## Project Focus:

- Empower educators to show leadership and mentor others to continue the growth of Math + Coding activities in elementary classes in Wellington Catholic District School to increase engagement in Mathematics and promote 21st Century learning skills.



# Mentorship Model

- Coding Leads will mentor a colleague in delivering Math + Coding activities in their respective classrooms
- Several methods will be utilized
  - Co-teaching/ Coaching
  - Lesson Study
  - Professional Learning Community

# Outcomes

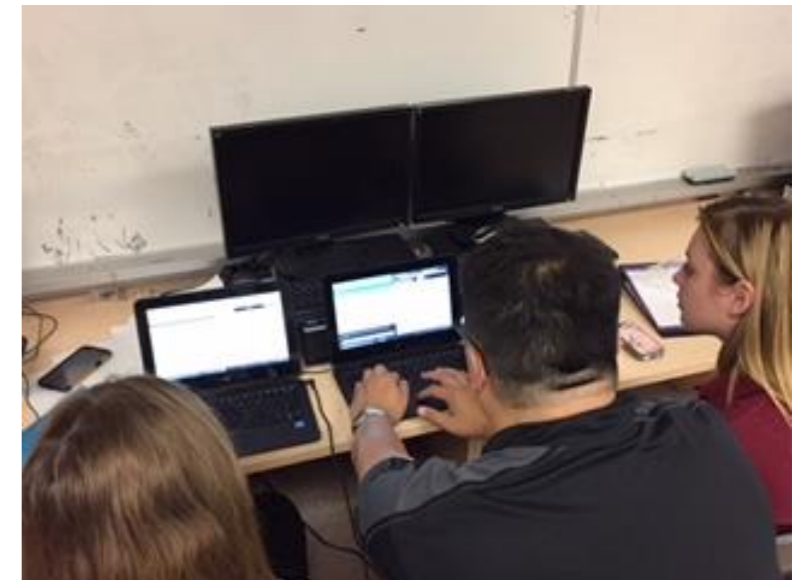
- Continue to develop vibrant shareable resources and activities
- Create student voice opportunities to share learning using a variety of digital learning tools (#WEcode)
- Provide intensive professional learning opportunity to learning teams at target school sites
- Provide professional learning opportunities to non-participating schools in our board through Leadership opportunity (#WEinitiative)



# Grade 10 Math + Computer Science Cohort Project

## The Program

- Opportunity for students to receive two credits with a focus on computational skill to solve mathematical problems.
- Integration of mathematics tasks with computational thinking to problem solve and create real life solutions using code.
- Student learning products could be the construction of apps, games, robotics, and programs to solve real life problems (“Passion Projects”)



# Outcomes

- Goal to attract and increase the number of female students taking computer science
- Support inclusive learning environment for disengaged students (eg. Applied learners in Math)
- Promote modern learning environments that emphasize collaboration, creativity and critical thinking skill (redefine the learning space)