Programming with Turtles

Computational Thinking Meets Spatial Reasoning

Vivian Li & Katie Bell

Schedule

10:30   Introduction

11:00   Setting up accounts & getting started

11:20   if statements/branching with turtle

12:10   Lunch

13:00   Parallel lines with turtle

13:30   Loops/iteration with turtle

14:05   Finish

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A brief history of Grok

- ○ NCSS Summer School

- ○ NCSS Challenge

- ○ Grok Learning

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Challenges

- Curriculum is crowded

- Need to cover DT content descriptors in conjunction with other learning areas

- Subjects are siloed

- Need expertise in more than one learning area

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Computing & Maths

- Deep connection between maths and CS

- Lots of connections between the two curricula

  - http://www.australiancurriculum.edu.au/mathematics/curriculum/f-10?layout=1

- Opportunity for authentic integration

- Every child learns maths

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A brief history of Logo

- Educational programming language designed in 1967, remembered for turtle graphics

- Originally a physical robot (called a turtle) that drew with a pen on paper

- There have been various implementations over the years , e.g. Python turtle module!

```
from turtle import *

forward(100)
```
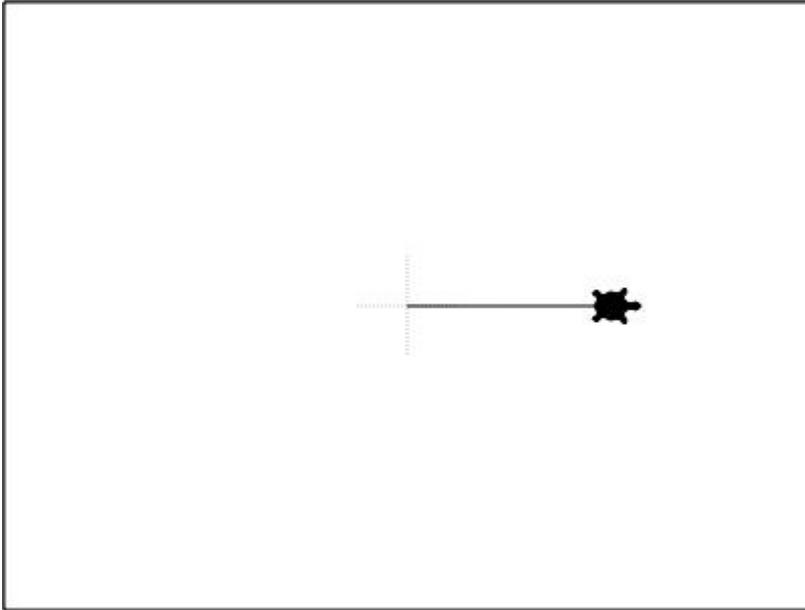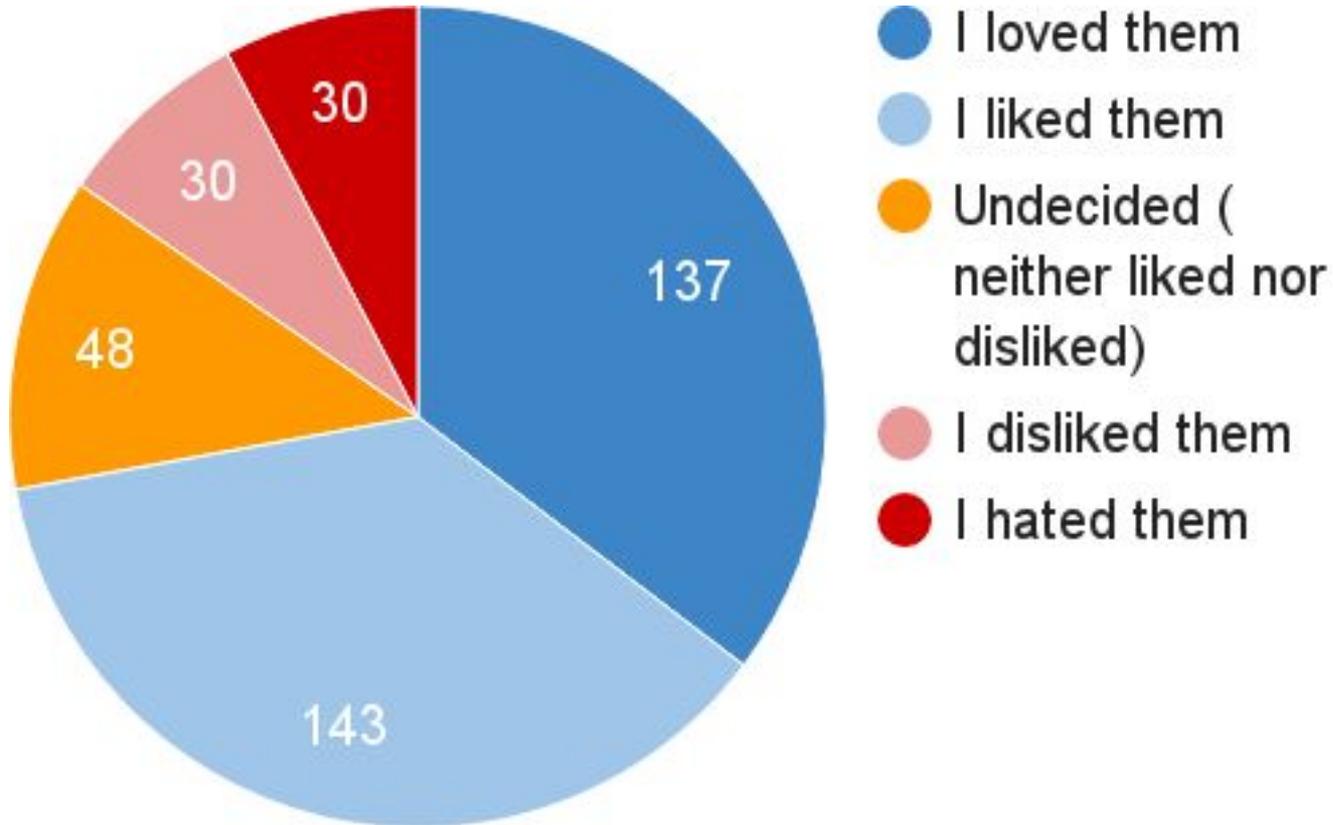
Turtle in the NCSS Challenge

- ○ NCSS Challenge 2015
  - ● ~6000 students, ~500 teachers
- ○ 2 questions at the end of each week
- ○ Feedback generally positive

- ○ Concerns about maths being too difficult turning students off programming

- ○ Problem: Large range of ages (Years 5-12) works for programming but not maths

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What students thought

- *IT WAS AMAZING!!!! I loved programming to make shapes and pictures but don't ask me to redo them because they were very hard to work out how do*

- *It felt nice when I got them right, because I'm weak at maths.*

- *I would much rather write other programs or stab forks in my eyes than do anymore [sic] turtle questions.*
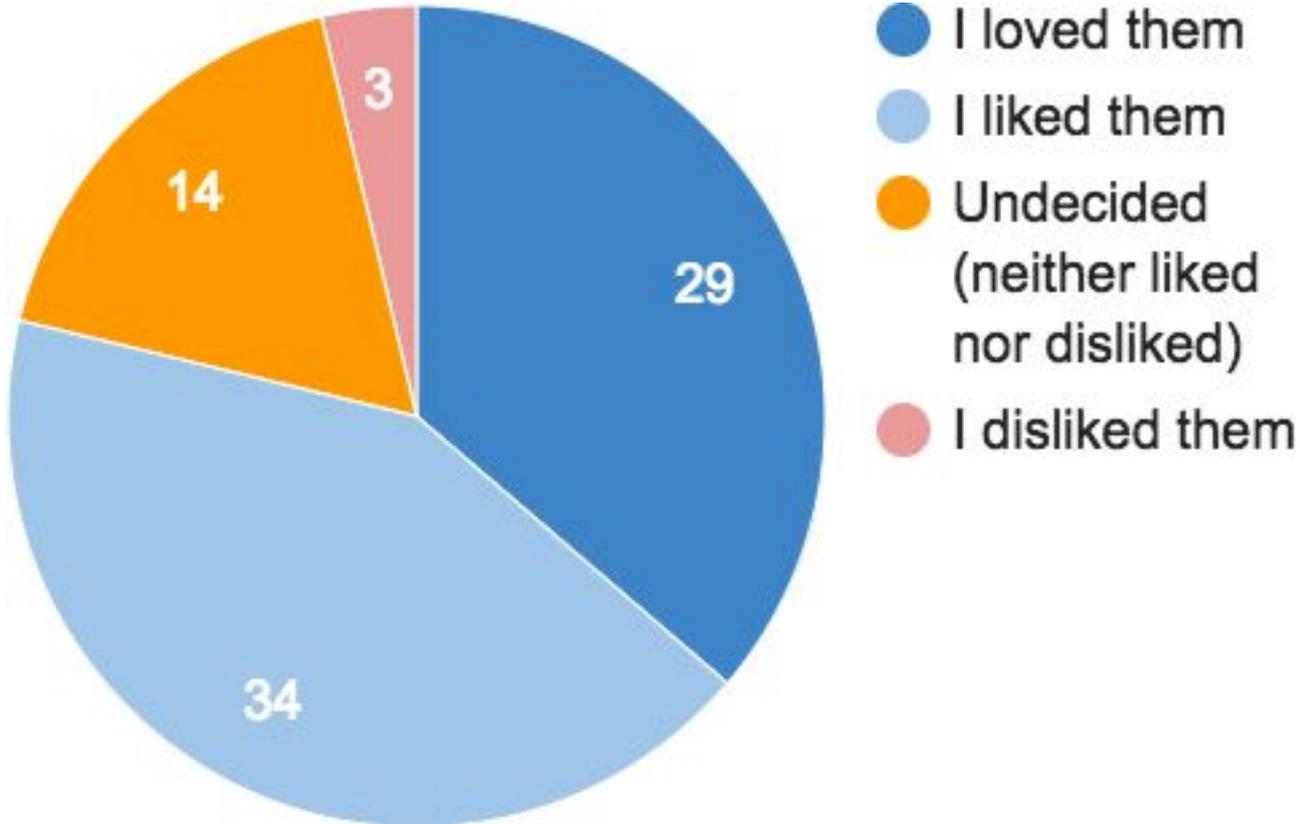
Did you like the turtle questions? (students)

I loved them — 137
I liked them — 143
Undecided (neither liked nor disliked) — 48
I disliked them — 30
I hated them — 30

What teachers thought

- *Engaging and more enjoyable as you could see where an incorrect instruction was drawn out with the turtle - see physical errors, rather than computer language feedback stating errors.* - Rob McLean

- *As much as I liked them, students tended to get hung up on the mathematics of the questions, rather than the programming bits! At the Beginner level, this often caused the students to get disheartened with the programming side of things too.* - Richard Lawler

- *Okay, I personally hated the turtle but that's because I couldn't get my mind around it! It was great for students however and our Head of Maths found some great connections with vectors, angles etc.* - Lou Christie

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Did you like the turtle questions? (teachers)

Pie chart segments:
- 29 — I loved them
- 34 — I liked them
- 14 — Undecided (neither liked nor disliked)
- 3 — I disliked them

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Year 7 Maths & Computing course

- ○ Targeted at Year 7 and tied to their curricula

- ○ More explicit teaching of maths concepts

- ○ Slower pace than NCSS Challenge

- ○ More repetition - two problems for each concept

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Year 7 Maths & Computing course progression

1. Programming basics: Talking to your computer
2. Programming basics: Calculating things
3. Geometry: Drawing shapes with turtle
4. Geometry: Making decisions
5. Geometry: Decisions with numbers
6. Geometry: Parallel lines

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Digital Technologies

Mathematics

5-6

Implement digital solutions as simple visual programs involving **branching**, **iteration** (repetition), and **user input** (ACTDIP020)

Investigate, **with and without digital technologies**, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles (ACMMG141)

7-8

Implement and modify programs with user interfaces involving **branching**, **iteration** and **functions** in a **general-purpose programming language** (ACTDIP030)

Identify corresponding, alternate and co-interior angles when two straight lines are crossed by a transversal (ACMMG163)

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Setting up

- Go to the short URL on your card

- Enter your email address

- Check your email - click the "Click here" to accept

- Create an account

- Click 'Accept Free Invite' (red button)

- Click the 'Courses' menu

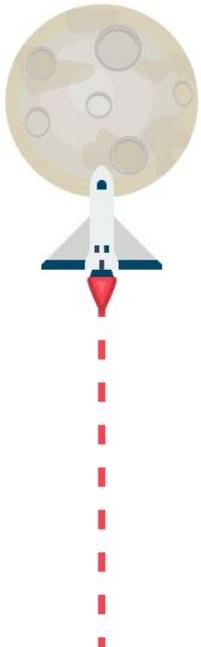- Click 'Year 7 Maths & Computing' course

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Setting up (cont.)

Challenge turtle questions

- Click your name in the top-right corner then 'Account'

- Click 'Enrolments' and enter your *special enrolment code*: acce16-workshop

Short activities

- Click 'HoC' in the top bar
    - Frozen Fractals & Hydrangea Danger (angles at a point)
    - Flags of the world (drawing shapes)

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ANY QUESTIONS?

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