Using StarLogo, a graphics-based programming environment, to enable biology students to build computer simulations

V Anne Smith

School of Biology, University of St Andrews

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The Context

- Senior Honours module "Complex Systems in Animal Behaviour"

- Small group teaching

- Students learn about methods for studying complex systems in animal behaviour
  - including computer simulation

Computer Practical

- Wanted to enable students to experience building a computer simulation

- But…
  - most SH Biology students not conversant with programming

StarLogo TNG

- Developed by MIT's Education Labs

- Graphical programming interface

- Agent-based modelling

- Available free for Windows & Mac

http://education.mit.edu/projects/starlogo-tng

The Practical

- Two 2-hour sessions

- First session
  - learning to build simulation

- Second session
  - modify simulation on own

Learning

- Step-by-step instructions to build simulation from scratch
  - ants carrying granules
  - follow **process** of programming, not just putting pieces together

- Process
  - constantly checking results
  - debugging for desired output

The dip in the top of the *create Ants* command fits into the overhand in *setup*. *create Ants* has another bump on its underside, which will allow more commands to be added.

- Move *create Ants* over to *setup*, connecting the bump and dip. It clicks into place, and the *setup* slot expands a little to allow it to fit.
- We'd like more than 10 Ants, so click on the number *10* and change it to *50*.

Now we'll do the same thing for Granules.

- Clicking on the button *Granules* opens a drawer from which you can choose *create Granules (num)*.
- Click this into *setup* below *create Ants*.
- Change the number from *10* to *100*.

> **B.** Let's see what we've done so far. Go to the SpaceLand window. Click on *setup*. What happens now?

We've made 50 Ants and 100 Granules, but they are all standing on top of each other in the centre of the land. We'd rather have them scattered throughout. Go back to StarLogoBlocks.

- Return to the Factory (click on arrow to left of My Blocks, labelled "Factory").
- Click on *Setup and Run* and choose from the drawer the command *scatter everyone*.
- Click this in below *create Granules*.

> **C.** Go to SpaceLand and click on *setup*. Now what happens?

Modifying

- Provide completed version of simulation

- Ask students to modify characteristics and run a small simulation experiment

Student Modifications

- Change angle of turn
- Change height of granules
- Change numbers
- Change initial distribution
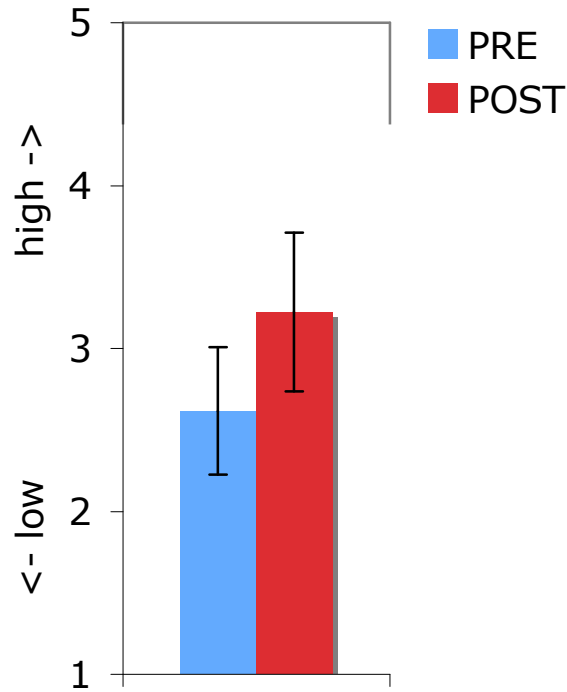- Change shapes
- etc.

Survey Experiment

- Pre- and post-surveys

- Ask
  - perceptions of computer programming
  - questions requiring understanding code
    - text and graphical
  - confidence on answers

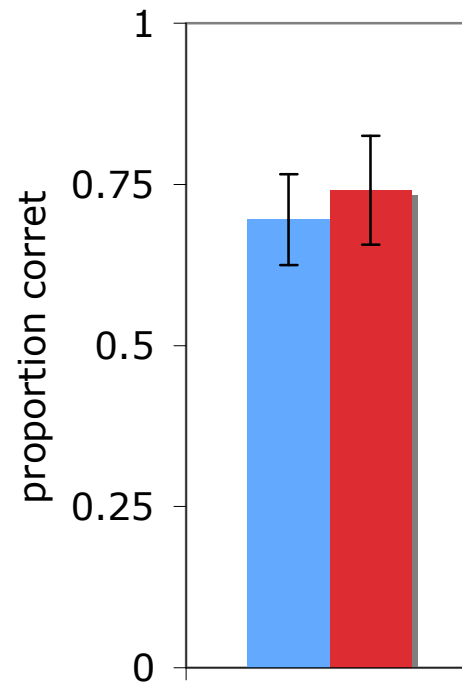- Preliminary: 8 students from last year, plan to continue

with Dr Ishbel Duncan, Computer Science
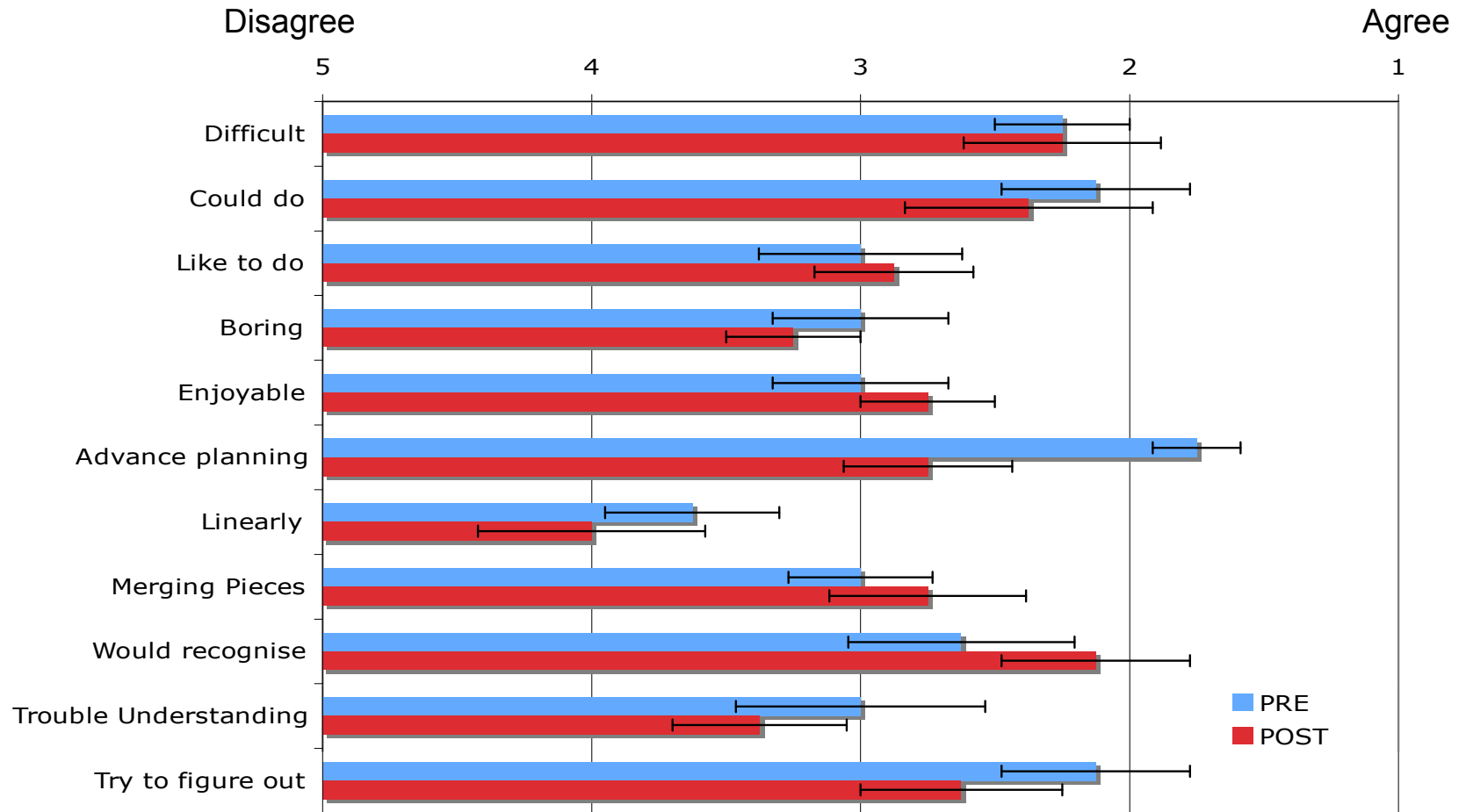
Perceptions

Questions

Summary

- Students enjoy StarLogo
- Students learn about programming

- Change in perception? More research needed
- Confidence increases, although not necessarily accuracy

anne.smith@st-andrews.ac.uk