From Unplugged to Blocks

Coding & STEM 4 Schools

An Introduction to Coding and Computational Thinking

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Recap of Last Session

- In the Unplugged session you learned about some **computational concepts**:
  - Sequences
  - Loops
- In this session, you will apply these concepts to solve Coding Puzzles
- You will also learn about another concept: Events

Session Overview

- We will explain what Block Coding is
- Share and try out a variety of free Coding Puzzles resources:
  - Lightbot
  - Code.org Activities
  - Scratch DebugIt Projects
- Discuss some other resources for teaching Coding with Puzzles

Coding with Blocks Languages

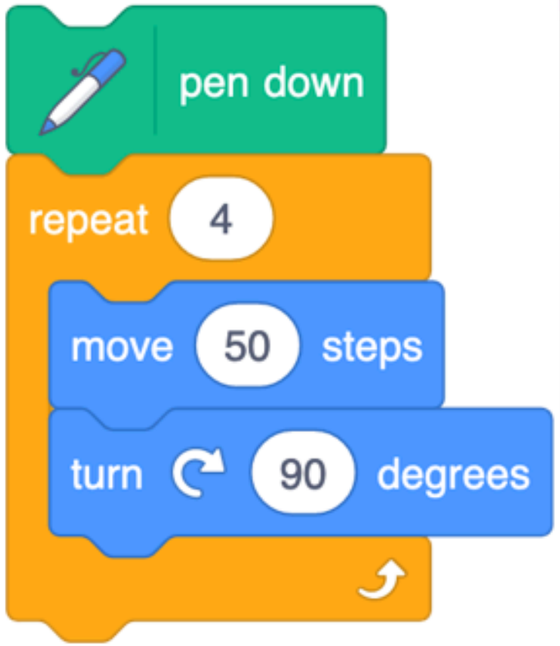
- Blocks are a common way of introducing Coding to students
- Involve dragging and dropping blocks together to build Scripts
- Also referred to as Visual Programming Languages
- Scratch, Lego Mindstorms and Snap! are examples of Blocks Languages

Text vs Blocks

LOGO (Text)

```
pd
repeat 4 [
  fd 50
  rt 90
]
```

Scratch (Blocks)



Result

Blocks Coding in Education

- Scratch is commonly used in K-6
- Snap! (an extension of Scratch) has been used for High School and University courses in the USA
- Blocks Coding could be easier to learn than in Text
- Prevent problems caused by spelling or syntax errors
- Students can focus on learning the concepts instead of being overloaded by remembering commands

Blocks Coding in Education

— Blocks Coding languages vary in complexity

— Will be suitable to different students' age groups

— Symbols for younger students (Early Stages - Stage 2), for example: ScratchJr

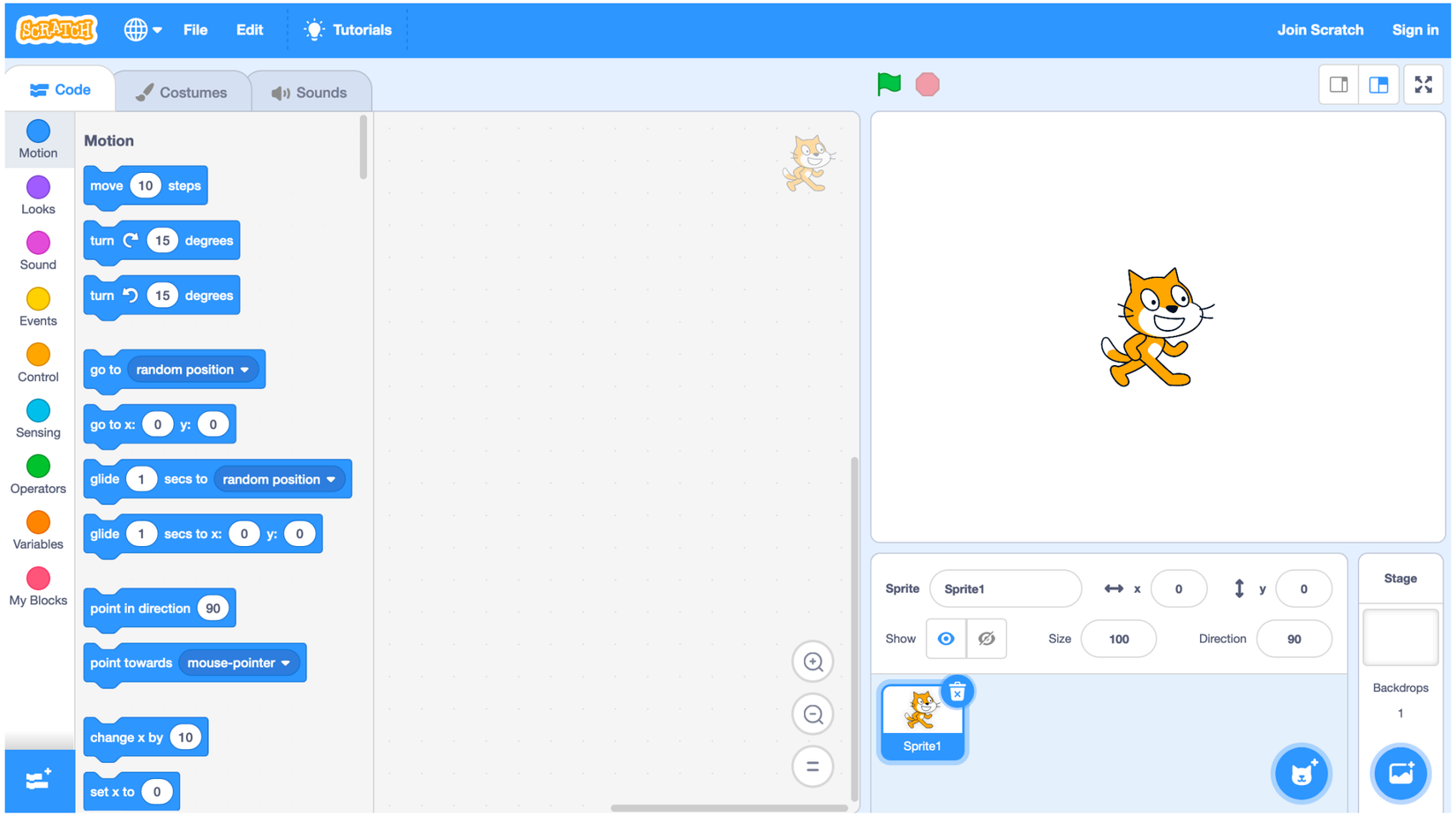
— Commands in Blocks for students from Stage 2 upwards, for example: Scratch

— Hybrid for students moving from Blocks to Text Coding, for example: PencilCode for Years 7-8

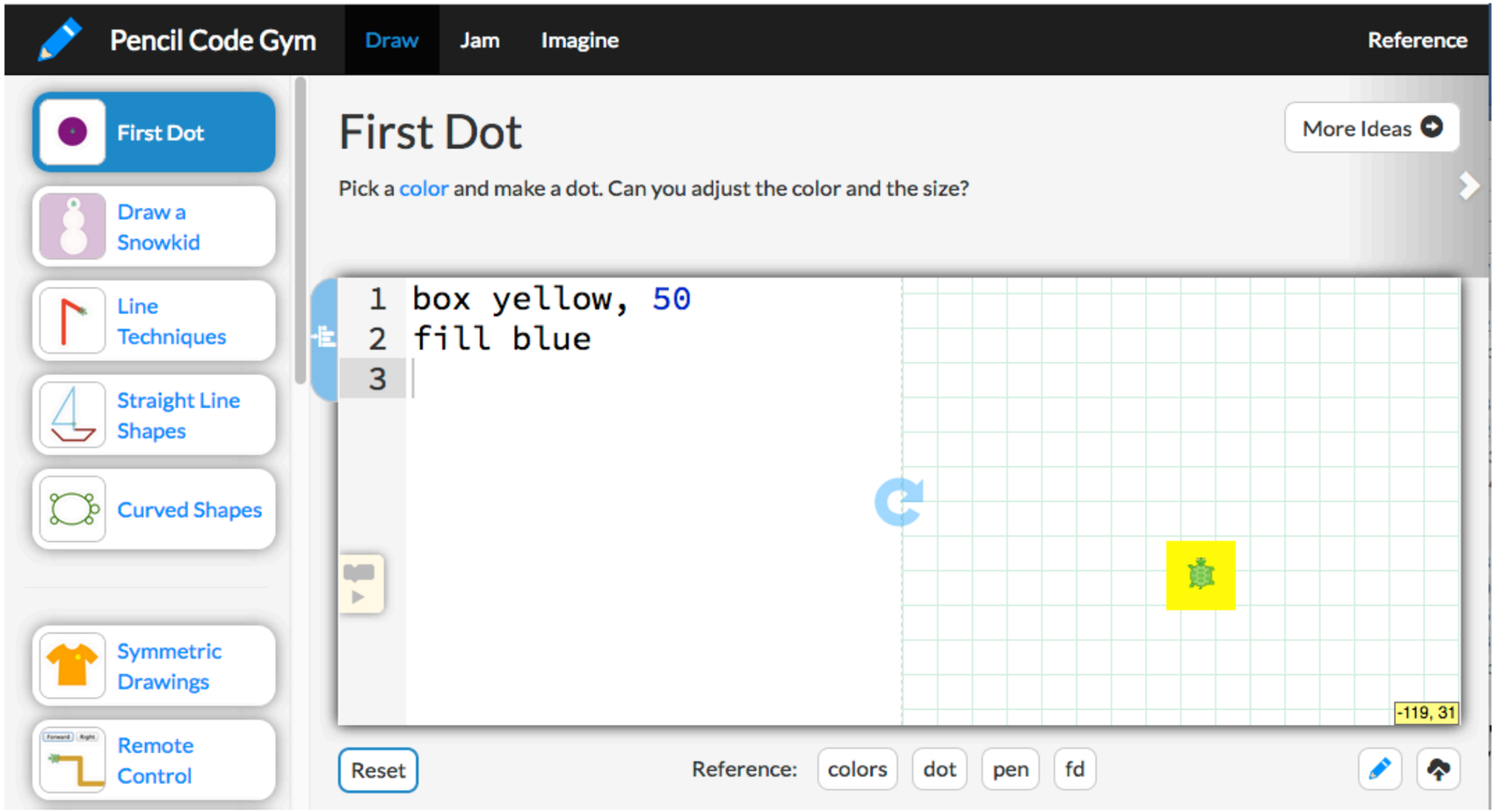
Blocks Languages: Symbols for Early Stages

Image from: https://www.scratchjr.org/learn/interface

Blocks Languages: Commands in Blocks for Stage 2+



Blocks Languages: Mixing Blocks and Text for Years 7+



Syllabus Outcomes: Stages 1 - 3

- New Science & Technology K-6 Syllabus:
  - ST1-3DP-T: describes, follows and represents algorithms to solve problems
  - ST2-3DP-T: defines problems, describes and follows algorithms to develop solutions
  - ST3-3DP-T: defines problems, and designs, modifies and follows algorithms to develop solutions

Syllabus Outcomes: Stage 4 & Cross-Curricular

- New Technology Mandatory (7-8) Syllabus:
  - TE4-4DP: designs algorithms for digital solutions and implements them in a general-purpose programming language
- Puzzles also involve elements within the Numeracy General Capability as there's often counting and spatial reasoning involved when solving the Puzzles

Puzzles for Teaching Coding

— A common way of teaching Coding (particularly with Blocks languages)

— We will look at a few different resources for teaching Coding with Puzzles in this session

— Help your students think about sequences of instructions and how Computers follow these

— Practice their algorithmic thinking: solving problems through step-by-step instructions

Coding Puzzles for High School Students

- The resources in this session may be more suitable for K-6 students or those new to Coding
- There are Puzzle resources for learning Coding that are more difficult & involve Text Coding, for example:
  - Code Combat: a game for learning JavaScript
  - Swift Playgrounds: iPad app for learning Swift
  - Project Euler: problems that can be solved with Coding and Mathematics (can be quite difficult)

Lightbot

— An example of a Puzzle game for learning Coding
— Involves solving problems with Sequences and Loops
— A link to the site is under the Activities heading
— Also available on Android and iOS for a small price
— The goal is to instruct the Lightbot character to light up all of the blue squares with algorithmic thinking

Lightbot

Try to solve some different puzzles in Lightbot

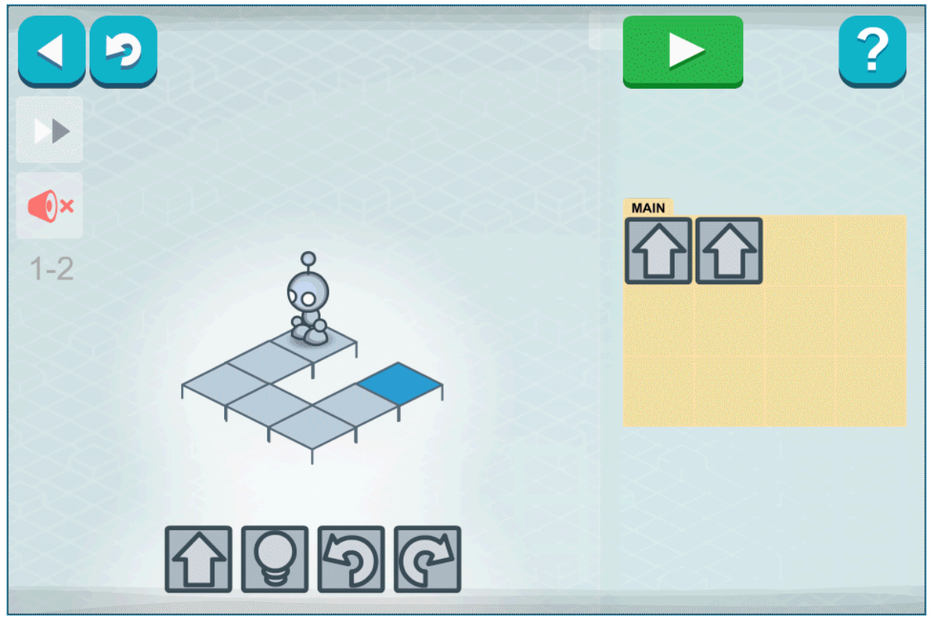


Image from: http://lightbot.com/flash.html

Lightbot: Discussion

— Why were Sequences important when playing Lightbot?

— Did anyone try the Procedures activities?

— Did anyone use Loops?

Code.org

- Has anyone run an Hour of Code with their students?
- An initiative created by the Code.org organisation (based in USA)
- Code.org does a lot of work in:
  - Developing their own resources and curriculum
  - Collating existing resources
  - Helping prepare teachers for teaching Coding

Code.org's Hour of Code

- Code.org has several Coding Puzzle resources
- Some examples with different themes:
  - Star Wars
  - Frozen
  - Minecraft
- Blocks have a command written on them (for example, move up, instead of an arrow symbol like in Lightbot)

Code.org's Hour of Code

— Choose one of the themed Hour of Code activities (Star Wars, Frozen or Minecraft) and try the activities

— The Star Wars activity could be useful for introducing Text Coding, as it allows you to switch between blocks and text, if you select the JavaScript option

— If you have already done these activities already, try one of the other resources available from the Learn page or let us know what we suggest you try next

Code.org's Hour of Code: Discussion

- Were the Puzzles that you solved similar to those in Lightbot?
  - Did you use Sequencing and Loops?
- Did you try a different Code.org resource?
- How was it different to the Star Wars, Frozen and Minecraft activities?

Puzzles in Scratch

— Next, we will look at Scratch

— The real strength of Scratch is for the creation of Projects (such as Stories, Animations and Games)

— However, there is a collection of Scratch Puzzles called DebugIt activities

— These DebugIt activities involve identifying and fixing a problem in a Scratch project (debugging)

— We will look at the DebugIt 1.1 Project now

Debugging

- The DebugIt 1.1 Project has two Sprites (Characters)
- When we click the green flag, the Cat does a dance
- The when green flag clicked block is an example of an Event
- Gobo should start dancing when the green flag is clicked, why doesn't he?
- There are many more Debug It! activities, which are from the Creative Computing Curriculum Guide

Next Session

— You will learn about the Creative Computing Curriculum Guide

— A guide for teaching Coding in Scratch but that could be adapted for other languages

— Encourages an approach to learning Coding that emphasises creativity and the creation of Projects