Moving Beyond Puzzles: Project-based Coding

Jared O'Leary
BootUp PD

What's the plan?

- Discussion
- Interest-driven learning
- Q&A

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How to reach the resources

- www.JaredOLeary.com
  - Presentations
  - Moving Beyond Puzzles: Project-based Coding

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Sequential learning?

- Affordances
  - How might sequential learning potentially support or enable learning how to code (or engage in CS)?
- Constraints
  - How might sequential learning potentially constraint or limit learning how to code (or engage in CS)?

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Some context

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Moving from replication

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To interest-driven creation

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Technology Classes at Desert Thunder
Jared O'Leary
Arizona State University
Avondale Elementary School District
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0:00 / 5:00

Platforms grew out of student interest

1. Scratch
2. Khan Academy
3. Sonic Pi
4. Xcode
5. Swift Playgrounds

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Q3 Project Options

1. Amazing Mazes
    a. Step one - Starter Maze
        i. Remix this project and change the code of the ball sprite to navigate it through the maze.
        ii. Use only the three kinds of motion blocks in a sequence to get the ball to the X.
    b. Step two - Loopy Maze
        i. Remix this project and change the code of the cat sprite to navigate him through the maze.
        ii. Use only the three kinds of motion blocks and one repeat block to get him to the X.
    c. Step three - Advanced Maze
        i. Remix this project and change the code of the cat sprite to navigate him through the maze.
        ii. Use only the three kinds of motion blocks in a sequence to get him to the X.
    d. Step four - More Amazing Mazes
        i. Pick another project from this studio and remix it to make it do something new

2. What can you create? v3
    a. Using any combination and number of these blocks, what can you create?
    b. Create a spinoff of the project above using only the blocks inside the project.

3. Pong starter project
    a. How could you remix this game to do something different?
    b. Use this studio to learn some tips and tricks for making games

4. Remix or create your own school appropriate project
    a. Think about what kind of project you want to remix/create and what you hope to learn while working on it, then come talk with me before you get started

Project idea generator

by DTTechnology

v459.1

Super heroes

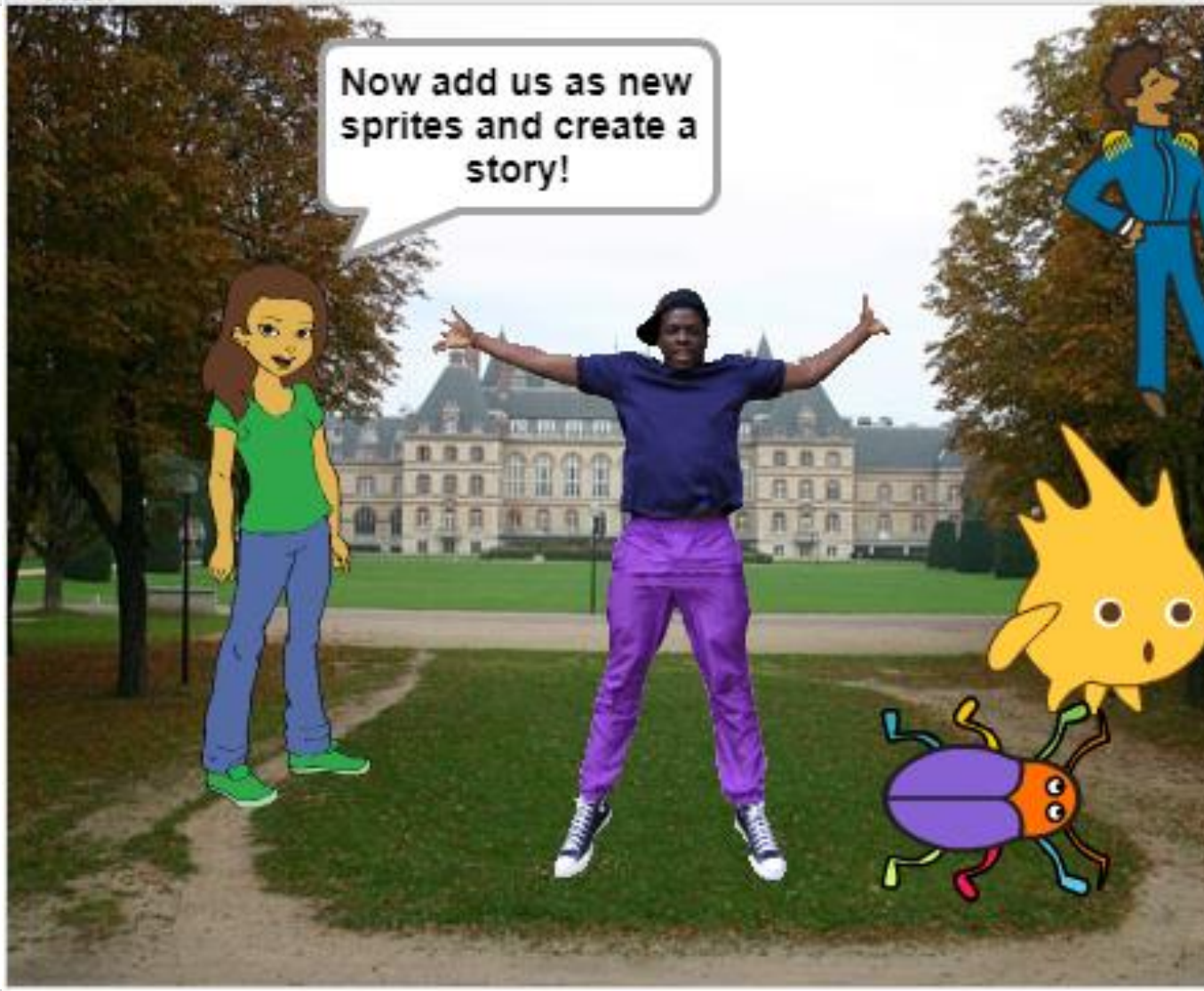
In a field

Musical

Random story challenge

by DTTechnology

v459.1



DTTechnology » Studios I Curate (12)

Music from SCRATCH

Mazes

Game Addons

Advanced

Video Sensing

Desert Thunder

Stories

Games

Drawing and Animation

Pass It On

Debugging

Music and Sound

Example project prompts

- Can you create a school appropriate project that…
  - …helps someone?
  - … is scary, funny, exciting, boring, musical, silly, relaxing, or colorful?
  - … solves a problem you see in the world?
  - … reminds you of a special event, story, or place?
  - … you can give as a gift to someone else?
  - … you can use for another class?

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Why do I need to know this?

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Can I work on this at home?

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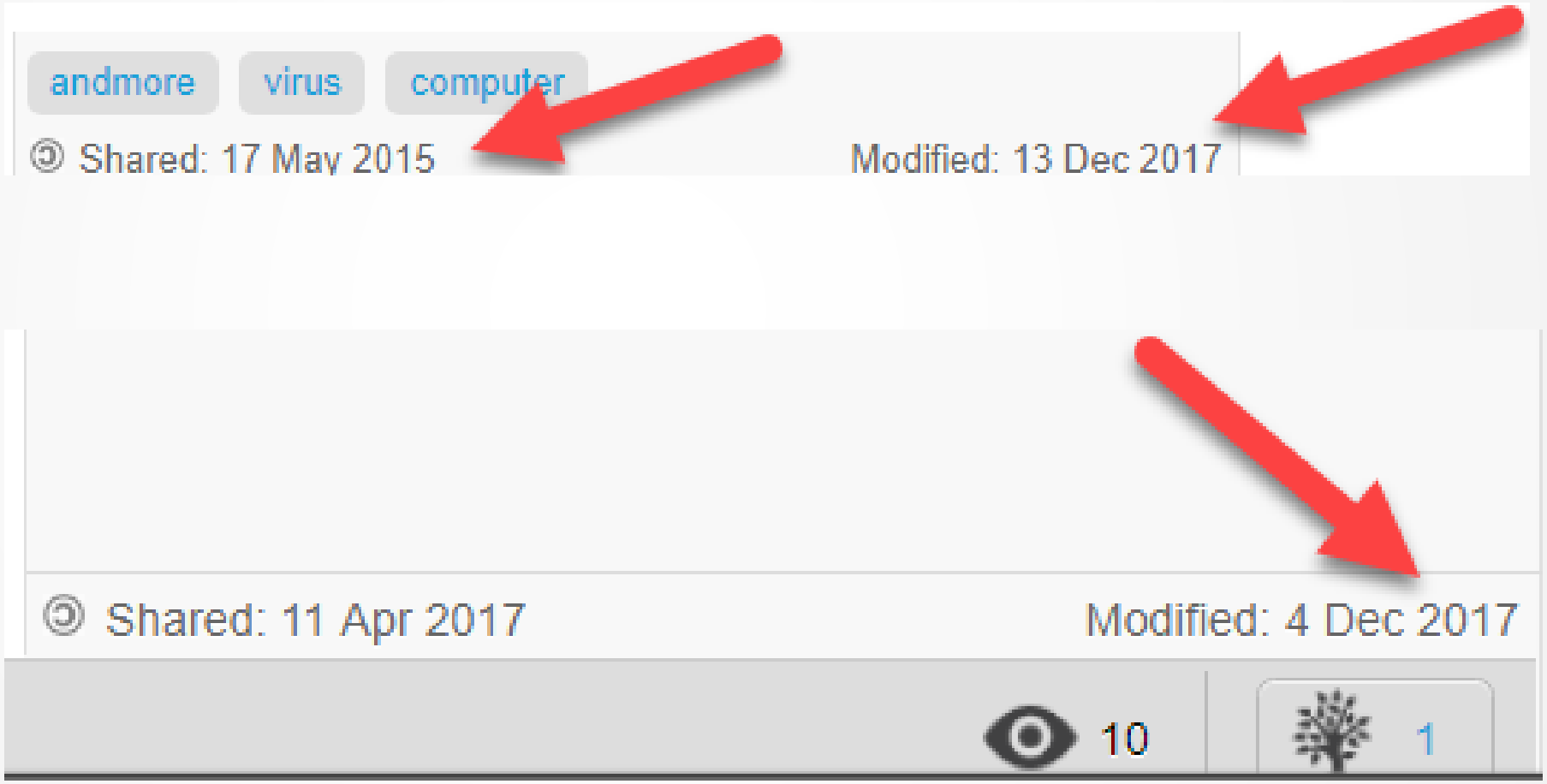

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Process > Product

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Generic Plan

1. Check the built-in help or resources
2. Ask a friend for help
3. Ask another friend for help
4. If I'm not working with someone, ask me
    a. If I'm working with someone, repeat steps 1-3

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Scratch Example

1. Read through the comments in the project or use Scratch's built in help
    a. You can use the block help button (?) to find out information on a specific block
    b. You can use the Tips button to find out how to do some basics in Scratch
2. Ask someone next to you
    a. Make sure you are controlling the mouse and they are asking questions like:
        i. What step in your algorithm isn't working?
        ii. What blocks/code do you think you'll need to use?
        iii. How does this compare with other projects we've worked on?
3. Ask someone else in the class
    a. Make sure you are controlling the mouse and they are asking questions like:
        i. What step in your algorithm isn't working?
        ii. What blocks/code do you think you'll need to use?
        iii. How does this compare with other projects we've worked on?
4. If I'm not working with anyone else, ask me (If I'm helping someone, repeat steps 1-3)
    a. Please keep what you have tried on the screen so I can see it

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Guiding through questions video

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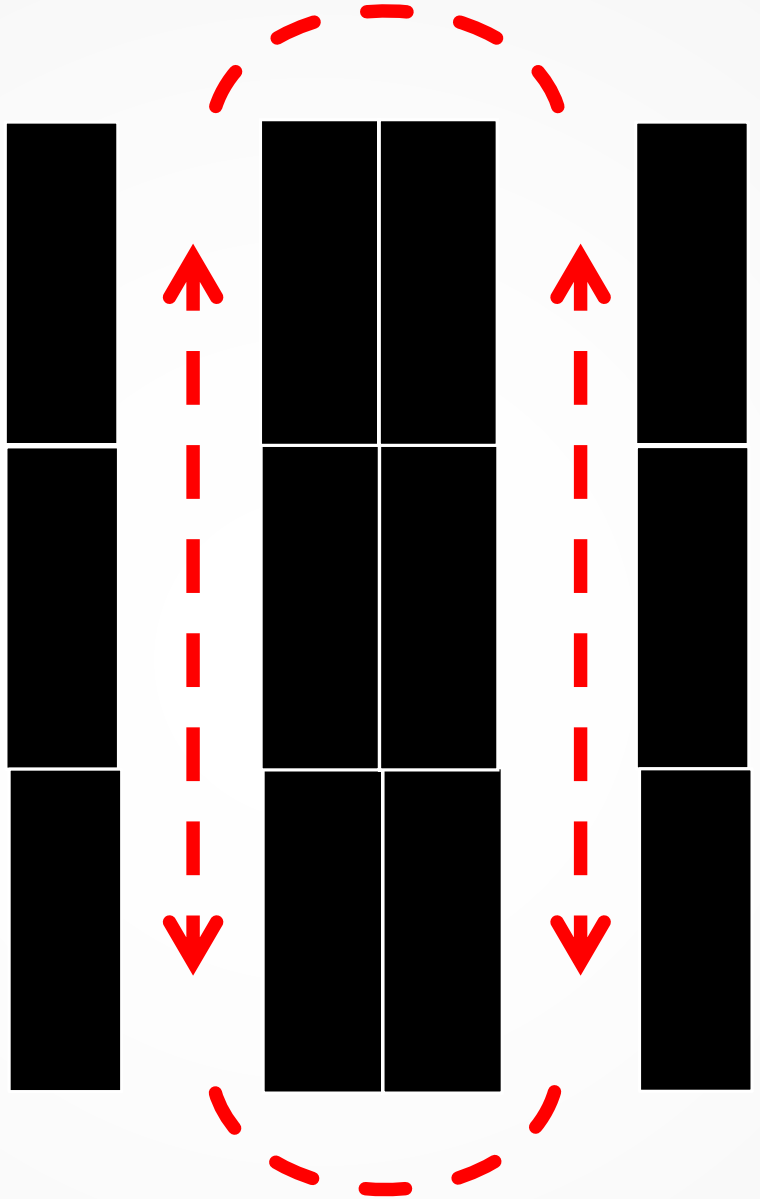

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Room setups video

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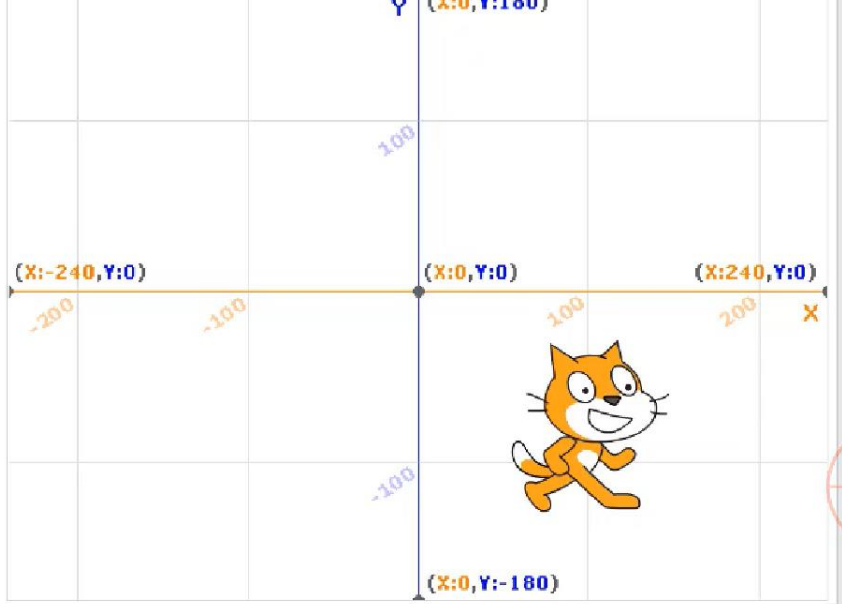
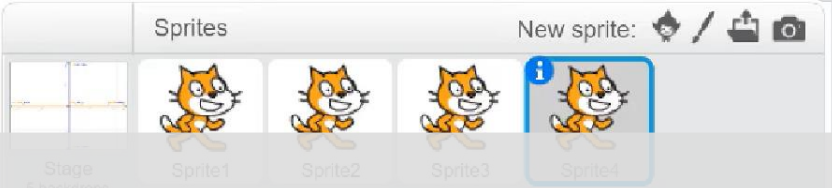
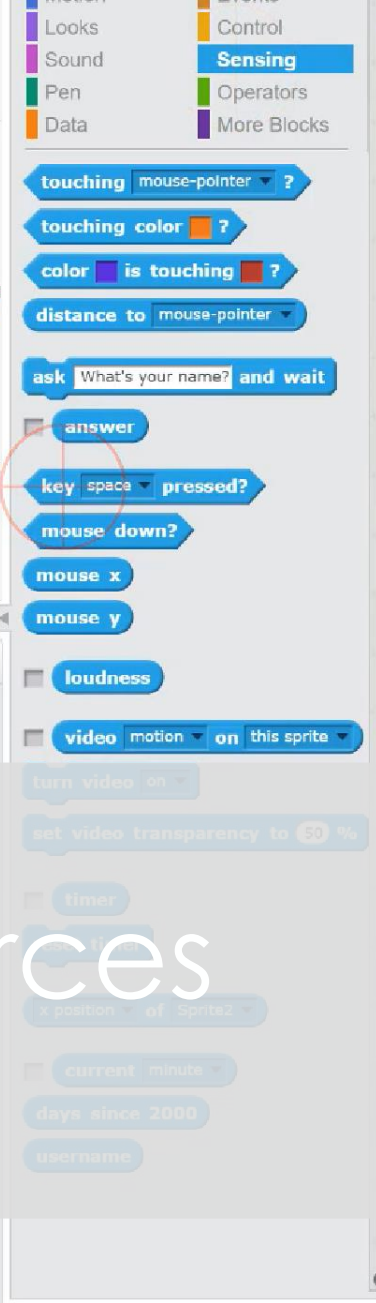
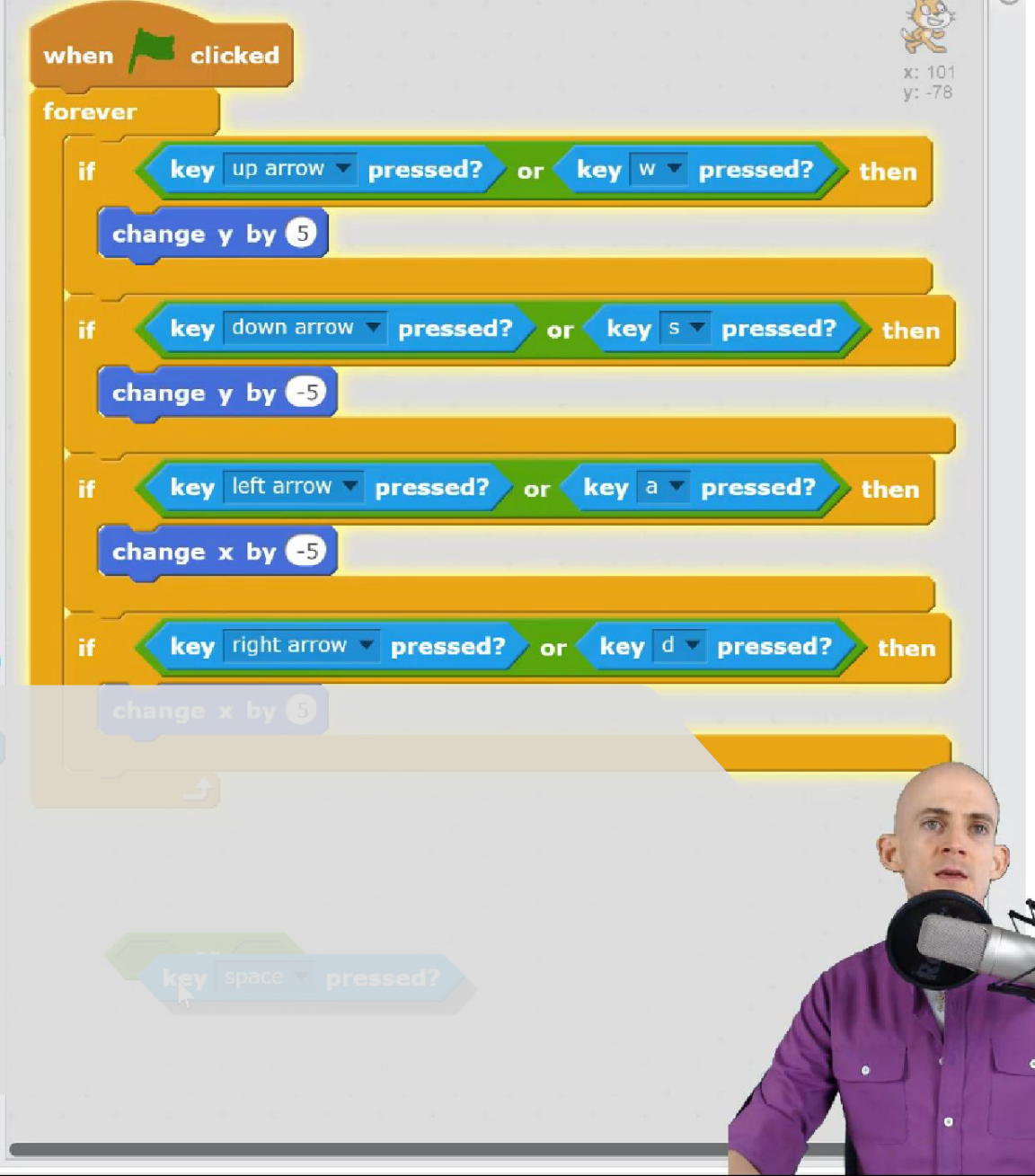
Video resources









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1
BootUp Professional Development
Scratch Tips
Player Controls
2
3
Option 1 - Look where you're going
4
Option 2 - Face the same direction
5
What is X and Y?
6
Option 3 - More responsive controls
7
Option 4 - More options
8
Option 4 - More options

Option 3 - More responsive controls

1. If you tried out one of the first two methods, you may have noticed they don't work well if you want to press and hold the keys to move
2. Use code on the right to make a much more responsive controller for your sprite

Quick reference guides

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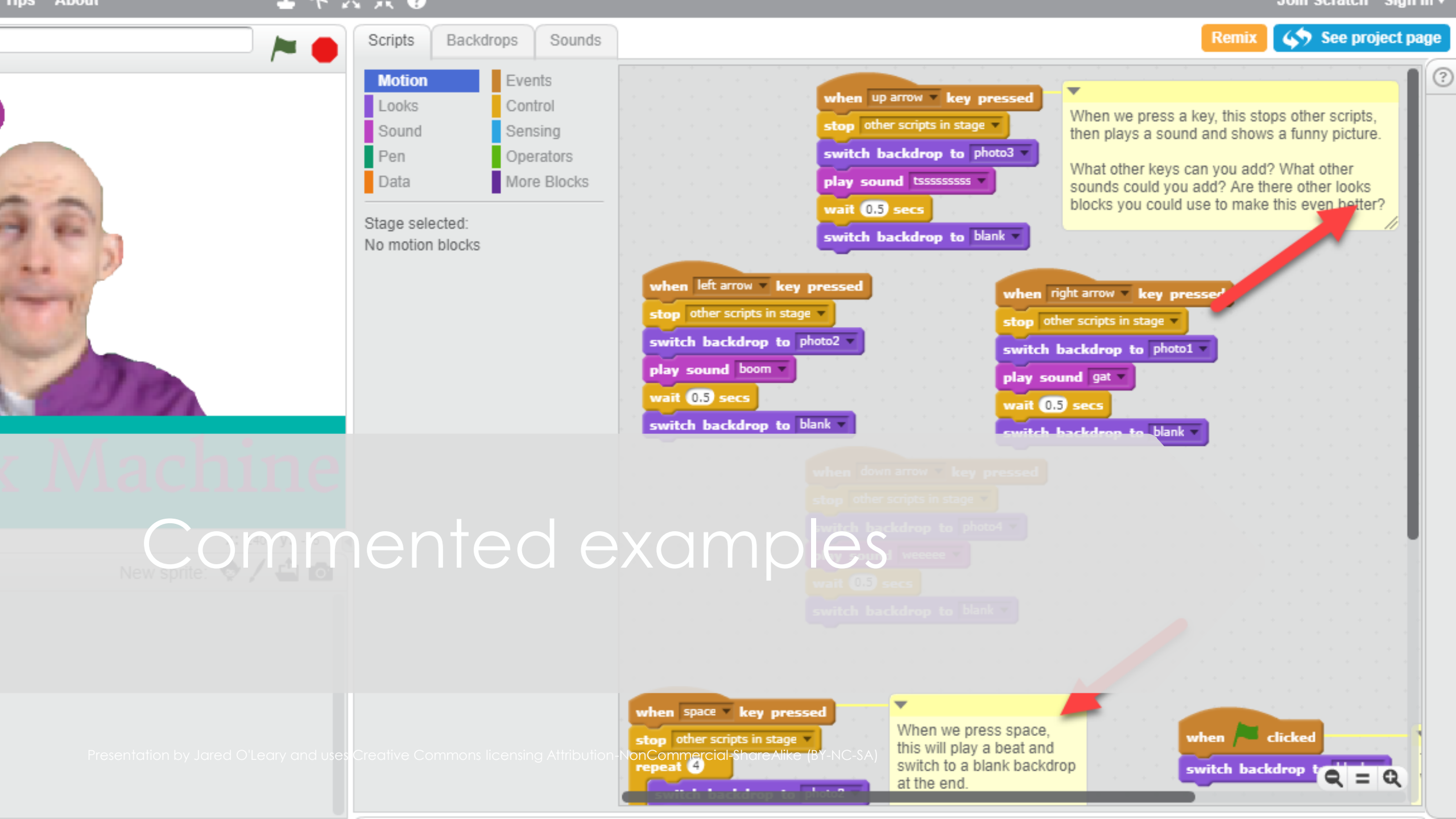
Tips About
Join Scratch Sign in
Scripts
Backdrops
Sounds
Remix
See project page
Motion
Looks
Sound
Pen
Data
Events
Control
Sensing
Operators
More Blocks
Stage selected:
No motion blocks
when up arrow key pressed
stop other scripts in stage
switch backdrop to photo3
play sound tsssssssss
wait 0.5 secs
switch backdrop to blank
When we press a key, this stops other scripts, then plays a sound and shows a funny picture.
What other keys can you add? What other sounds could you add? Are there other looks blocks you could use to make this even better?
when left arrow key pressed
stop other scripts in stage
switch backdrop to photo2
play sound boom
wait 0.5 secs
switch backdrop to blank
when right arrow key pressed
stop other scripts in stage
switch backdrop to photo1
play sound gat
wait 0.5 secs
switch backdrop to blank
when down arrow key pressed
stop other scripts in stage
switch backdrop to photo4
play sound weeeee
wait 0.5 secs
switch backdrop to blank
when space key pressed
stop other scripts in stage
repeat 4
When we press space, this will play a beat and switch to a blank backdrop at the end.
when clicked
switch backdrop to
Commented examples
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Outline

An Amazing Maze Game

Example Project and Files

Project Sequence

Project Extensions

Debugging Exercises

An Amazing Maze Game

Coder Resources

Example Project and Files

1. **Project**: Example project
2. **Video:** Project Preview (1:11)
3. **Video**: Remixing a project (1:57)
4. **Video**: How to reverse engineer a project (2:16)

Project Sequence

1. **Creating levels**
    a. **Additional resources:**
        i. **Video:** Image editor: Bitmap mode (3:38)
        ii. **Video:** Image editor: Vector mode (4:31)
        iii. **Video:** Image editor: Extra tools (4:12)
2. **Player controls**
3. **Restart function**
4. **Don't touch the walls**
5. **Goooooaaaaallllllll**
6. Adding in comments

Project Extensions

1. Roguelike challenge
2. Adding enemies (Advanced)
3. Changing up with functions
4. Sharing your project
5. Creating a thumbnail
6. Learn even more Scratch tips

Debugging Exercises

1. Why don't we switch to the next level when we touch the goal (the green rectangle)?
2. Why does Scratch Cat move to the right instead of the left when we press the left arrow?
3. Why do we stay on level 1 even when we reach the goal?
4. Even more debugging exercises

Project walkthroughs

Outline

Instructional Plans
Student Work
Assessment
Expectations
Managing Student Behavior
Environment
Respectful Culture
Standards and Objectives
Motivating Students
Presenting Instructional Content
Lesson Structure and Pacing
Activities and Materials
Questioning
Academic Feedback
Grouping Students
Teacher Content Knowledge
Teacher Knowledge of Students
Thinking
Problem Solving

Assessment Original	1. *are aligned with state content standards;* 2. *have clear measurement criteria;* 3. *measure student performance in more than three ways (e.g., in the form of a project, experiment, presentation, essay, short answer, or multiple choice test);* 4. *require extended written tasks;* 5. *are portfolio based with clear illustrations of student progress toward state content standards and;* 6. *include descriptions of how assessment results will be used to inform future instruction.*	1. *are aligned with state content standards;* 2. *have measurement criteria;* 3. *measure student performance in more than two ways (e.g., in the form of a project, experiment, presentation, essay, short answer, or multiple choice test);* 4. *require written tasks and;* 5. *include performance checks throughout the school year.*	1. *are rarely aligned with state content standards;* 2. *have ambiguous measurement criteria;* 3. *measure student performance in less than two ways (e.g., in the form of a project, experiment, presentation, essay, short answer, or multiple choice test) and;* 4. *include performance checks, although the purpose of these checks is not clear.*
Assessment Crosswalk	**Assessment Plans:** 1. **are aligned with the governing board adopted coding curriculum** 2. **have clear measurement criteria based on each student's individual needs** 3. **assess in more than three ways (e.g., puzzles, challenges, projects, in/formal discussions, project comments/instructions, coding algorithms, tests, observation, etc.)** 4. **Require extended tasks/projects through a written coding language (block or text)** 5. **Are portfolio/project based with clear illustrations of student progress toward district coding standards** 6. **Include descriptions of how assessment results will be used to inform future puzzles, projects, or instruction**	**Assessment Plans:** 1. **are aligned with the governing board adopted coding curriculum** 2. **have measurement criteria** 3. **assess in more than two ways (e.g., puzzles, challenges, projects, in/formal discussions, project comments/instructions, coding algorithms, tests, observation, etc.)** 4. **Require demonstrations of learning through a coding language (block or text)** 5. **include assessment of learning throughout the school year**	**Assessment Plans:** 1. **are rarely aligned with the governing board adopted coding curriculum** 2. **have ambiguous measurement criteria;** 3. **assess in less than two ways (e.g., puzzles, challenges, projects, in/formal discussions, project comments/instructions, coding algorithms, tests, observation, etc.)** 4. **assess for learning; however, the purpose of these assessments is unclear**
Crosswalk explanation	*How might assessment differ?* The main difference in assessments is not related to what assessments are used for, but what assessments look like. Assessment of computational thinking can take place through assessments as learning, assessments for learning, or assessments of learning; as well as in in/formal contexts. One can assess by having students writing in comments or instructions for the projects/code, asking students at the end of class to share with a neighbor how something in their project/code works and having their neighbor ask follow-up questions, having the teacher/facilitator walk around and informally assess how everyone is doing by looking at their algorithms, engaging in informal discussions in small or large groups, taking a multiple choice quiz on a concept related to computational thinking, assessing progress with puzzles/projects, and many more. Informal assessments occur throughout class time; however, formal assessments might only occur once per quarter (for instance, turning in a quarterly project). All assessments should in some way incorporate coding language either in the form of blocks or text (pseudo, modified, or full). Exit tickets are one form of an assessment tool, as coding language can be assessed through such forms as manipulative algorithms, written or typed text, coding blocks, body movements (such as reading an algorithm that tells you how to move), and more. In addition, written out exit tickets might be decontextualized from coding practices.		

Teacher evaluation "crosswalk"

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Q&A

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