Project-based Learning with Scratch

Jared O'Leary
BootUp PD

What's the plan?

- Project-based learning?
- Explore Scratch projects
- Q&A

How to reach the resources

- www.JaredOLeary.com
  - Presentations
  - Project-based Learning with Scratch

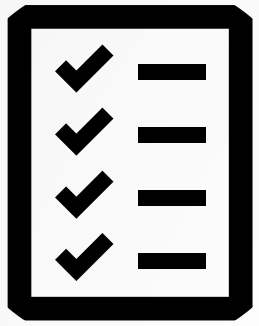
Project-based learning?

- “Project-based learning is built on the idea that real-life problems capture student interest and provoke critical thinking and develop skills as they engage in and complete complex tasks that typically result in a realistic product, event, or presentation to an audience." (p. 40)

Tobias, E. S., Campbell, M. R., & Greco, P. (2015). Bringing Curriculum to Life: Enacting Project-Based Learning in Music Programs. *Music Educators Journal*, 102(2), 39–47

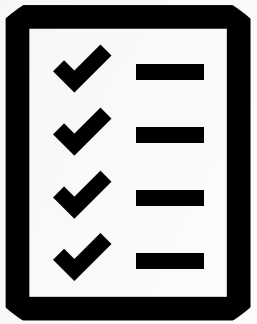
1. Central to the curriculum
2. Organized around driving questions
3. Focused on a constructive investigation
4. Student-driven
5. Authentic

Tobias, E. S., Campbell, M. R., & Greco, P. (2015). Bringing Curriculum to Life: Enacting Project-Based Learning in Music Programs. *Music Educators Journal*, 102(2), 39–47



Fixed

Project continuum



Fixed

Open

Project continuum

Example: Fixed project criteria

- Game
- One player sprite
- Three enemy sprites
- At least two “if _ then” blocks
- At least one variable

Example: Open project questions

- 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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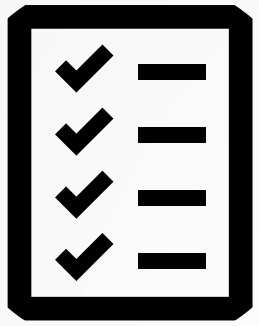

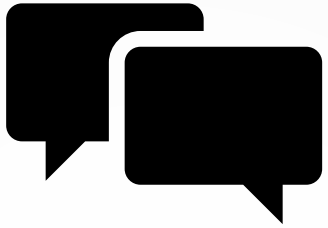

Fixed Flexible Open

Project continuum

Example: Flexible prompts with embedded criteria

- What type of project can you create that includes at least two “if _ then” blocks and at least one variable?
- How might you create a game that keeps track of a score?
- Storyboard and create a superhero(ine) project that uses several different “Events” blocks.

Example: Storyboard questions

- What sprite(s) will you use as superhero(ines)?
  - What kind of superpowers or technology will they have?
  - Will they transform into their superhero(ine) costume or always be a superhero(ine)?
    - If they are transforming, what will they look like normally? What will they look like when they are a superhero(ine)?
- Who will the superhero(ines) try and save?
  - What kind of danger are they in?
  - If it's another sprite, what kind of powers or technology will they use?
- How might your superhero(ine) save the day?
  - What algorithms can you create to do that?
- Will users be able to interact with your superhero(ine) project?
  - If so, what kind of code will you use to create that interaction?

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1. Choose a worthy topic
2. Find a real-life context
3. Create generative questions
4. Develop critical thinking and cultivate dispositions
5. Decide the scope
6. Design the experience

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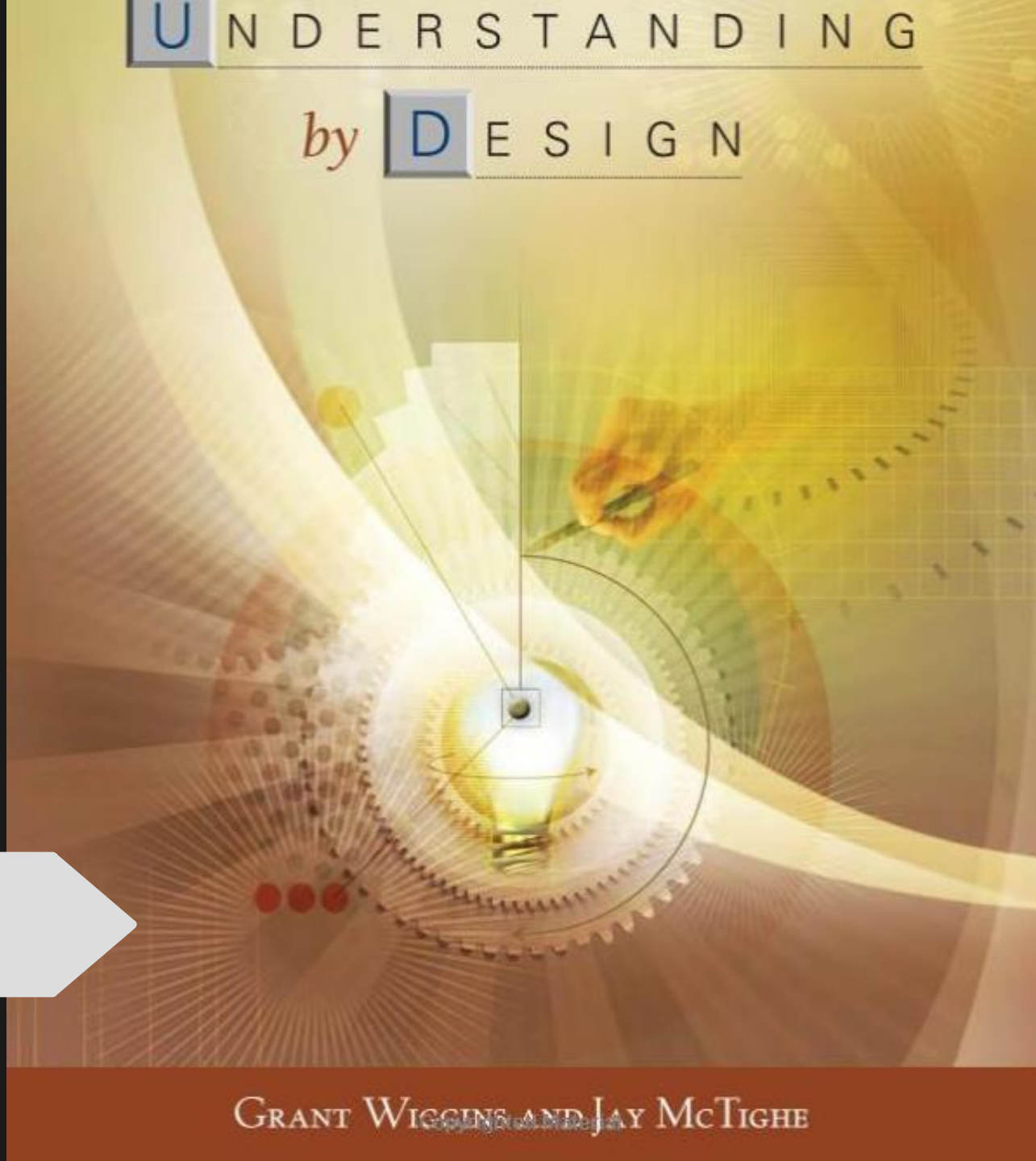
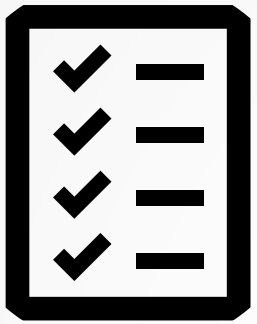
Backward design projects





Fixed Flexible Open

Backward design

1. Identify the desired results
    a. Big ideas
    b. Enduring understandings
    c. Essential questions
2. Determine evidence
3. Plan learning experiences

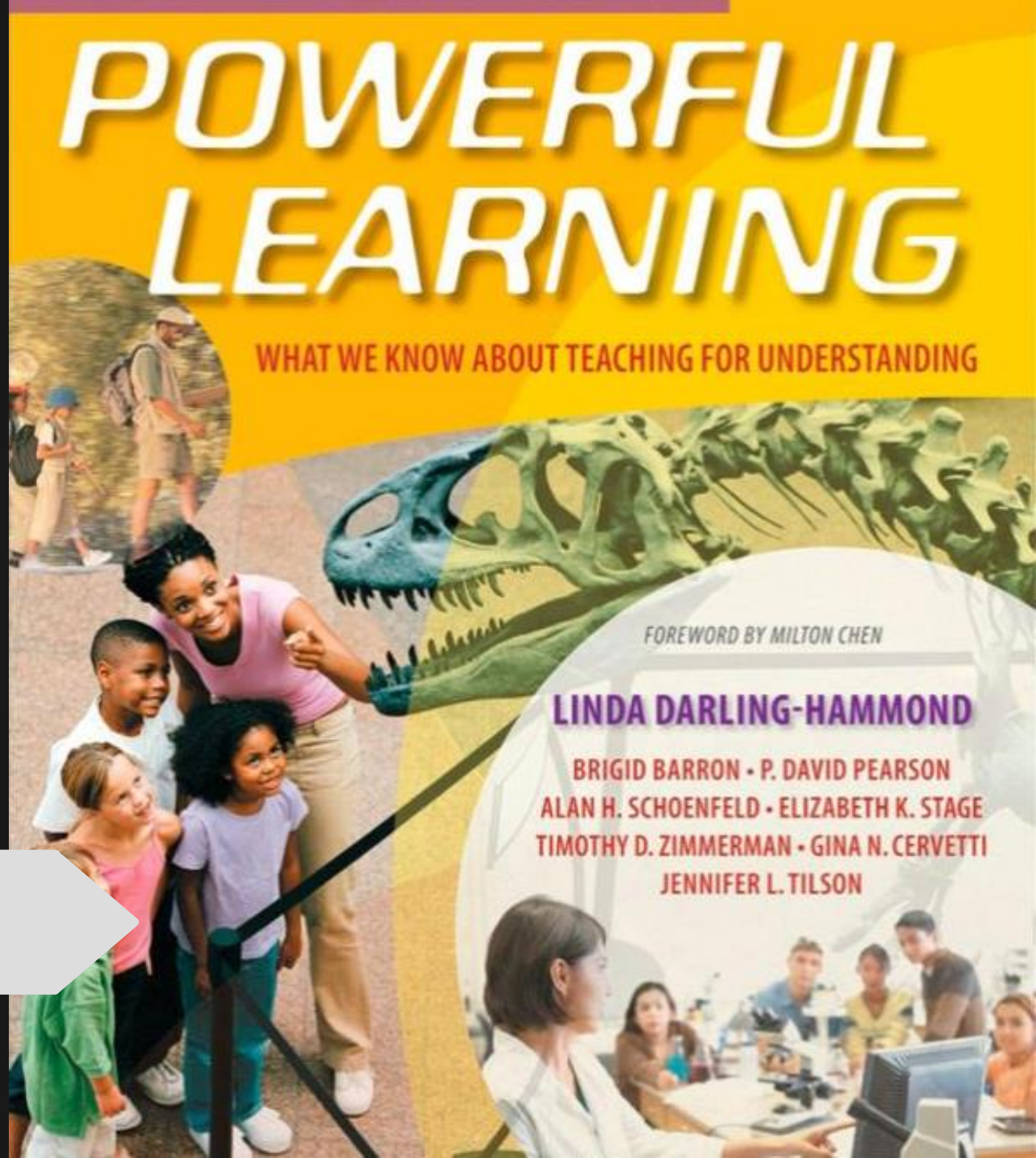
tworks for various contexts.

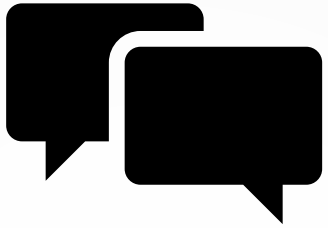
forming choices for media artworks? How can presenting or sharing media artworks in a public format help a media artist learn and grow?

3rd (MA:Pr6.1.3)	4th (MA:Pr6.1.4)	5th (MA:Pr6.1.5)	6th (MA:Pr6.1.6)	7th (MA:Pr6.1.7)	8th (MA:Pr6.1.8)	HS Proficient (MA:Pr6.1.I)
a. Identify and describe the presentation conditions, and take on roles and processes in presenting or distributing media artworks.	a. Explain the presentation conditions, and fulfill a role and processes in presenting or distributing media artworks.	a. Compare qualities and purposes of presentation formats, and fulfill a role and associated processes in presentation and/or distribution of media artworks.	a. Analyze various presentation formats and fulfill various tasks and defined processes in the presentation and/or distribution of media artworks.	a. Evaluate various presentation formats in order to fulfill various tasks and defined processes in the presentation and/or distribution of media artworks.	a. Design the presentation and distribution of media artworks through multiple formats and/or contexts.	a. Design the presentation and distribution of collections of media artworks, considering combinations of artworks, formats, and audiences.
experience, and share results of and improvements for presenting media artworks.	b. Explain results of and improvements for presenting media artworks.	b. Compare results of and improvements for presenting media artworks.	b. Analyze results of and improvements for presenting media artworks.	b. Evaluate the results of and improvements for presenting media artworks, considering impacts on personal growth.	b. Evaluate the results of and implement improvements for presenting media artworks, considering impacts on personal growth and external effects.	b. Evaluate and implement improvements in presenting media artworks, considering personal and local impacts, such as the benefits for self and others.

National Core Arts Standards

Inquiry-based projects



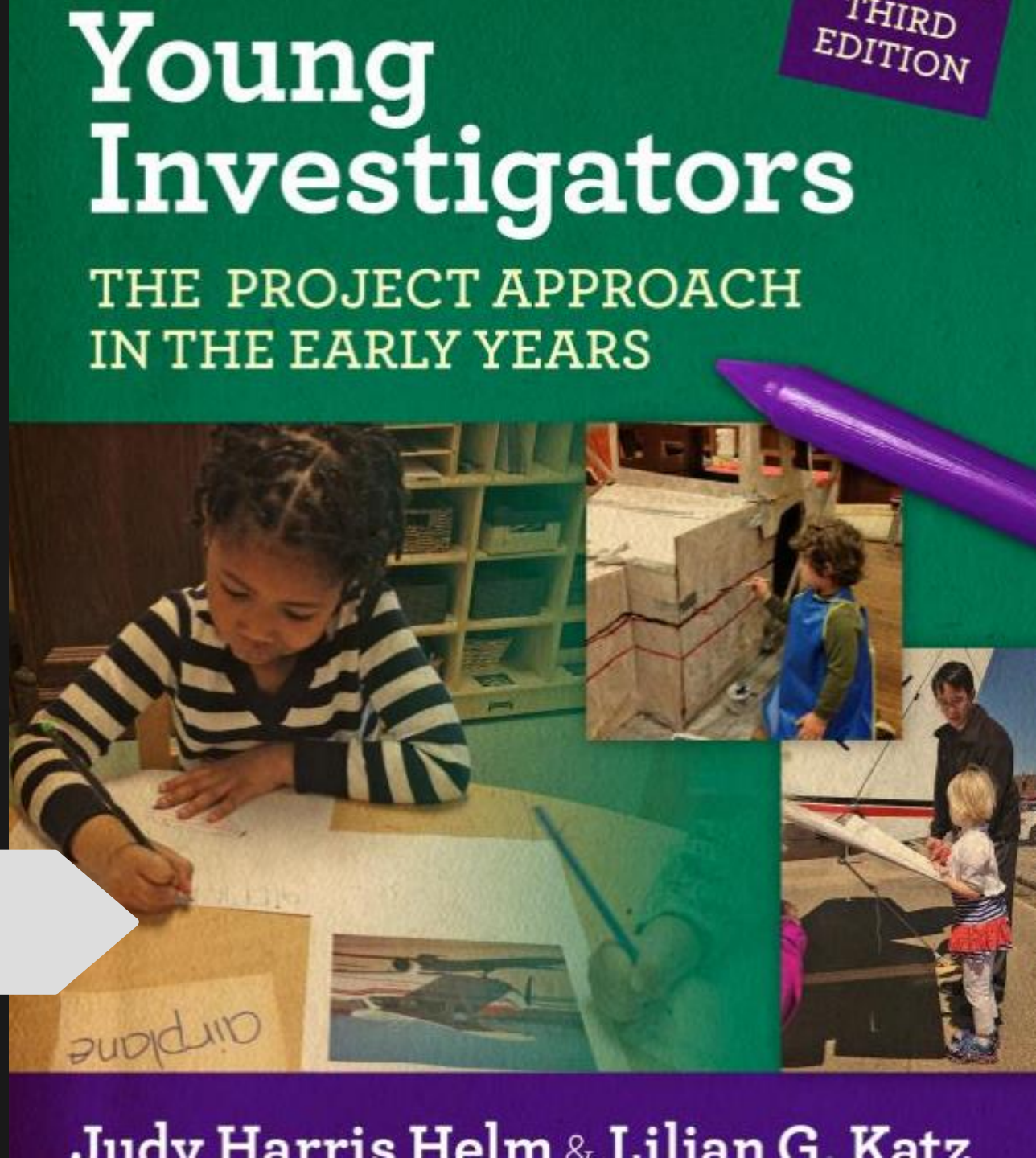


Fixed Flexible Open

Inquiry-based project stages

1. Vision
2. Inquiry
3. Build
4. Showtime
5. Transition

Emergent projects



Fixed

Flexible

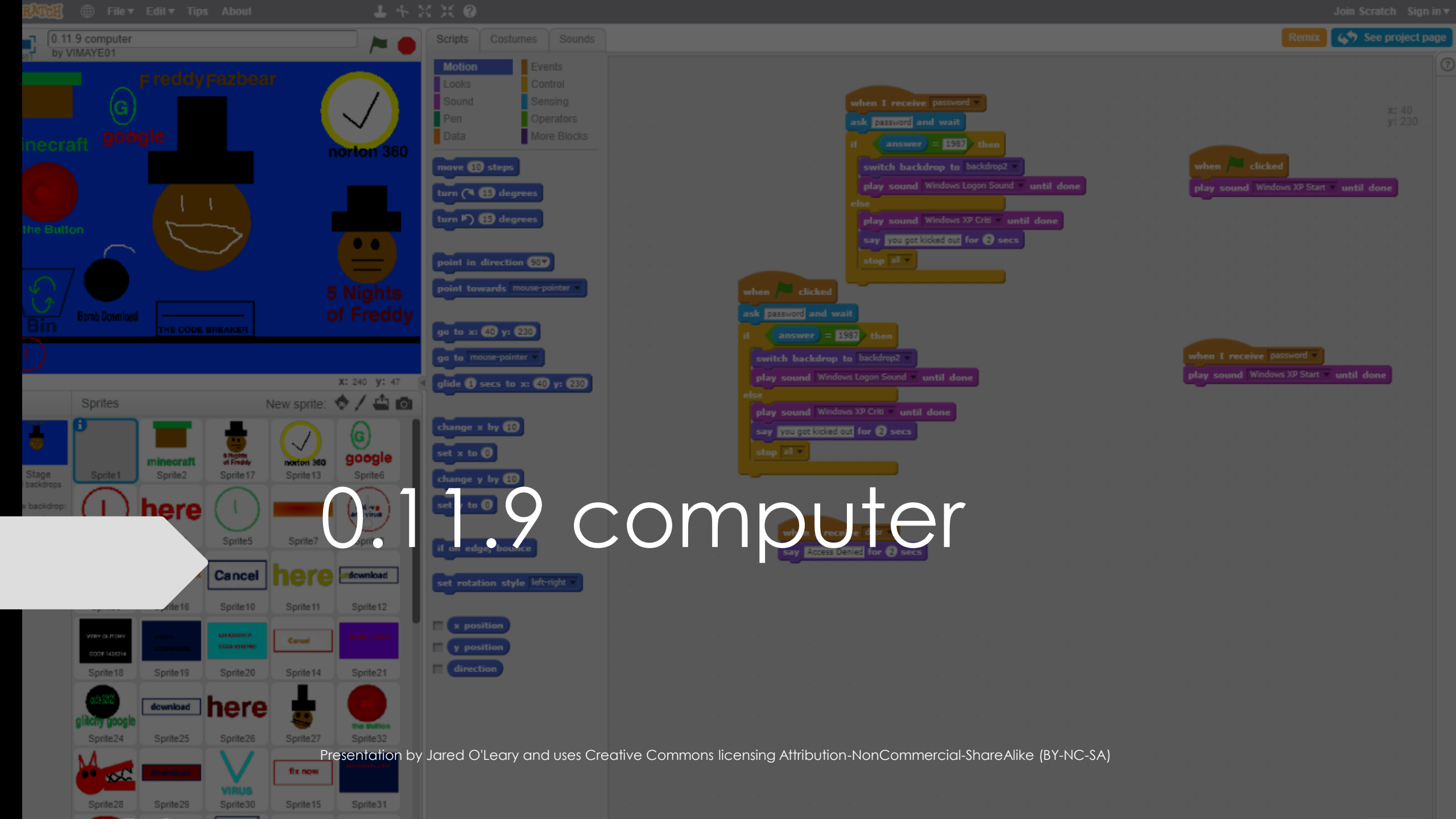
Open

The project approach phases

1. Determine a topic
2. Plan and investigate the topic
3. Culminating event/activities and assessment

If using a sequential curriculum . . .

- Create a base project idea or theme
- Layer in new concepts and understandings
- Revisit throughout the year



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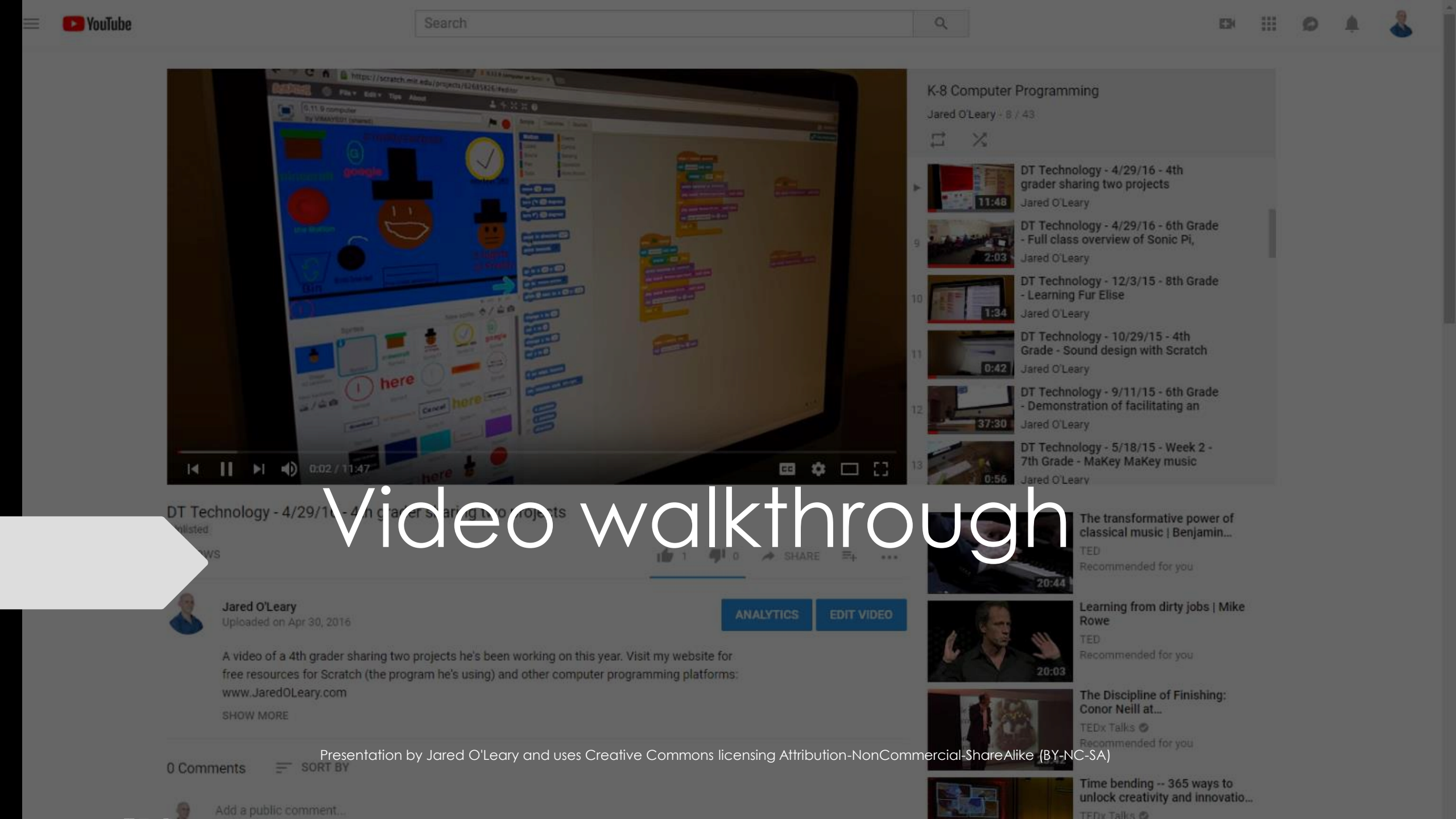
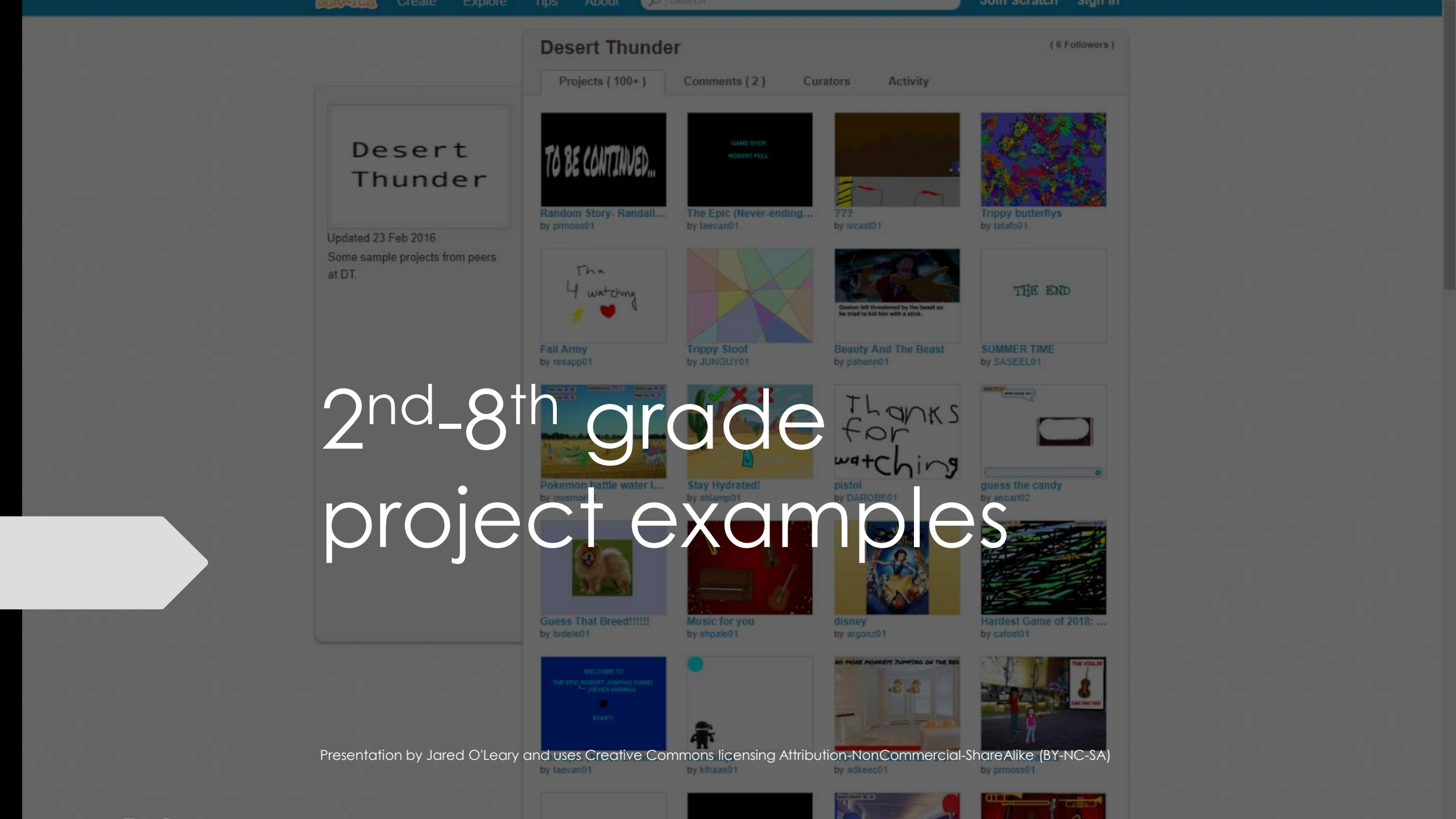
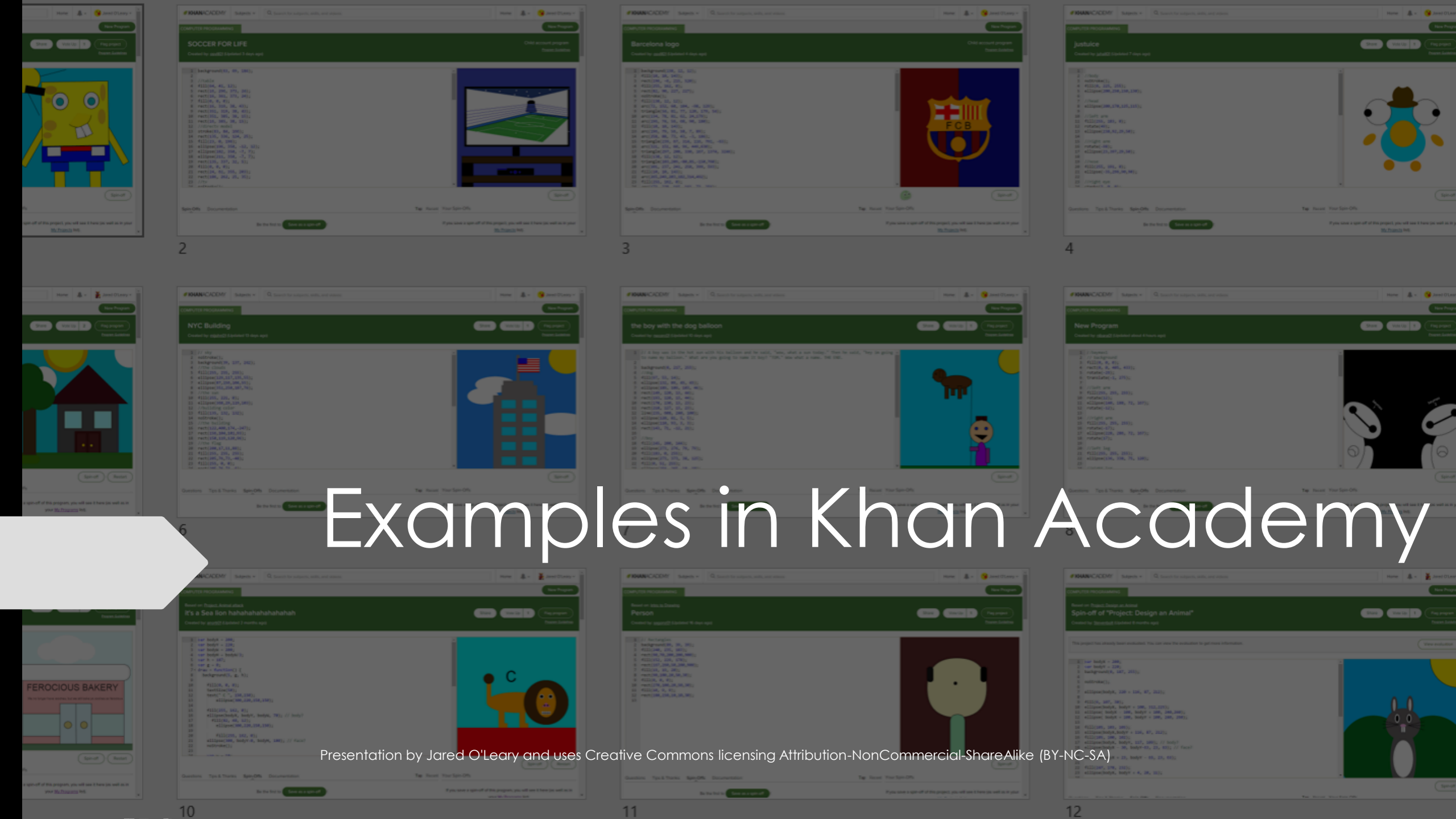
Video walkthrough





2nd-8th grade project examples



Examples in Khan Academy

Explore Scratch projects

Scratch - Imagine, Progra ×

1 https://scratch.mit.edu

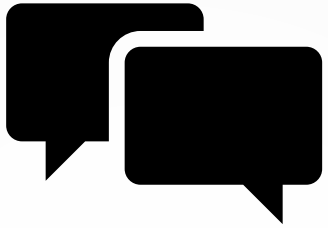
2

SCRATCH Create Explore Tips About Search

Create stories, games, and animations
Share with others around the world

A creative learning community with **over 20 million** projects shared

ABOUT SCRATCH | FOR EDUCATORS | FOR PARENTS



Fixed Flexible Open

Coder Resources

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. Goooooaaaaalllllllll
6. Adding in comments

Project Extensions

1. Roguelike challenge
2. Adding variables (Advanced)
3. Cleaning up with functions
4. Sharing your project

Creating a thumbnail

earn 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

Scratch Projects

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BootUp Curriculum

Scratch (Grades 3+)

In this introductory sequence of projects for Scratch, we gradually introduce a variety of practices and concepts while simultaneously introd a variety of blocks and tools in Scratch. Each of the projects is aligned with the algorithms and programming standards developed by the Co Teachers Association (CSTA). Each project may take several classes to complete. Scratch (Grades 3+) Overview Video for projects #1-#10 (1:4 #20 (1:48), and projects #21-#30 (1:44).

#1 Animate Your Name

Minimum Experience:
Grades 3+, 1st year using Scratch, 1st quarter or

#2 Interactive Collage

Minimum Experience:
Grades 3+, 1st year using Scratch, 1st quarter or

#3 Jump Scare Slideshow

Minimum Experience:
Grades 3+, 1st year using Scratch, 1st qu

Coder Resources

Pumpkin Carver

Minimum Experience:
3+, 1st year using Scratch, 3rd quarter or

Overview & Purpose:
create a pumpkin carver simulator that users to "carve" a pumpkin with their . The purpose of this project is to introduce a drawing application using pen blocks bining them with previous understandings.

SON PLAN | CODER RESOURCES

#23 What Can You Create? Drawing

Minimum Experience:
Grades 3+, 1st year using Scratch, 3rd quarter or later

Overview & Purpose:
This challenge asks coders to use a limited selection of block types within an unlimited number of sprites to create art. The purpose of this challenge is to encourage coders to think creatively about block combinations to better understand algorithmic sequences.

LESSON PLAN | CODER RESOURCES

#24 Carve a Pumpkin with Code

Minimum Experience:
Grades 3+, 1st year using Scratch, 3rd quarter or later

Overview & Purpose:
Coders continue to develop their understanding pen blocks by creating algorithms to carve pumpkins. This purpose of this project is to reinforce understandings of how to draw shapes with code.

LESSON PLAN | CODER RESOURCES

Music Player

Minimum Experience:
3+, 1st year using Scratch, 3rd quarter or

se:
previous understandings of buttons to create a music tiple buttons. The purpose of this is to reinforce understandings of arity by combining previous understandings a new context.

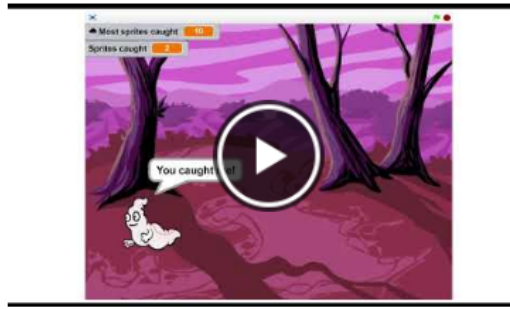
SON PLAN | CODER RESOURCES

#26 Blinking Maze Game

Minimum Experience:
Grades 3+, 1st year using Scratch, 3rd quarter or later

Overview & Purpose:
Coders create a player controlled blinking maze game with multiple, custom levels. The purpose of this project is to reinforce understandings of the previous maze game, while introducing new mechanics.

LESSON PLAN | CODER RESOURCES



#27 Sprite Catcher

Minimum Experience:
Grades 3+, 1st year using Scratch, 3rd quarter or later

Overview & Purpose:
Coders combine their understandings from previous projects to create a sprite catcher game The purpose of this project is to reinforce understandings of modularity in a new context.

LESSON PLAN | CODER RESOURCES

goo.gl/MKn7Uz
(case sensitive)

Explore the “Coder Resources”

Lesson Plans

#22 Pumpkin Carver

Minimum Experience:
Grades 3+, 1st year using Scratch, 3rd quarter or later

Overview & Purpose:
Coders create a pumpkin carver simulator that allows users to "carve" a pumpkin with their mouse. The purpose of this project is to introduce creating a drawing application using pen blocks by combining them with previous understandings.

LESSON PLAN | CODER RESOURCES

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LESSON PLAN | CODER RESOURCES

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LESSON PLAN | CODER RESOURCE

#25 Music Player

Minimum Experience:
Grades 3+, 1st year using Scratch, 3rd quarter or

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LESSON PLAN | CODER RESOURCES

#26 Blinking Maze Game

Minimum Experience:
Grades 3+, 1st year using Scratch, 3rd quarter or later

Overview & Purpose:
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LESSON PLAN | CODER RESOURCES

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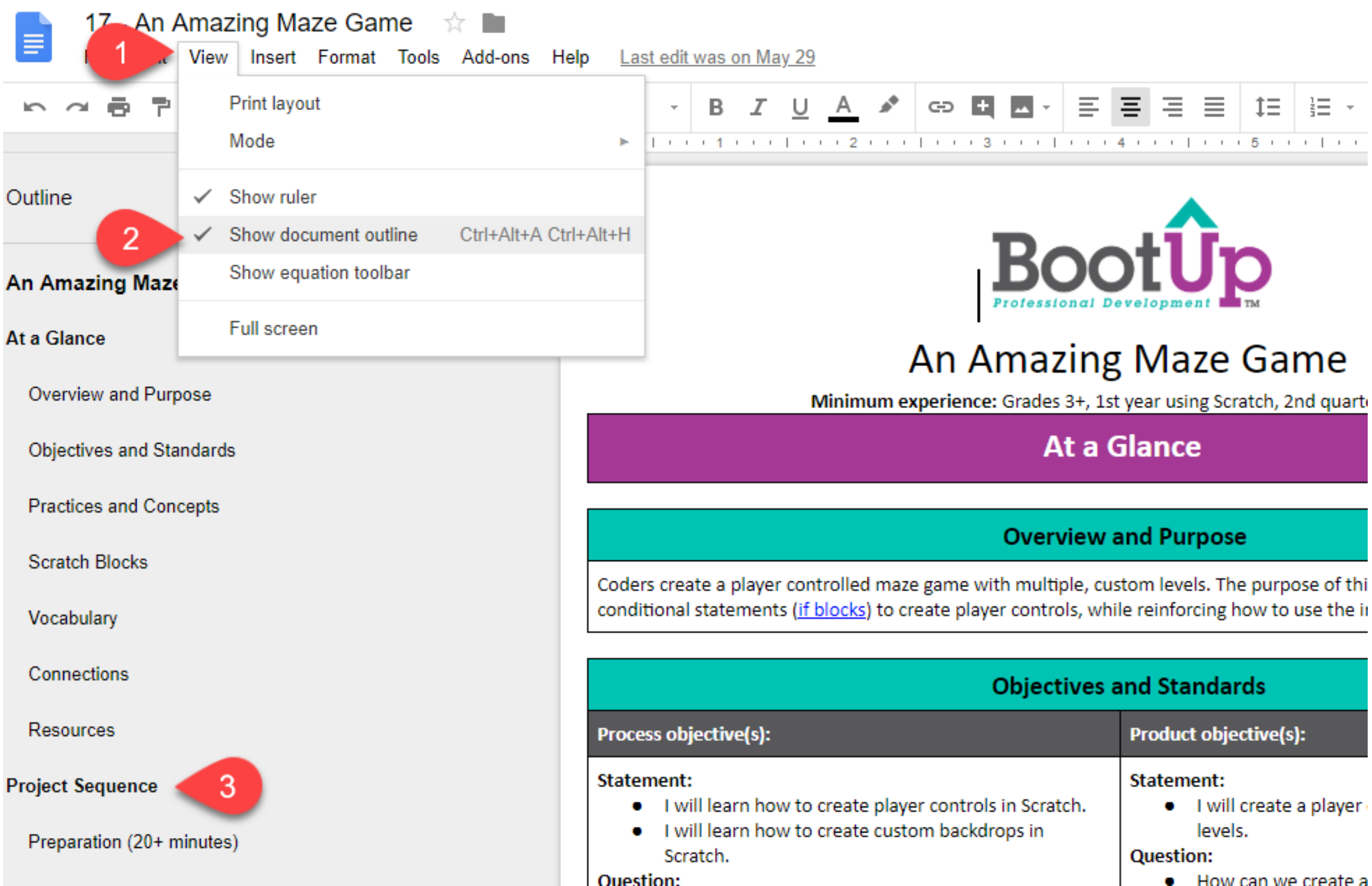
LESSON PLAN | CODER RESOURCE


17 An Amazing Maze Game
1
View
Insert
Format
Tools
Add-ons
Help
Last edit was on May 29
Print layout
Mode
Show ruler
Show document outline Ctrl+Alt+A Ctrl+Alt+H
Show equation toolbar
Full screen
2
Outline
An Amazing Maze
At a Glance
Overview and Purpose
Objectives and Standards
Practices and Concepts
Scratch Blocks
Vocabulary
Connections
Resources
Project Sequence
3
Preparation (20+ minutes)
BootUp
Professional Development
An Amazing Maze Game
Minimum experience: Grades 3+, 1st year using Scratch, 2nd quart
At a Glance
Overview and Purpose
Coders create a player controlled maze game with multiple, custom levels. The purpose of thi
conditional statements (if blocks) to create player controls, while reinforcing how to use the i
Objectives and Standards
Process objective(s):
Product objective(s):
Statement:
I will learn how to create player controls in Scratch.
I will learn how to create custom backdrops in Scratch.
Question:
Statement:
I will create a player
levels.
Question:
How can we create a

ScratchJr

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ScratchJr (Grades K-2)

In this introductory sequence of projects for ScratchJr, we gradually introduce a variety of practices and concepts while simultaneously intro coders to a variety of blocks and tools in ScratchJr. Each of the projects is aligned with the algorithms and programming standards develope the Computer Science Teachers Association (CSTA). Each project may take several classes to complete. ScratchJr (Grades K-2) Overview Video #1-#10 (1:18), projects #11-#20 (1:32), and projects #21-#30 (1:35).

#1 Dancing Alone

Minimum Experience:
Grades K+, 1st year using Scratch Jr., 1st quarter or

#2 Can't Stop Dancing

Minimum Experience:
Grades K+, 1st year using Scratch Jr., 1st quarter or

#3 Dance Party

Minimum Experience:
Grades K+, 1st year using Scratch Jr., 1st

Upcoming sessions I'm presenting

- **Tuesday, July 10th**
  - **Assessing Coding Projects**
    - *10:00-10:20 am in room 213*
  - **Moving Beyond Puzzles: Project-based Coding**
    - *10:40-11:00 am in room 212*

Q&A

- www.JaredOLeary.com
  - Presentations
  - Project-based Learning with Scratch