Strategies and Approaches for Assessing the Development of Computational Thinking

Scratched Webinar Series
Wednesday, May 30, 2012
7pm – 8pm EST
Karen Brennan and Michelle Chung
What are young people learning as they develop interactive media with Scratch?
Create and share your own interactive stories, games, music, and art

Check out the 2,548,250 projects from around the world!

To create your own projects:

Download Scratch

Featured Projects

The end
by wasabi06

Vector graphics will offer a new way to make costumes, so that sprites will look high quality no matter if they are zoomed in or zoomed out!

Scratch 2.0 Overview
by Lucario621

BETA Invincible
by sparcy08

Projects Selected by Legolas_Greenleaf

Scratch Day

Be a part of Scratch Day - a worldwide network of gatherings, where Scratchers come together to meet, share, and learn.

Find out more

ScratchEd

Do you help people learn Scratch? Join ScratchEd, our new online community for educators.

Find out more
100 levels

Welcome to 100 levels. I made originally 51 levels and when I said for every love it I would add a level. But then it got curated and it got to many love its and it got really stressful. Every other comment is how do you do this level. How do you do that. And then came the day that I couldn't finish all 100 because my computer fizzled out. Well now I would suggest that after you play this game you press love it and then go play some of my other really good games. One for instance is called ninja assassin and it is really fun and before ninja assassin three can come out I need 10 love its.
10 Levels

Play

Instructions
1,125,262
registered members
2,566,018 projects uploaded
What are young people learning as they develop interactive media with Scratch?
Computational Thinking
Computational Thinking

Computational **Concepts**

Computational **Practices**

Computational **Perspectives**
Computational Concepts

sequences  conditionals
loops      operators
parallelism data
events
when OS clicked
say "Guess the song!" for 2 secs
point in direction 90°
move 10 steps
turn 15 degrees
cchange size by 10
play note 51 for 0.8 beats
play note 50 for 0.8 beats
play note 59 for 0.8 beats
play note 58 for 0.8 beats
play note 57 for 0.8 beats
play note 56 for 0.8 beats
play note 55 for 0.8 beats
play note 54 for 0.8 beats
play note 53 for 0.8 beats
play note 52 for 0.8 beats
play note 51 for 0.8 beats
play note 50 for 0.8 beats
play note 59 for 0.8 beats
play note 58 for 0.8 beats
play note 57 for 0.8 beats
play note 56 for 0.8 beats
play note 55 for 0.8 beats
play note 54 for 0.8 beats
play note 53 for 0.8 beats
play note 52 for 0.8 beats
play note 51 for 0.8 beats
play note 50 for 0.8 beats
play note 59 for 0.8 beats
play note 58 for 0.8 beats
play note 57 for 0.8 beats
play note 56 for 0.8 beats
if on edge, bounce
x position
y position
direction
when clicked
set score to 0
change score by 0
wait until touching color red?
stop all

when clicked
forever if touching paddle left?
play sound water drop
change score by 1
point in direction 180 direction
move 5 steps
turn 12 pick random -20 to 20 degrees

when clicked
forever
if on edge, bounce
move 10 steps
Computational **Practices**

- being incremental/iterative
- testing/debugging
- reusing/remixing
- abstracting/modularizing
This script is located on the stage.

Press the right arrow key to see the terrain sprites scroll past the screen.
MaplestorySim 0. Mover BUG FIX

@. @. Some rights reserved

Based on archmage's project

34 views, 3 remixes by 1 person, 5 downloads, in 1 gallery
Check for inventory or support
Computational Perspectives

expressing
connecting
questioning
I love Scratch. Wait, let me rephrase that – Scratch is my life. I have made many projects. Now I have what I call a ‘programmer’s mind’. That is where I think about how anything is programmed. This has gone from toasters, car electrical systems, and soooo much more.
Panther - What the community wants

Panther is a programming language aimed at young users with only a small knowledge of programming. Panther offers you a more advanced version of Scratch, a simple programming language developed at MIT.

With a host of new features such as file and webpage manipulation and advanced colour sensing, cloning and much more besides, Panther provides advanced usage for avid Scratchers around the globe as well as new programmers looking for a fluid, easy to understand starting language. Why not visit our Wiki page for a full list of our features?

Welcome to ProgrammingFreak - our newest developer for Panther 1.1!

stats:

Panther

Blockshop
What are young people learning as they develop interactive media with Scratch?

How can this learning being assessed?
Three Approaches

Project Analysis
Artifact-Based Interviews
Design Scenarios
Three Approaches

Project Analysis
Artifact-Based Interviews
Design Scenarios
projects
<table>
<thead>
<tr>
<th>Projects</th>
<th>Color Search Engine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>blocks</td>
<td></td>
</tr>
<tr>
<td>used</td>
<td></td>
</tr>
</tbody>
</table>
projects

blocks used

blocks not used
Strengths

• view collection of work over time
• record of computational concepts being encountered
Strengths

- view collection of work over time
- record of computational concepts being encountered

Limitations

- not all projects are posted
- intentionality of block use is unknown
- development process is unknown
Three Approaches

Project Analysis
Artifact-Based Interviews
Design Scenarios
Background
  Introduction to Scratch
  Current practices

Project creation
  Project framing
  Project process

Online community
  Other people
  Other projects

Looking forward
  Scratch
  Technology
  Beyond technology
Strengths

• discussion of product and process
• more nuanced characterization of understanding of concepts
<table>
<thead>
<tr>
<th>Strengths</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• discussion of product and process</td>
<td>• time consuming</td>
</tr>
<tr>
<td>• more nuanced characterization of understanding of concepts</td>
<td>• subject to vagaries of memory</td>
</tr>
<tr>
<td></td>
<td>• constrained by projects selected</td>
</tr>
</tbody>
</table>
Three Approaches

Project Analysis
Artifact-Based Interviews
Design Scenarios
Three sets of projects, with increasing conceptual complexity:

1. Explain what the project does
2. Describe how it could be extended
3. Fix a bug
4. Add a feature
Strengths

• explores different ways of knowing (critiquing, remixing, debugging, extending)

• process-in-action
Strengths

• explores different ways of knowing (critiquing, remixing, debugging, extending)
• process-in-action

Limitations

• time consuming
• may not connect to personal interests or may feel like a test
<table>
<thead>
<tr>
<th>Approach #1: Project Analysis</th>
<th>Concepts</th>
<th>Practices</th>
<th>Perspectives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>presence of blocks indicates conceptual encounters</td>
<td>N/A</td>
<td>N/A (maybe through project subject analysis)</td>
</tr>
<tr>
<td>Approach #2: Artifact-Based Interviews</td>
<td>nuances of conceptual understanding, but with limited set of projects</td>
<td>yes, but subject to limitations of memory</td>
<td>maybe, but hard to ask directly</td>
</tr>
<tr>
<td>Approach #3: Design Scenarios</td>
<td>nuances and range of conceptual understanding, but externally selected</td>
<td>yes, in real-time and in a novel situation</td>
<td>maybe, but hard to ask directly</td>
</tr>
</tbody>
</table>
What are young people learning as they develop interactive media with Scratch?

How can this learning being assessed?

What are other approaches?
6 guides
6 guides

Guide #1: Supporting further learning
Assignment 1 (Stairs)

**Goal:** Have a cat draw a staircase with 5 steps. You must use the repeat block.

**Assessing:** Iteration, Breaking down a problem into parts, sequencing

Part A: Draw 1 step

Part B: Draw 5 steps

Assignment 2 (Thinking inside the line):

**Goal:** Make the cat draw line with a slope of 1/2 using the blocks change x and change y. You must make the cat begin at the middle of the screen (0,0)

**Bonus:** Can you do this assignment using the change x value of 25?

**Assessing:** Slope, understanding of x and y values, sequencing, linear relationship, ratio

Assignment 3 Debugging (Could be assignment 1):

**Goal:** If the cat touches (20, 50) have it pop up a speech bubble that says “I have found the secret treasure”
6 guides

Guide #1: Supporting further learning
Guide #2: Incorporating artifacts
6 guides

Guide #1: Supporting further learning
Guide #2: Incorporating artifacts
Guide #3: Illuminating processes
<table>
<thead>
<tr>
<th>Category</th>
<th>Exceptional</th>
<th>Proficient</th>
<th>Developing</th>
<th>Beginning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Items that can be assessed by self-reflection or observation of the student at work)</td>
<td>I chose smart places to stop and test my program.</td>
<td>I stopped and tested my program in random places.</td>
<td>I waited until my project was complete to test my program.</td>
<td>I did not stop to test my program.</td>
</tr>
<tr>
<td></td>
<td>I used project time well, finished early, and asked myself, “Now what can I do to make it better?”</td>
<td>I used project time well and met all deadlines.</td>
<td>Sometimes I was able to complete tasks to meet deadlines.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I found ways to collaborate with people outside my class by using online communities</td>
<td>I collaborated in and out of my group, but I did not reach out to online communities.</td>
<td>I collaborated only with members of my own group.</td>
<td>I completed the project on my own.</td>
</tr>
<tr>
<td></td>
<td>When faced with a challenge, I stuck with it until I found a solution and I used my new learning to solve other challenges for myself and/or others.</td>
<td>When faced with a challenge, I stuck with it until I found a solution.</td>
<td>When faced with a challenge, I chose to do something easier.</td>
<td>When faced with a challenge, I got frustrated and stopped working.</td>
</tr>
<tr>
<td></td>
<td>I chose the most appropriate problem solving strategy for each situation.</td>
<td>I used different problem solving strategies for different situations.</td>
<td>I tried the same problem solving strategy each time I had a challenge.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I can explain my thinking about how and why I made certain programming decisions and I can make suggestions for improvement.</td>
<td>I can explain my thinking about how and why I made certain programming decisions.</td>
<td>I can show you how aspects of my program work, but I can’t explain why they work.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6 guides

Guide #1: Supporting further learning
Guide #2: Incorporating artifacts
Guide #3: Illuminating processes
Guide #4: Checking in at multiple waypoints
### Formative Assessment: Student Blog

<table>
<thead>
<tr>
<th></th>
<th>Exceeds Expectations</th>
<th>Meets Expectations</th>
<th>Does Not Meet Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Science Content</strong></td>
<td>The student is addressing concerns about the Science content in detail.</td>
<td>The student is addressing concerns about the Science content.</td>
<td>The student fails to adequately address the Science content.</td>
</tr>
<tr>
<td><strong>Design and Understanding</strong></td>
<td>The student is reflecting on the design in terms of needs and constraints as well as their own understanding in detail.</td>
<td>The student is reflecting on the design in terms of needs and constraints as well as their own understanding.</td>
<td>The student lacks reflection on the design of the game in terms of needs and constraints as well as their own understanding.</td>
</tr>
<tr>
<td><strong>Questioning</strong></td>
<td>The student generates and records in depth questions about the science concepts of video game design.</td>
<td>The student generates and records questions about the science concepts and video game design.</td>
<td>The student is not generating questions while reflecting.</td>
</tr>
</tbody>
</table>
## Summative Assessment: Science Video Game

<table>
<thead>
<tr>
<th></th>
<th><strong>Exceeds Expectations</strong></th>
<th><strong>Meets Expectations</strong></th>
<th><strong>Does Not Meet Expectations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Science Content</strong></td>
<td>The student made a strong connection between the game and the science content. The science concepts in the game are represented accurately.</td>
<td>The student made a connection between the game and the science content. The science concepts in the game are represented accurately.</td>
<td>The student fails to make a connection between the game and science content or the science content is inaccurate.</td>
</tr>
<tr>
<td><strong>Game Design</strong></td>
<td>The design of the game takes into account needs and constraints. The game is clear, logical and exceptionally creative. The instructions for use are also clear and/or intuitive.</td>
<td>The design of the game takes into account needs and constraints. The design is clear and logical. The instructions for use are also clear and logical.</td>
<td>The design of the game does not take into account needs and constraints. The game is not clear and logical. The game becomes confusing at some points or the instructions are unclear.</td>
</tr>
<tr>
<td><strong>Creativity</strong></td>
<td>The student uses the game design tool with exceptional creativity. The game is fun and of interest to intended audience.</td>
<td>The student uses the game design tool creatively to create a game that is of interest to the intended audience.</td>
<td>The game is predictable and of little interest to the intended audience.</td>
</tr>
</tbody>
</table>
6 guides

Guide #1: Supporting further learning
Guide #2: Incorporating artifacts
Guide #3: Illuminating processes
Guide #4: Checking in at multiple waypoints
Guide #5: Valuing multiple ways of knowing
reading
writing
remixing
6 guides

Guide #1: Supporting further learning
Guide #2: Incorporating artifacts
Guide #3: Illuminating processes
Guide #4: Checking in at multiple waypoints
Guide #5: Valuing multiple ways of knowing
Guide #6: Including multiple perspectives
# Storytelling using Scratch

Students will be able to create a story related to camp.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>1 - Exceptional</th>
<th>2 - High Achievement</th>
<th>3 - Achieved</th>
<th>4 - Experiencing Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structure</strong></td>
<td>Story has a beginning, middle and end with supporting detail and confident sequencing.</td>
<td>Story has a beginning, middle and end with supporting detail.</td>
<td>Story demonstrates a beginning, middle and end.</td>
<td>Lack of structure</td>
</tr>
<tr>
<td><strong>Character</strong></td>
<td>At least three characters are included, each with a distinct personality that is developed through what they say and do.</td>
<td>At least three characters are included with confident character development.</td>
<td>At least three characters are included with some character development.</td>
<td>Little character development.</td>
</tr>
<tr>
<td><strong>Language Features</strong></td>
<td>Three or more examples of different language features such as alliteration, simile, onomatopoeia, metaphor or personification.</td>
<td>Two examples of different language features such as alliteration, simile, onomatopoeia, metaphor or personification.</td>
<td>More than one example of alliteration, simile or onomatopoeia. At least one example of metaphor or personification.</td>
<td>One or less example of alliteration, simile or onomatopoeia. No examples of metaphor or personification.</td>
</tr>
<tr>
<td><strong>Vocabulary</strong></td>
<td>Wide and appropriate use of vocabulary beyond expectations for age level.</td>
<td>Some use of vocabulary beyond expectations for age level.</td>
<td>Use of vocabulary appropriate for age level.</td>
<td>Very simple use of vocabulary – under expectation for age-level.</td>
</tr>
<tr>
<td><strong>Surface features</strong></td>
<td>More than 1 year above age level for spelling, grammar and punctuation.</td>
<td>Up to 1 year above age level for spelling, grammar and punctuation.</td>
<td>At age level for spelling, grammar and punctuation.</td>
<td>Below age level for spelling, grammar and punctuation.</td>
</tr>
<tr>
<td><strong>Graphics</strong></td>
<td>Used graphics from Scratch library with creative, confident and original editing or creating of original graphics.</td>
<td>Used graphics from Scratch library with editing to make more appropriate for recount or created simple original graphics.</td>
<td>Used graphics from Scratch library with little or limited attempt at editing or creating original graphics.</td>
<td>Used graphics from Scratch library.</td>
</tr>
<tr>
<td><strong>Programming Structures</strong></td>
<td>Three or more programming structures used.</td>
<td>Two different programming structures used.</td>
<td>One programming structure used or linear programming timed carefully.</td>
<td>Linear programming with lack of timing.</td>
</tr>
<tr>
<td><strong>Backgrounds</strong></td>
<td>Have use more than two backgrounds and confidently edited or created these.</td>
<td>Have use more than one background and have edited or created these.</td>
<td>Have edited a background from the Scratch or made a simple original background.</td>
<td>Used a standard background from the Scratch library.</td>
</tr>
<tr>
<td><strong>Originality/Risk taking/Experimentation</strong></td>
<td>Demonstrates a deep understanding of Scratch by going far beyond what has been demonstrated in class.</td>
<td>With assistance can involve self in some experimentation with use of Scratch to create desired effects.</td>
<td>Has used what has been demonstrated in class but has not experimented further to create desired effects.</td>
<td>No experimentation</td>
</tr>
<tr>
<td><strong>Problem Solving</strong></td>
<td>Problem solving independently and can discuss problem-solving strategies.</td>
<td>Problem solving independently.</td>
<td>Problem solving with some assistance.</td>
<td>No attempt at problem solving.</td>
</tr>
</tbody>
</table>
## Can do sheet

### Storytelling using Scratch

<table>
<thead>
<tr>
<th>I can</th>
<th>How I am going.</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I am doing this really well.</td>
<td>I am sometimes doing this.</td>
<td>I need help with this.</td>
</tr>
<tr>
<td>My story has a beginning, middle and end with supporting detail.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My characters have distinct personalities that are demonstrated by what they say and do.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I make my recount more interesting by using language features such as alliteration, simile, onomatopoeia, metaphor and personification.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I use interesting and high quality vocabulary.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What is Scratch?

Scratch is a programming language that makes it easy to create interactive art, stories, simulations, and games – and share those creations online.

Learn more →

What is ScratchEd?

ScratchEd is an online community where Scratch educators:

- share stories
- exchange resources
- ask questions
- find people

Get Started with Scratch

Imagine the creative possibilities with Scratch and the online community in this intro video.

New Stories

- Scratch Day East
  Scratch Day East Of England
  James Abela posted this 3 days ago

- Pilot Perspectives: Reflections on the Scratch Curriculum Guide by Kara Restner of Sherwood High School
  In this special ScratchEd story series, K-12 educators who participated in the Scratch curriculum guide draft pilot program share their experiences and feedback.
  ScratchEd Team posted this 1 week ago

- A Video Interview with Ben Chun of the Galileo Academy of Science & Technology
  In these short video vignettes, Scratch educator Ben Chun shares his teaching practices and pedagogy.
  ScratchEd Team posted this 2 weeks ago

New Resources

- Juguemos con Scratch
  Yolanda Campos Campos posted this 4 days ago

- Tutorial de para escuela primaria
  Yolanda Campos Campos posted this 4 days ago

- Talleres de Introducción a Scratch, proyectos colaborativos y su integración en estrategias didácticas
  Yolanda Campos Campos posted this 4 days ago

- Can coding really change the world?
  Kim Wilkin posted this 1 week ago

  - Find a resource
  - Share a resource

New Discussions

- Scratch Competition - Suggestions?
  Cory Robertson commented on this 9 hours ago

- Game Competition for Scratch
  Karen Brennan commented on this 9 hours ago

- Try Scratch 2.0 from May 17-21
  Stefano Federici commented on this 14 hours ago

- Let's celebrate Scratch's Birthday – join World Scratch Birthday Project, online!
  Yoshino Miyata commented on this 19 hours ago

- Scratch 2.0 Feedback
  Ben Canter commented on this 1 day ago
http://www.surveymonkey.com/s/2012-05-webinar

Next webinar: Wednesday, June 27, 2012

scratched@scratch.mit.edu
http://scratched.media.mit.edu