



SCRATCH elegantly and powerfully meets a deep need within many urban schools: a tool that allows students to create with computers. Designed by the Lifelong Kindergarten Project and the MIT Media Lab, Scratch represents the best of cutting-edge technological design for schools—and it’s completely free. But how do we use it? This resource suggests six strategies for getting started.

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|----------------------------|-------------------------------------|
| 1. “From Scratch” | members follow along |
| 2. “The Scratchbook” | members go at their own pace |
| 3. “Backscratch” | members work in pairs |
| 4. “Scratching for Seeds” | members start with a “seed” project |
| 5. “Scratch That, Rewind!” | members undo a popular project |
| 6. “Scratch the Tape!” | members remix a popular project |

AS A PLATFORM for learning, Scratch stresses creativity and collaboration. So rather than present a series of lesson plans, this resource offers six strategies or methods for designing activities with Scratch. Each strategy connects to Scratch projects. These strategies are intended to serve as a starting point.

THIS RESOURCE assumes a basic knowledge of Scratch. It does not attempt to explain every block or how Scratch works as a whole. For a basic knowledge of Scratch, view the explanatory videos on the Scratch website and then just tinker!

ELEMENTS of this project and links to it have been shared in several places. ScratchEd is where all the pieces can be found together.

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|--------------------------|--|
| 1. The Scratch Website | scratch.mit.edu |
| 2. Scratch for Educators | scratched.media.mit.edu |
| 3. TMC Wiki | techmissioncorps.org/cms/wiki/techmission-corps-wiki |
| 4. Thinkfinity Community | community.thinkfinity.org |
| 5. After School TechTeam | afterschooltechteam.wordpress.com |

Constructionism

THE EDUCATIONAL PHILOSOPHY underpinning this resource is constructionism, developed by Seymour Papert from Jean Piaget's constructivism. Jean Piaget, the famous psychologist, taught a theory of human knowledge: rather than being received, human knowledge is actively constructed from experience. Papert went a step further: if knowledge is built, so to speak, then perhaps we learn best when we are building something, something concrete in the real world.

SCRATCH fits well with this philosophy. It allows students to create with computers. This resource suggests ways of pairing the tool with the philosophy, to design shared time together that will yield fun projects and good learning.

BUT the resource also fits with another layer of educational philosophy, which we might call *social constructionism*, although that term has a separate meaning popularized by sociologist Peter Berger. By *social constructionism*, I mean the sense in which we learn best when building something *with others*. Through collaboration and creativity, we foster an emergent community. For Scratch, this often takes the form of a "clubhouse" rather than a "classroom." "Teachers" become "mentors" and students "members." This terminology—which I have adopted—suggests the participatory spirit of Scratch.

SCRATCH IS A TOOL TO BE HELD LOOSELY.

Mitchel Resnick's Creative Learning Cycle

THE CAREFUL READER will by now have noticed the green and blue words framing this document. These words come from Mitchel Resnick's *Creative Learning Cycle*, a theory he fleshed out in a 2007 article, published in *Learning and Leading in Technology*, entitled "Sowing the Seeds for a More Creative Society." In this article, Resnick argues that a vital skill for the twenty-first century will be engagement with and execution of collaborative, creative projects. And new technologies, he suggests, hold unprecedented potential for giving students opportunities to engage in such projects.

SCRATCH is one of those technologies. You will notice that I have deliberately attempted to frame my material around the Creative Learning Cycle: imagine-create-play-share-reflect-imagine. By incorporating these six words within my strategies, I have challenged myself to interlace my ideas with each step of Resnick's cycle. The "right questions" are a big part of the way I have laid out the resource.

THESE PLANS do not follow the cycle exactly. Often they start with "create" rather than "imagine," and vacillate back-and-forth between steps. Once members are comfortable with Scratch, they will, with some guidance, engage in every step of the cycle. At some point, I imagine, students should be taught the cycle formally.

1. “From Scratch”

For this strategy, design a simple project and guide a group of students through the process, step by step. Everyone starts with a new project. The project should reach a satisfying conclusion within five to ten minutes. Simplify, simplify, simplify. One background and one sprite is a good rule. Allow students a lot of space for personalization and give them room to expand on the project once the official portion is over. Here is the sample project, called *Under the Sea*, inspired by the Scratch “Rainbow Fish” tutorial and Crystal Noel’s “Scratch for Young Learners.”

Under the Sea

• http://bit.ly/under_the_sea

Part A: A Fish out of Water

- **Create** Open a blank Scratch project.
- Review Vocabulary: Blocks, Scripts, Sprites, Stage, Project.
- Cut out the Scratch Cat.
- Add Fish 4, under Animals.
- **Create** Change Color Effect [see right]
- **Create** Program Swim Pattern [see below]



- **Play** Direct your fish using the arrow keys.
- **Share** How is your fish different from your friends’?
- **Reflect** Why does the fish move the way it does?
- **Imagine** Can you change the way the fish moves?
What blocks would you need?
Could you do other animals?

Part B: Setting the Scene

- **Imagine** Draw a sea world on a piece of paper.
- **Create** Draw the sea world using the Edit Background function.

Helpful Hint: the motion block comes with 10 steps, but this produces a rather hasty fish. Students will need to click inside the bubble and change the 10 to 4.

2. “The Scratchbook”

In this strategy, design a Scratchbook and pass it out. A Scratchbook contains the complete directions, with the codes, for a project! With a Scratchbook, each member can proceed at his or her own pace. The Scratchbook functions as a sort of manual. Members also practice a sort of “reading.” If a code does not work, perhaps the member did not “read” correctly. Workshop members can also collaborate to author their own Scratchbook. The sample project is called *Graphic Effects*, inspired by Mitchel Resnick’s sample project “PlayWithYourFace.”

Graphic Effects

• http://bit.ly/graphic_effects

Part A: Read and Write

- **Create** Program a sprite of your choice with this code.
- **Play** Fiddle around with the sprite.
- **Share** How is your sprite different from other sprites in the workshop?
- **Reflect** Why does the sprite change this way?
- **Imagine** How could you make your sprite different?

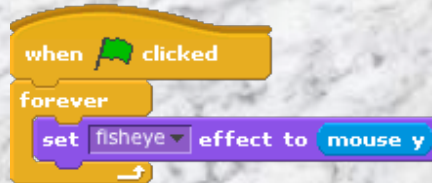
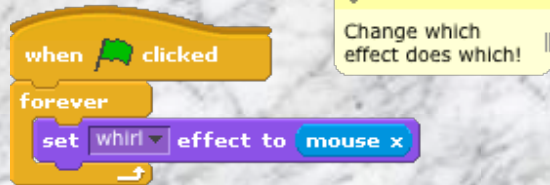
Part B: Make it Yours

- **Create** Add your cool background.
Fiddle, twiddle, tweak.



Part C: Write Your Own

- **Imagine** What should be in the book?
- **Create** Write your own page!
- **Share** Share your page with a friend.
- **Create** Put together a Scratchbook with your friends!



Helpful Hint: to take a picture of a block, right-click or control-click on the script palette. You can save a picture of the scripts to the desktop or a folder, then copy them into Word.

3. “Backscratch”

Our third strategy encourages teamwork. Projects are specifically designed with two pieces that “dovetail.” In the first sample project, each student designs a sprite that will not function without the partner’s sprite. In the second, one student designs a sprite that will not function without the proper stage. In this way, students learn about the division of labor, group projects, and how Scratch can incorporate communication between and among objects. The first project is called *Mako & Marissa*; the second is called *Ghosts Hate Green*.

Mako & Marissa

• http://bit.ly/mako_and_marissa

Part A: Code Your Sprite

- **Create** In a team of two, program either Mako or Marissa.

Part B: Swap and Repeat

- **Share** Use the Scratch website or swap computers to share.
- **Create** Program Mako or Marissa again.

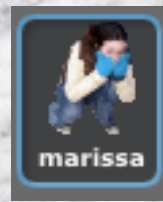
Part C: Create Your Own

- **Reflect** Why does Mako need Marissa to work? Why does Marissa need Mako?
- **Imagine** What other project would work best with multiple programmers? Could you create your own “Backscratch” project?



```

when mako clicked
  play sound Scream-male1 until done
  broadcast ah!
  
```



```

when marissa clicked
  play sound Cough-female until done
  broadcast sh!
  
```

```

when I receive sh!
  play sound Scream-male1 until done
  broadcast ah!
  
```

```

when I receive ah!
  play sound Cough-female until done
  broadcast sh!
  
```

```

when I receive sh!
  say AAAHH!! for 1 secs
  
```

```

when I receive ah!
  say SHHHH!! for 1 secs
  
```

Helpful Hint: this project uses sound blocks. You will need to click the sound tab and import these sounds before they show up in the “play sound” block. You will also need to explain how broadcast works.

Ghosts Hate Green

• http://bit.ly/ghosts_hate_green

Part A: Code the Sprite, Draw the Stage

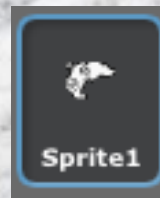
- **Create** One team member programs the “ghost,” the other designs the background. Explain that the background is a maze using the color green.

Part B: Swap and Repeat

- **Share** Use the Scratch website or swap computers to share.
- **Create** Program the ghost and stage again.

Part C: Reflect and Create

- **Reflect** Why does the ghost need the stage?
- **Imagine** How could you make the level easier? Harder? Could you create your own “Backscratch” project?



```

when green flag clicked
  go to x: -200 y: 150
  point in direction 90
  set size to 10 %
  forever loop
    move 4 steps
    if touching color green?
      turn 135 degrees
    if on edge, bounce
  
```

```

when right arrow key pressed
  point in direction 90
  
```

```

when left arrow key pressed
  point in direction -90
  
```

```

when up arrow key pressed
  point in direction 0
  
```

```

when down arrow key pressed
  point in direction 180
  
```

Helpful Hint: You cannot “sense” a color unless it is actually on the screen. You will have to have both sprite and background before you can program this piece.

4. “Scratching for Seeds”

Strategy number four entails designing a “seed” project: a project intentionally left unfinished in a way that allows for creative development. I have provided two sample projects, *Cars 1-player* and *Cars 2-player*. Seed projects have the advantage of carrying some pretty serious programming, as in both cases here. Still, the seed can be “planted” in the minds of even very young students, who can then develop it however they like.

Cars 1-player

• <http://bit.ly/cars1player>

Cars 2-player

• <http://bit.ly/cars2player>

Part A: Choose Your Seed

- **Play** Fiddle around with the seed project.
- **Reflect** How does it work?
- **Imagine** How is this project incomplete?
How could you make it better? Easier? Harder?
How could you make the project more “you”?

Part B: Plant Your Seed

- **Create** Build your ideas into reality.
- **Play** Play with your better, more “you” project.
- **Share** Share your projects with your friends.

Part C: Create Your Own Seed

- **Reflect** Why is a “seed” a fun way to start a project?
- **Imagine** What kind of seed could you make?
- **Create** Create your own seed.
- **Share** Share your seed with a friend. See what he or she makes with it!

Helpful Hint: Students can also try to figure out what makes the seed tick!

5. “Scratch That, Rewind!”

The constructive tendency is important to human flourishing, but so is the deconstructive tendency! Taking things apart, especially to see how they work, is vitally important to learning—and the same is true with Scratch. Scratch is the perfect environment to deconstruct, even break, complex projects, just to see how they work. Check out these links to popular projects on the Scratch website and challenge students to take any piece out, then put it back. All of these projects are in the gallery. Or have them pick their own project to scratch!

| | |
|----------------------------|---|
| Space Laser | • http://bit.ly/space_laser |
| Fall Down | • http://bit.ly/fall_down |
| Highly Caffeinated Rodents | • http://bit.ly/highlycaffeinatedrodents |
| Dress up! :D | • http://bit.ly/dressupD |
| Avoider | • http://bit.ly/avoider |
| Spider-man | • http://bit.ly/spider-man-scratch |
| Lawn Mower | • http://bit.ly/lawnmower_scratch |

6. “Scratch the Tape!”

Another basic human desire is the desire to improve upon what we see. In the Scratch world, this is called “remix” and is an important part of the Scratch community. Projects, like cakes, are shared along with their recipes. Anyone is allowed to try the cake and adapt the recipe, as long as they give credit to those who inspired them. Challenge students with the following questions! Have them use these popular projects or pick their own!

Part A: Play the Project

- **Play** Find one of your favorite projects online.
- **Reflect** How does it work?
- **Imagine** How could you build upon this project?
How could you make it better? Easier? Harder?
How could you make the project more “you”?

Part B: Remix the Project

- **Create** Build your ideas into reality.
- **Play** Play with your better, more “you” project.
- **Share** Share your projects with your friends.

And check out these two remixes in our gallery!

| | |
|--------------------|---|
| Space Laser Remix: | • http://bit.ly/falldownremix |
| Fall Down Remix: | • http://bit.ly/spacelaserremix |

7. Bonus!

There are many ways to enjoy Scratch. One that I found recently was to write poetry using Scratch blocks. I don't know if it will catch on, but check it out and try it with your students! You can take a picture of the scripts by right-clicking on a PC or control-clicking on a Mac. This is also the way I've taken pictures of scripts for this resource.

when my heart clicked
when I receive
change the world by 1

- <http://bit.ly/whenmyheartclicked>
- <http://bit.ly/whenireceive>
- <http://bit.ly/changetheworldby1>