

Visual Introduction to Computer Programming

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Abstract

An introduction into computer programming using the free, web-based, drag-and-drop visual animation/programming learning tool Scratch (<http://scratch.mit.edu>). Each session will also include a short, visual or hands-on lesson (“Short Byte”) on how computer hardware or the Internet works.

The sessions will use these software tools to teach the following concepts and practices with a heavy emphasis on critical thinking.

Programming Skills

- An enthusiasm for the modern world of computer programming
- Strong critical thinking skills – ability to start with a programming problem and develop a sequence/algorithm to solve it
- Hands-on experience in how programmers use math and English everyday
- An outlook on the future of programming and how personal devices and embedded computers will use software

Programming Concepts

- Algorithm – identifying a series of steps for a task (“sequence”)
- Loops – running the same sequence multiple times
- Variables - a placeholder for data such as a number
- Parallelism – making things happen at the same time
- Events – one thing causing another thing to happen
- Conditionals – making decisions based on conditions
- Operator – support for mathematical and logical expressions
- Functions – perform a specific task based on input and return a result

Programming Practices

- Being iterative and incremental – developing a little bit, then trying it out, then developing some more
- Testing and debugging – making sure that things work and finding and fixing mistakes

Tentative Schedule

Session 1

- Become familiar with Scratch: Be able to connect blocks
- Understand how/when blocks are executed (Concept connection: Events)
- Create a basic Scratch project (Concept connection: Algorithm)
- Share one cool thing you found in experimenting with Scratch
- Assess prior knowledge with a pre-test
- Short Byte: How a hard drive works (hands-on)

Session 2

- Introduce the “forever,” or infinite, loop
- An introduction to conditionals or “if” statements (Concept connection: Conditionals)
- Saving a Scratch project
- Short Byte: How a DVD drive works

Sessions 3-12

Sessions three through twelve will each introduce a concept, give a reinforcing critical-thinking challenge, and include a “Short Byte.” One session will include a programming best practices presentation.

Session	Topic	Concept Connection	Short Byte
3	Booleans	Conditionals	Binary
4	Types of loops	Loops	ASCII Text
5	Intro to sprites	Parallelism	Compression
6	Using math	Operators	Bar codes
7	Intro to variables	Variables	Internet layout
8	Intro to strings	Variables/Operators	IP Addresses overview
9	Intro to functions	Functions/Algorithm	DNS overview
10	Final challenge 1		Into to Internet “packets”
11	Final challenge 2		HTML Overview
12	Final Project		RAM

Session 13

- Work on final project
- Very basic first introduction to text-based programming with a web-based Python interpreter
- Review programming skills, concepts, and practices
- Short Byte: Review previous Short Bytes

Session 14

- Finish final project
- Prepare projects to take home or possibly competition
- Write a very simple program in Python
- Review programming skills, concepts, and practices
- Assess learning with a post-test
- Short Byte: The future of computers and programming