Coding in the 21st Century

...

Kay Knebel
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Coding: Why, How, What, & When?

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Director of Digital and Innovative Learning
Seguin ISD

Big Picture

Img credit: Facebook.com/MarkZuckerberg

TECH & LEARNING LIVE @ DALLAS

#TLTECHLIVE

SATURDAY, NOV. 4, 2017

Reedy High School

Frisco, TX

Inspire new ideas

challenge

think critically

use LOGIC

ENGAGE

Apply concepts

collaborate

Coding: Beginners

- Basic concepts and language
- Computational thinking
- Problem solving
- Creativity
- Fun

Coding: Beginners

- Block-based (Scratch; Tynker; Alice)
- Games (Code Monkey; Code Combat; Code.org; Code Monster)
- Apps (Daisy the Dinosaur; Hopscotch; Scratch, Jr.; Lightbot;

Coding: Intermediate

- Next level computational thinking (functions, variables,
- Intro to languages (e.g. Python, Javascript, HTML)

Coding: Device-Based

Coding: The Broader Curriculum

Leveling Up: One School District's Journey With Coding and Robotics

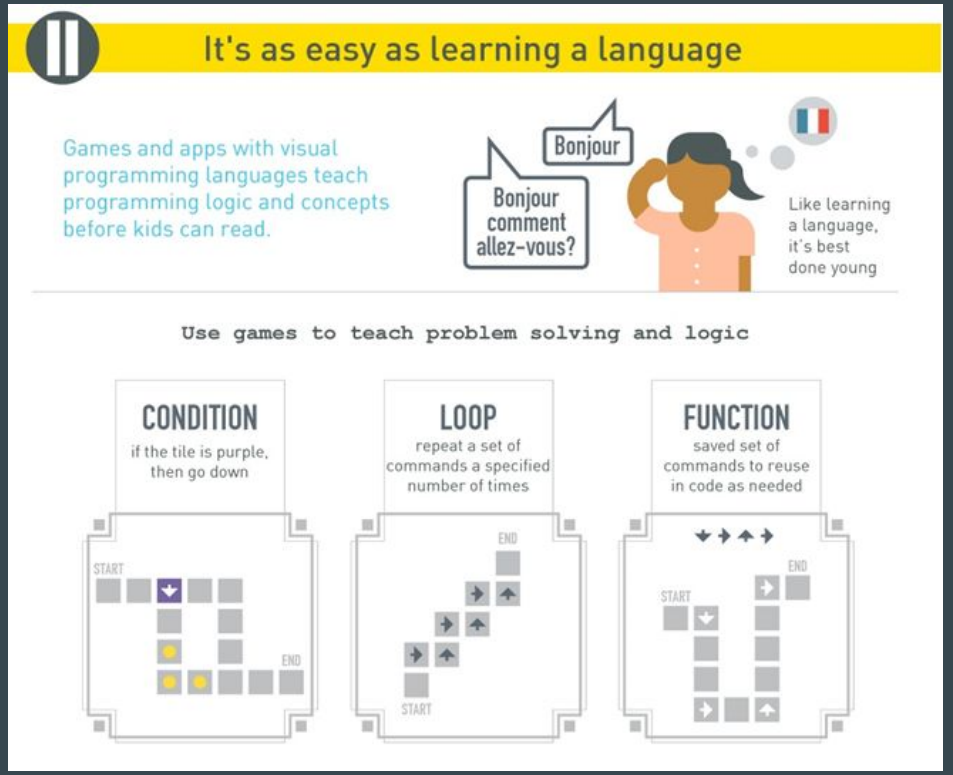
Juan Orozco
Director of Instructional Technology Del Valle ISD

Six Reasons Why Del Valle Teaches Coding and Computer Science Concepts

1. Learning Early Benefits Kids

- Similar to reading, math, and languages, it is important to start teaching coding skills early
- Children easily absorb information and use technology
- Creating an interest at an early age benefits students who want to learn more Computer Science later

Learning To Code Before You Can Read



2. Advantages of Coding in Elementary

Learning the fundamentals of coding encourages children to learn skills that will allow them to excel in other subject areas:

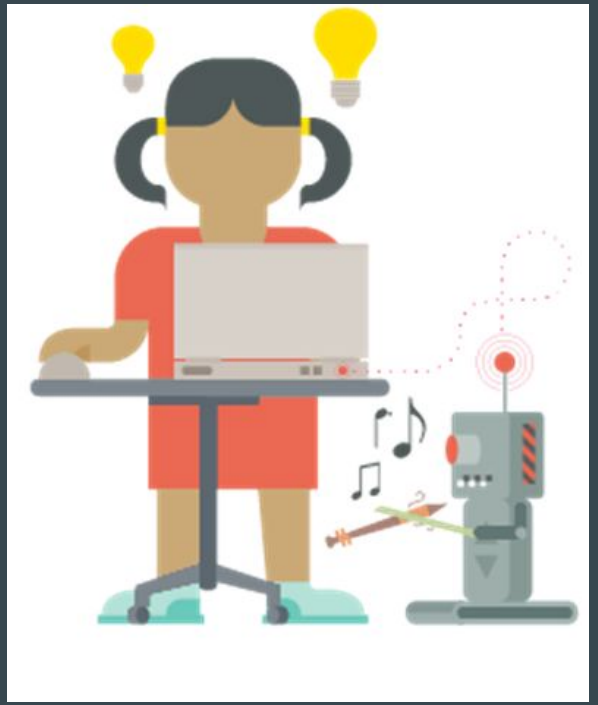
–Problem solving skills

–Computational thinking

–Critical thinking

–Art and Design

–Engineering



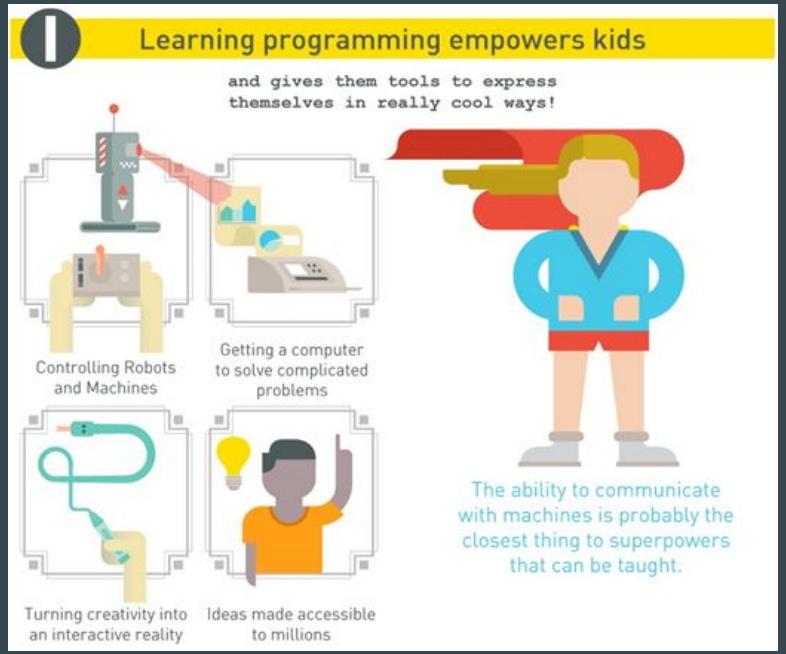
3. Coding Encourages Collaboration

Programming fosters collaboration amongst students, even across age groups and skill levels.

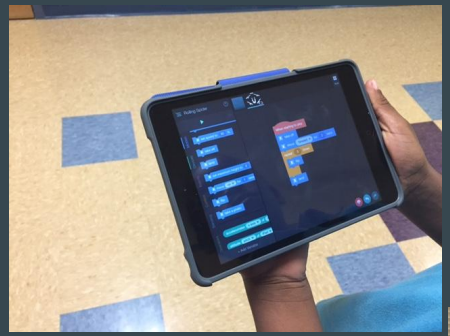
•Kids are even teaching parents to code!

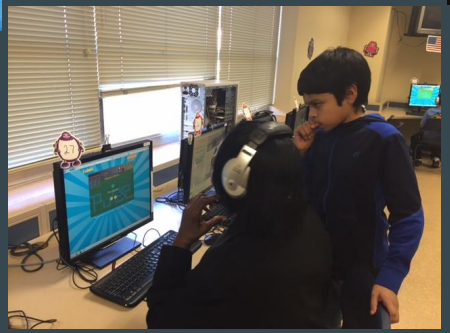
4. Programming Empowers Kids

- Coding teaches children to not just be passive consumers of technology, but *active creators.*



What does this look like in Elementary?

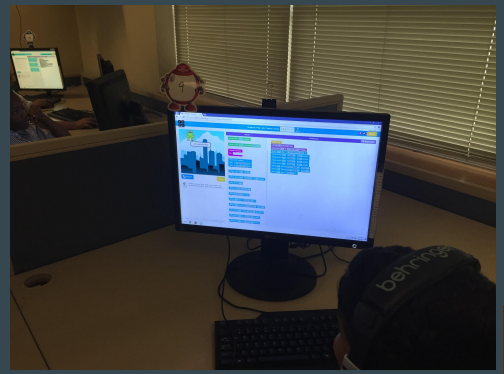


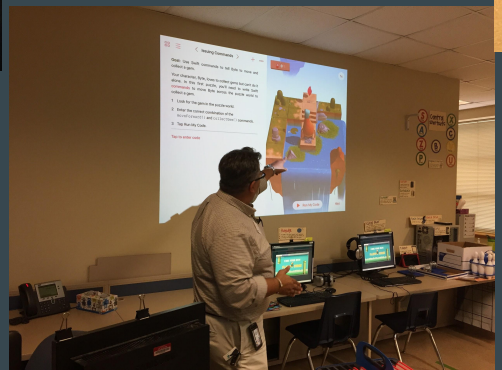


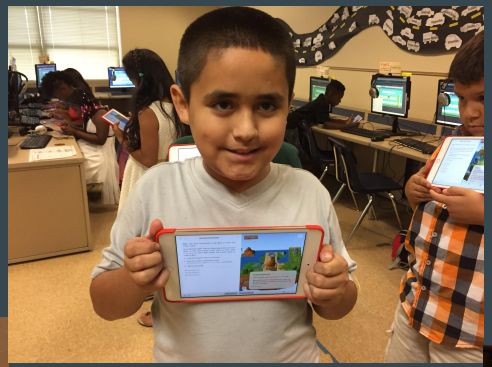
Computer Science Concepts:

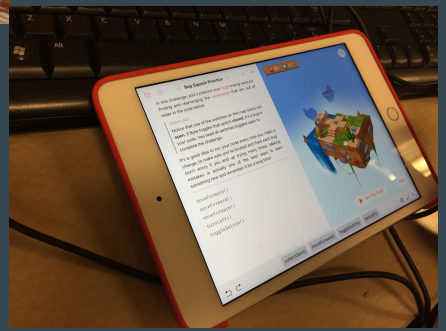
Events	Loops	Conditional Statement
Sequence	IF Statements	Variables
Simulation	Data	Input/Output

What does this look like in Elementary?









Elementary: Scope and Sequence

Del Valle ISD Technology Applications - 5th Grade — 2016/2017

First 9 Weeks — Performance Levels: Intorductory = I, Mastery = M, Application = A

TEKS Strand (1-6)	TEKS SE	Performace Description (SE)	Knowledge & Skills	Perform. Level
	D	CD.L1:6-03 Apply strategies for identifying simple hardware and software problems that may occur during use.	Understand software function	I
				M

Second 9 Weeks — Performance Levels: Intorductory = I, Mastery = M, Application = A

TEKS Strand (1-6)	TEKS SE	Performace Description (SE)	Knowledge & Skills	Perform. Level
1 Creativity and Innovation		SIET		
	A		Creating developmentally appropriate multimedia products	I
		CT.L1:3-02 Use writing tools, digital cameras, and drawing tools to illustrate thoughts, ideas, and stories in a step-by-step manner.	Multimedia tools for input and output	A
			Understanding steps and processes, Creating steps and processes	M
		CPP.L1:3-03 Create developmentally appropriate multimedia products with support from teachers, family members, or student partners	Creating developmentally appropriate multimedia products	I
			Multimedia tools for input and output	M
	B	CPP.L1:6-06/CI.L1:6-04 Construct a program as a set of step-by-step instructions to be acted out	Understanding steps and processes, Creating steps and processes	M

Third 9 Weeks — Performance Levels: Intorductory = I, Mastery = M, Application = A

TEKS Strand (1-6)	TEKS SE	Performace Description (SE)	Knowledge & Skills	Perform. Level
2 Communication & Collaboration		SIET		
	C - D	CL.L1:3-01 Gather information and communication electronically with others with support from teachers, family members, or student partners	Gather and organize information	A
		CL.L1:6-02 Use online resources (e.g. email, online discussions, collaborative web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products	Problem solving with technology resources	A
		CPP.L1:6-07 Use computing devices to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests	Electronic communication	I
	A, D	CL.L1:3-02 Work cooperatively and collaboratively with peers, teachers, and others using technology	Peer collaboration	A
	A - B, F	CL.L1:6-01 Use productivity technology tools (e.g. word processing, spreadsheet, presentation software) for individual and collaborative writing, communication, and publishing	Creating developmentally appropriate multimedia products	I
			Multimedia tools and peripherals	A

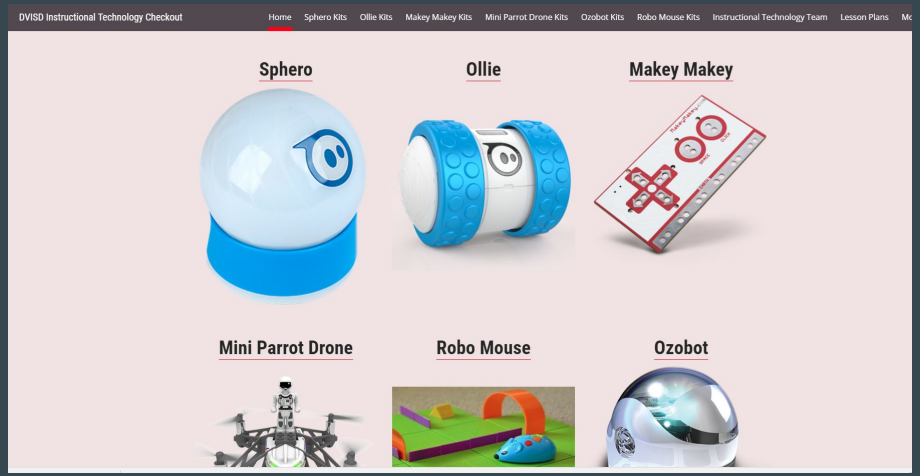
2016-2017 Coding Curriulum

File Edit View Insert Format Data Tools Add-ons Help — Last edit was made on July 18, 2016 by rachel.calabretta

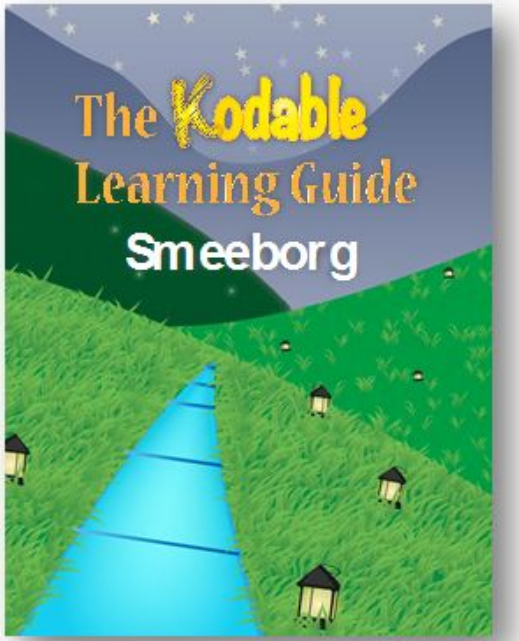
Resource Name

	A	B	C	D	E
3	Blockly Games	https://blockly-games.appspot.com/	K-6	CS concepts Progamming languages: Block	Use for daily assignments in comprehension/application levels Warm-ups or enrichment work remediation or concept introduction Problem solving
4	Codcademy	https://www.codecademy.com/learn	4-6	Programming languages: HTML/CSS, Java Script, JQuery, PHP, Python, Ruby Database with SQL Complex CS concepts	Students create products from predesigned projects
5	Code Combat	codecombat.com	4-6	Programming languages: Python, Java Script Complex CS concepts	Predesigned games students code to play Problem solving Daily activity or practice
6	Code.org	https://code.org/	K-6	Programming languages: Block, Java CS concepts	Use for daily assignments in comprehension/application levels Warm-ups or enrichment work remediation or concept introduction Problem solving
7	Computer Science Unplugged	csunplugged.org	K-6	CS concepts	Unplugged coding activities and games Daily practice
8	Game Blox	gameblox.org	4-6	Programming language: Block CS concepts	Students create shareable games from scratch or using templates End unit projects
9	Game Froot	http://gamefroot.com/	4-6	Programming language: Block CS concepts	Students create shareable games from scratch or using templates End unit projects
10	Khan Academy	https://www.khanacademy.org/computing/computer-programming	4-6	Programming languages: Java Script, HTML/CSS, Processing JS Database concepts with SQL Problem solving Complex CS concepts	Students create products from predesigned projects
11	Kodable		K-5	CS concepts Progamming languages: Block, Java	Use for daily assignments in comprehension/application levels Warm-ups or enrichment work remediation or concept introduction Problem solving
12	Made with Code	https://www.madewithcode.com/	3-6	Problem solving CS concepts	Students create products from predesigned projects Short projects for daily assignments, enrichment, remediation, warm-ups, practice
13	MIT App Inventor	http://appinventor.mit.edu/explore/hour-of-code.html	5-6	App invention and design Problem solving	Students create products from predesigned projects
14	Pro-Bots	Reserve through Library	3-5	Basic to complex CS concepts Problem solving	Inter-content projects Game creation Problem solving
				Programming language: Block	Students create shareable products from scratch or

Elementary Resources:



Determining the degree of adjecent angle	*4th grade*	*3/21/2016*
Lesson Objective	TEKS Addressed (Number and Strand)	
Students will be able to determine the degree of the adjacent angle using the robot to determine the primary angle.	4.7E	
Lesson Activity	Lesson Materials	
Students will enter in the commands for the robot to move and create and angle, after the robot has created its angle they will then use a ruler to create the straight angle and then use a protractor to measure both of the angles. They will double check to make sure that botht the angles add up to 180 degrees.	robots, butcher paper, rulers, protractors, and markers.	
How will learning be assessed	Formative/Summative	
Did they enter in the correct commands to create angles, did they then create a straight angle and find both angle measurements, did they both add up to 180 degrees.	purely formative	



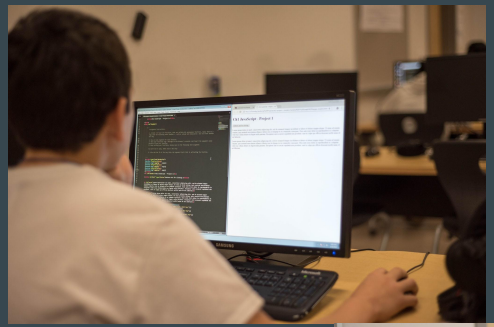
5. No Advanced Degree Required

What does this look like in secondary?

6. Studio Web and Text Editors

The goal is the end product for the students, ask yourself… What are you doing to help achieve this?

- Starting with block based coding is great but you need to make sure that you are providing a pathway for students to move into text style coding.



What does this look like in secondary?

HTML 5

HTML is the structural language behind every website in the world. It is the first language students must learn in web design and web development.

HTML 5 is the lastest version of HTML. HTML is also a great first coding language, because it introduces basic concepts and habits that are applicable to any type of coding.

Hand coding or a web design app?

If the goal is to teach web design, why not just start off by teaching a WYSIWYG app like Dreamweaver?

Nerd note: WYSIWYG is short for 'What You See Is What You Get'. These are point & click style apps, that make building websites similar to using a desktop publishing app like Adobe InDesign.

The short answer:

In modern web design, students need to understand the code behind the pages; the days of only using a point-and-click web design app are long gone. Even if you eventually plan to teach Dreamweaver (or some other WYSIWYG app,) students still have to understand how all the code (HTML, CSS and JavaScript) work together.

webmentor-screenshot.html

```
<!DOCTYPE html>
<html>
<head>
<title>Chapter 4 CSS Tutorial - No CSS Applied</title>
<meta charset="UTF-8">
<link href="#" rel="stylesheet">
</head>

<body>

<img id="miamiBuilding" src="miami.png" height="350" width="193">

<h1>The Main Heading</h1>
<p>
Studioweb is an interactive video question and answer training system. We focus on teaching the key basic concepts and techniques of web design and web programming.
</p>

<h2>A Sub Heading</h2>
<p>
Studioweb is an interactive video question and answer training system. We focus on teaching the key basic concepts and techniques of web design and web programming. Learn more:
</p>

</body>
</html>
```

Line 1, Column 16 | Tab Size: 4 | HTML

HTML code as seen in a popular code editor.

What does this look like in secondary?

CSS 3

CSS Code Adds Style to Websites

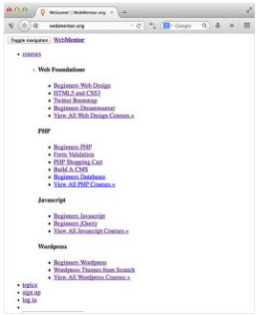
CSS is the second language that students should learn in a web design and web development curriculum.

CSS (cascading style sheets) is the sister language to HTML, and it's used in every website in the world to add style web pages. That includes setting font styles, font sizes, color, inserting images and even changing the entire look and positioning of page elements (text, images, menus) in a website. CSS 3 is the latest version of CSS.

CSS does get complex

Although basic CSS is very approachable, unlike HTML, CSS has advanced concepts and functionality that can be tough for students to absorb. For example, the CSS 'cascade', the hierarchical rules by which CSS code is applied to a web page, are central to using CSS but can be a challenge to teach!

No worries though, our beginners CSS course does a good job at simplifying this concept ... among many others. Nonetheless, we suggest that much more time be devoted to teaching CSS when compared to HTML.



Website with CSS turned off.

Website with CSS on.

What does this look like in secondary?

Javascript

JavaScript is a key language in web design and web development

JavaScript is a programming language that allows you to send direct commands to web browsers and so it allows you maximum control of your website. JavaScript works hand-in-hand with HTML and CSS in modern web design.

... If you're preparing students for web design today, they should learn at least basic JavaScript.

JavaScript and Web Frameworks

Web design now makes heavy use of pre-packaged code libraries called 'frameworks'.

Why?

Because frameworks make building websites much easier. Many popular web frameworks rely heavily on JavaScript, including the two most popular: Bootstrap and JQuery.

You don't absolutely need to know JavaScript to be a web designer but at some point, you are guaranteed to be exposed to it in some way. Whether it be because of frameworks, or just basic web design, it makes sense that students understand at least the basics of JavaScript.

```
<!doctype html>
<html lang="en-US">
<head>
    <meta charset="utf-8">
    <title>JavaScript Code in an HTML Page</title>

<script>
function myFunction() {
    document.getElementById("demo").innerHTML = "Paragraph changed.";
}
</script>

</head>
<body>
<p id="demo">Welcome to JavaScript!</p>


</body>
</html>
```

JavaScript code as seen in a popular code editor.

What does this look like in secondary?

PHP

PHP is a key language in modern web design and development. It is arguably a must learn programming language.

Nerd note: Most web apps have some sort of database working behind the scenes. So sometimes, web apps are called 'database driven websites'. Check out the databases page to learn more.

Why teach PHP?

There are several reasons to choose PHP as the first programming language to introduce to students:

When it comes to building web apps, PHP is the most popular programming language. Over 80% of web apps run on PHP! Students learning PHP, will find a much greater chance of finding internships and even freelance work - the demand is there.

PHP is easier to teach, because students can do practical things without having to understand (sometimes complex) object oriented programming principles. Yes, object oriented PHP will have to be taught at some point, but being able to gently introduce programming with PHP's simpler side, makes teaching programming much easier.

```
1  <!doctype html>
2  <html lang="en-US">
3  <head>
4      <meta charset="utf-8">
5      <title>PHP is used by 80% of dynamic websites!</title>
6  </head>
7  <body>
8
9  <p>Welcome to PHP!</p>
10
11 <?php
12
13 echo "PHP is easy to learn!";
14
15  ?>
16
17 </body>
18 </html>
```

PHP code as seen in a popular code editor.

What does this look like in secondary?

Courses

Beginners Python 3

foundation

Python is one of the most important programming languages used today. Popular in both education and in the professional world, Python is used in Ai, machine learning, web app creation, and so much more.

Beginners Python 3, is our new Python course specially designed for classroom teaching. Students learn modern Python programming through video lessons, code challenges, multiple choice quizzes and real-world projects.

- **For grades:** 8+
- **Prereqs:** None
- **Estimated Class Time:** 10-12 hours (depending on grade level and student aptitude.)
- **Number of Lessons:** 63
- **Quiz Questions:** 176 code challenges and quiz questions
- **Workshops / side projects:** Yes!
- **Included documents:** Chapter objectives, teacher's cheat sheet, glossary of terms, project guidelines.

The course starts with the basics, and quickly moves into fun but practical real Python programming with drawing, animation, object oriented programming and more.

Legend:

foundation
Foundation courses teach students the fundamentals of web development in HTML, CSS, PHP, and Javascript

project
Project courses teach students practical real-world development with small scale web projects.

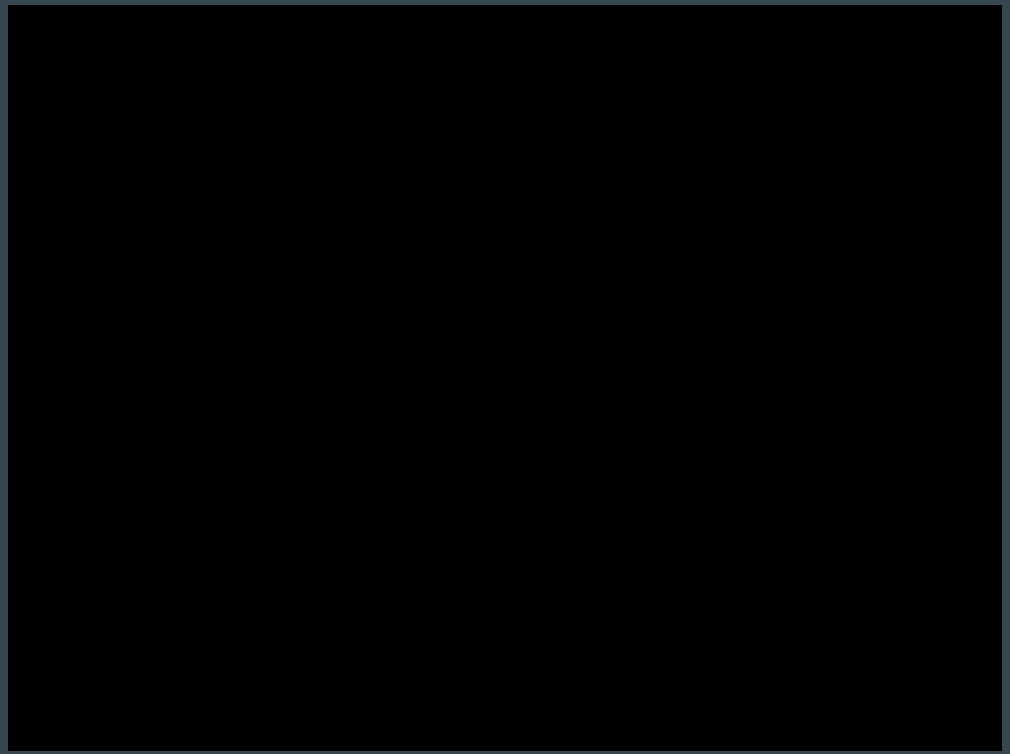
exam
Exam courses comprise of multiple choice questions only and cover material from other courses

FAQ:

Are source files included?
Yes, all courses come with downloadable source file3s.

How long does it take to get Studioweb setup?
Setup time is about 24hrs and teacher training is about 2-3 minutes - Studioweb is that easy to learn!

What does this look like in secondary?



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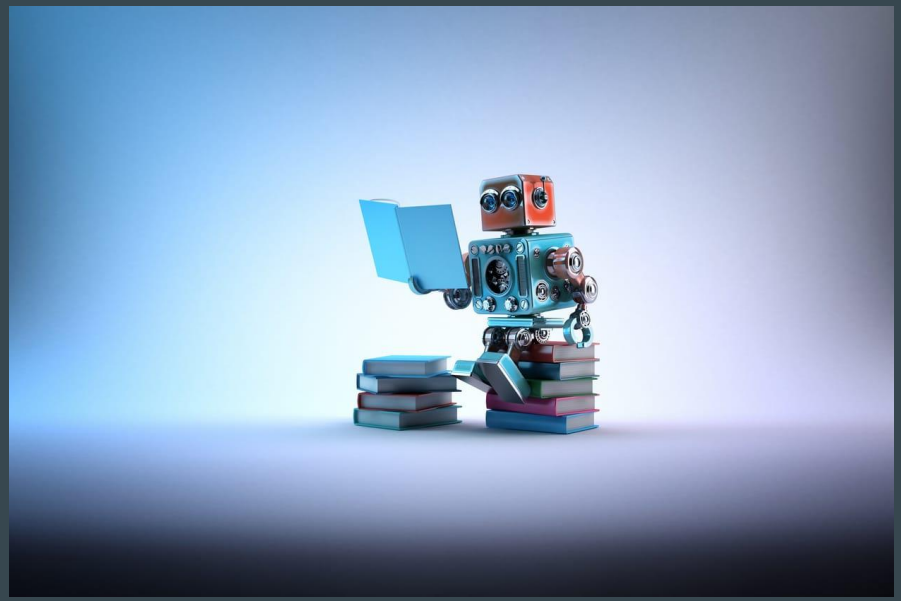
Come by the Playground to see these tools in action.



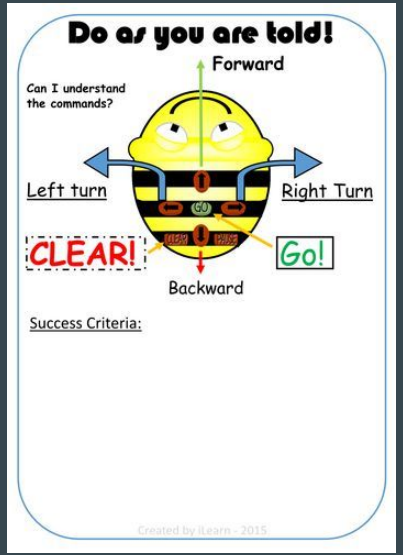
Using BeeBots to Teach Coding

Kay Knebel

Wall Elementary
Technology Teacher K-5

BeeBots Teach Basic Commands

With BeeBots, students who can't read can learn how to code with the simple directions.

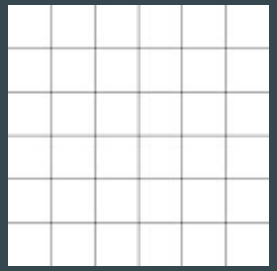


Using BeeBots to Teach Coding

Students have to learn how to sequence their codes to get BeeBot to move from one place to the other.

BlueBot can be remotely controlled by PC, Tablet, or Tactile Reader.

Using BeeBots to Teach Coding

Build courses for BeeBots to follow/go through

Mats for students to use