Administrators' Workshop
Rice University School Mathematics Project
November 15, 2016

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rusmp.rice.edu

Today's Facilitators:

Alice Fisher

RUSMP Director of Technology Applications & Integration

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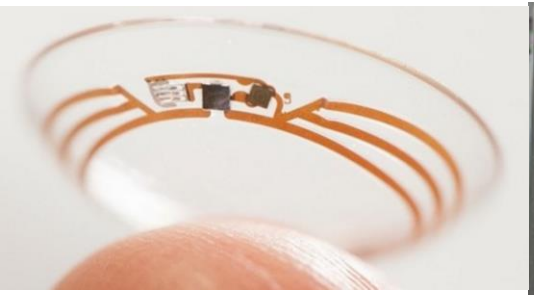
RUSMP Executive Director

Computer Science Education: Why it Matters

Impacts of Computing



Computing Jobs

Computing jobs are the #1 source of new wages in the United States.

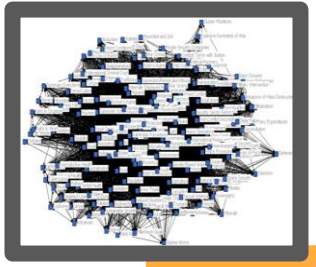
500,000 current openings: These jobs are in ***every*** industry and ***every*** state, and they're projected to grow at twice the rate of all other jobs.

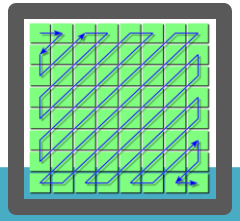
Access to Computer Science

What is Computer Science?

- “The study of computers and algorithmic processes, including their principles, their hardware and software designs, their applications, and their impact on society” (CSTA)
- The art of blending human ideas and digital tools to increase problem solving power

- Programming is writing a set of instructions for the computer so that it understands what humans want it to do.





“Big” Data and Information

Algorithms

Programming/ Coding

Abstraction and Problem Solving

The Internet

Creativity

Global Impact

Computer Science Big Ideas

Credit: Suyen Moncada-Machado

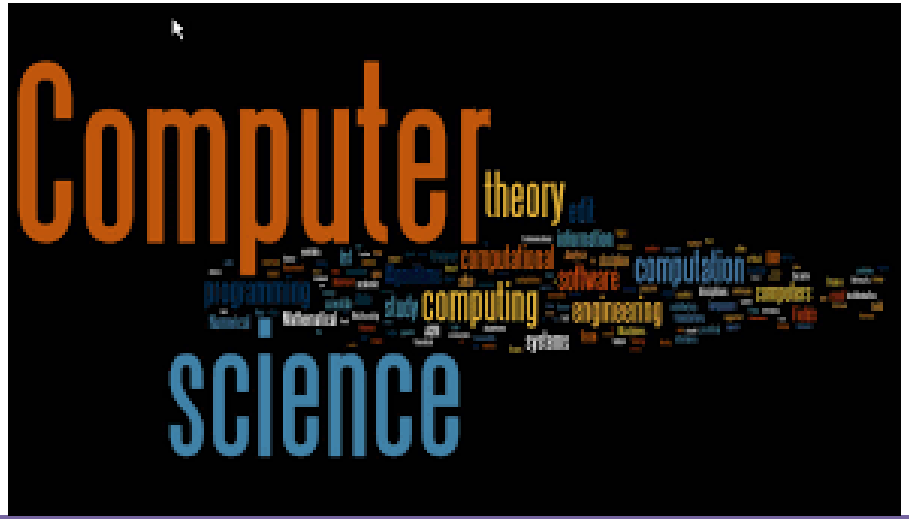
What Computer Science is Not

- Typing
- Being able to play games, text, do social media, navigate apps, etc.
- Knowing how to use applications (Word, Google Docs, etc.)
- Being “good with technology”
- Computer Literacy
- Educational Technology

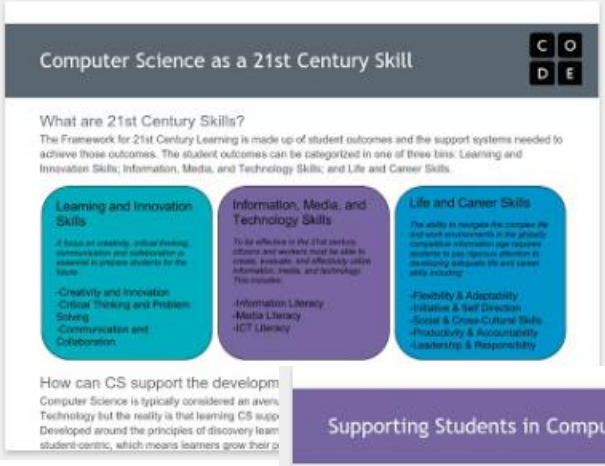
Focus Questions

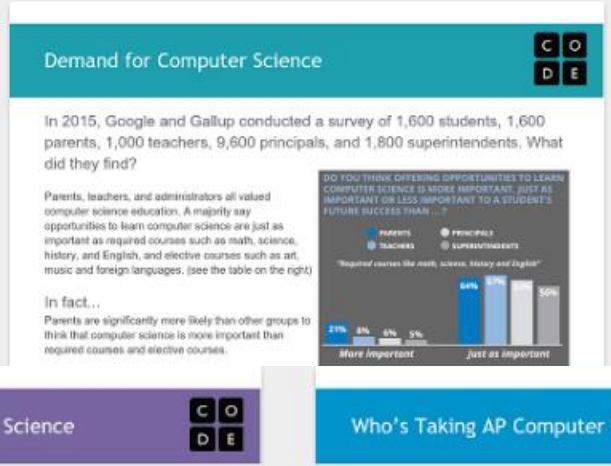
- Why does K-12 computer science education matter?

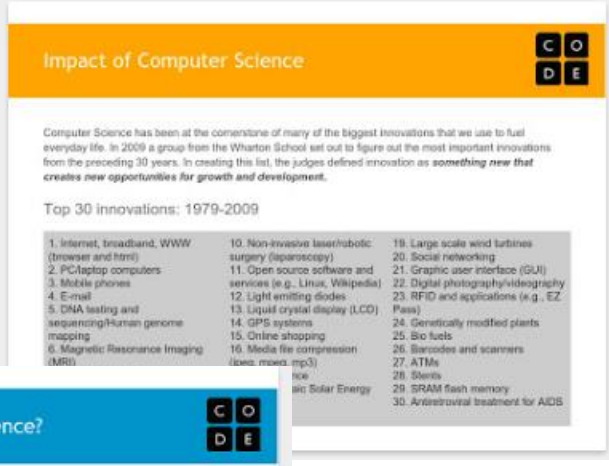
- Why should all students have the opportunity to learn CS?

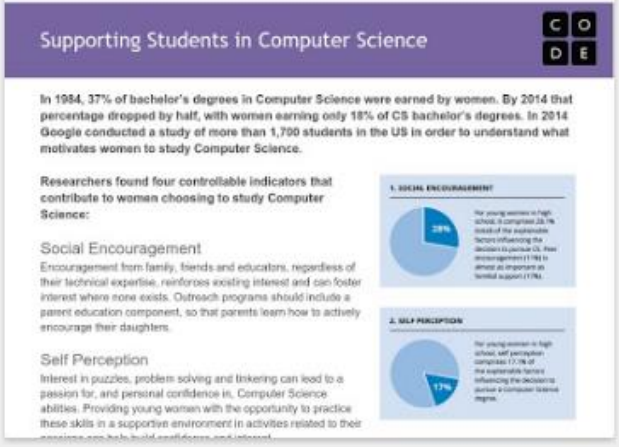


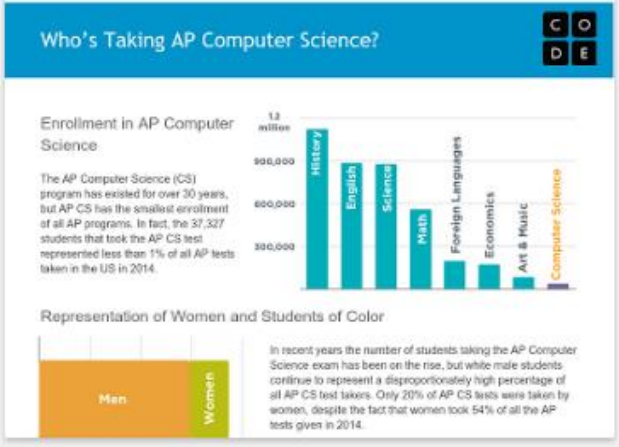
Resources


Computer Science as a 21st Century Skill
What are 21st Century Skills?
The Framework for 21st Century Learning is made up of student outcomes and the support systems needed to achieve those outcomes. The student outcomes can be categorized in one of three bins: Learning and Innovation Skills; Information, Media, and Technology Skills; and Life and Career Skills.
Learning and Innovation Skills
-Creativity and Innovation
-Critical Thinking and Problem Solving
-Communication and Collaboration
Information, Media, and Technology Skills
-Information Literacy
-Media Literacy
-ICT Literacy
Life and Career Skills
-Flexibility & Adaptability
-Initiative & Self Direction
-Social & Cross-Cultural Skills
-Productivity & Accountability
-Leadership & Responsibility
How can CS support the developm


Demand for Computer Science
In 2015, Google and Gallup conducted a survey of 1,600 students, 1,600 parents, 1,000 teachers, 9,600 principals, and 1,800 superintendents. What did they find?
Parents, teachers, and administrators all valued computer science education. A majority say opportunities to learn computer science are just as important as required courses such as math, science, history, and English, and elective courses such as art, music and foreign languages. (see the table on the right)
In fact...
Parents are significantly more likely than other groups to think that computer science is more important than required courses and elective courses.
DO YOU THINK OFFERING OPPORTUNITIES TO LEARN COMPUTER SCIENCE IS MORE IMPORTANT, JUST AS IMPORTANT OR LESS IMPORTANT TO A STUDENT'S FUTURE SUCCESS THAN ... ?
PARENTS
TEACHERS
PRINCIPALS
SUPERINTENDENTS
"Required courses like math, science, history and English"
21%
8%
6%
5%
64%
57%
50%
More important
Just as important


Impact of Computer Science
Computer Science has been at the cornerstone of many of the biggest innovations that we use to fuel everyday life. In 2009 a group from the Wharton School set out to figure out the most important innovations from the preceding 30 years. In creating this list, the judges defined innovation as something new that creates new opportunities for growth and development.
Top 30 innovations: 1979-2009
1. Internet, broadband, WWW (browser and html)
2. PC/laptop computers
3. Mobile phones
4. E-mail
5. DNA testing and sequencing/Human genome mapping
6. Magnetic Resonance Imaging (MRI)
10. Non-invasive laser/robotic surgery (laparoscopy)
11. Open source software and services (e.g., Linux, Wikipedia)
12. Light emitting diodes
13. Liquid crystal display (LCD)
14. GPS systems
15. Online shopping
16. Media file compression
19. Large scale wind turbines
20. Social networking
21. Graphic user interface (GUI)
22. Digital photography/videography
23. RFID and applications (e.g., EZ Pass)
24. Genetically modified plants
25. Bio fuels
26. Barcodes and scanners
27. ATMs
28. Stents
29. SRAM flash memory
30. Antiretroviral treatment for AIDS


Supporting Students in Computer Science
In 1984, 37% of bachelor's degrees in Computer Science were earned by women. By 2014 that percentage dropped by half, with women earning only 18% of CS bachelor's degrees. In 2014 Google conducted a study of more than 1,700 students in the US in order to understand what motivates women to study Computer Science.
Researchers found four controllable indicators that contribute to women choosing to study Computer Science:
Social Encouragement
Encouragement from family, friends and educators, regardless of their technical expertise, reinforces existing interest and can foster interest where none exists. Outreach programs should include a parent education component, so that parents learn how to actively encourage their daughters.
Self Perception
Interest in puzzles, problem solving and tinkering can lead to a passion for, and personal confidence in, Computer Science abilities. Providing young women with the opportunity to practice these skills in a supportive environment in activities related to their


Who's Taking AP Computer Science?
Enrollment in AP Computer Science
The AP Computer Science (CS) program has existed for over 30 years, but AP CS has the smallest enrollment of all AP programs. In fact, the 37,327 students that took the AP CS test represented less than 1% of all AP tests taken in the US in 2014.
1.2 million
900,000
600,000
300,000
History
English
Science
Math
Foreign Languages
Economics
Art & Music
Computer Science
Representation of Women and Students of Color
Men
Women
In recent years the number of students taking the AP Computer Science exam has been on the rise, but white male students continue to represent a disproportionately high percentage of all AP CS test takers. Only 20% of AP CS tests were taken by women, despite the fact that women took 54% of all the AP tests given in 2014.

Focus Questions

- At your table, choose one of the resources in your packet.
- Focus on **one of the following questions** to guide discussion at your table:
  - Why does K-12 computer science (CS) education matter?
  - Why should all students have the opportunity to learn CS?
- Be ready to share ideas from the resource and table discussion.

Reflection Question

- How would you respond if asked, “Why should our district/school offer computer science?” or “Why does our district/school offer computer science?”
  - Jot down a few of the ideas that stand out to you.
  - Share with a neighbor.

RUSMP as Code.org Regional Partner

Code.org

Launched in 2013, Code.org is a national nonprofit dedicated to expanding access to CS, and in particular, to increasing the participation of women and underrepresented ethnic minority students.

Code.org's vision is that:

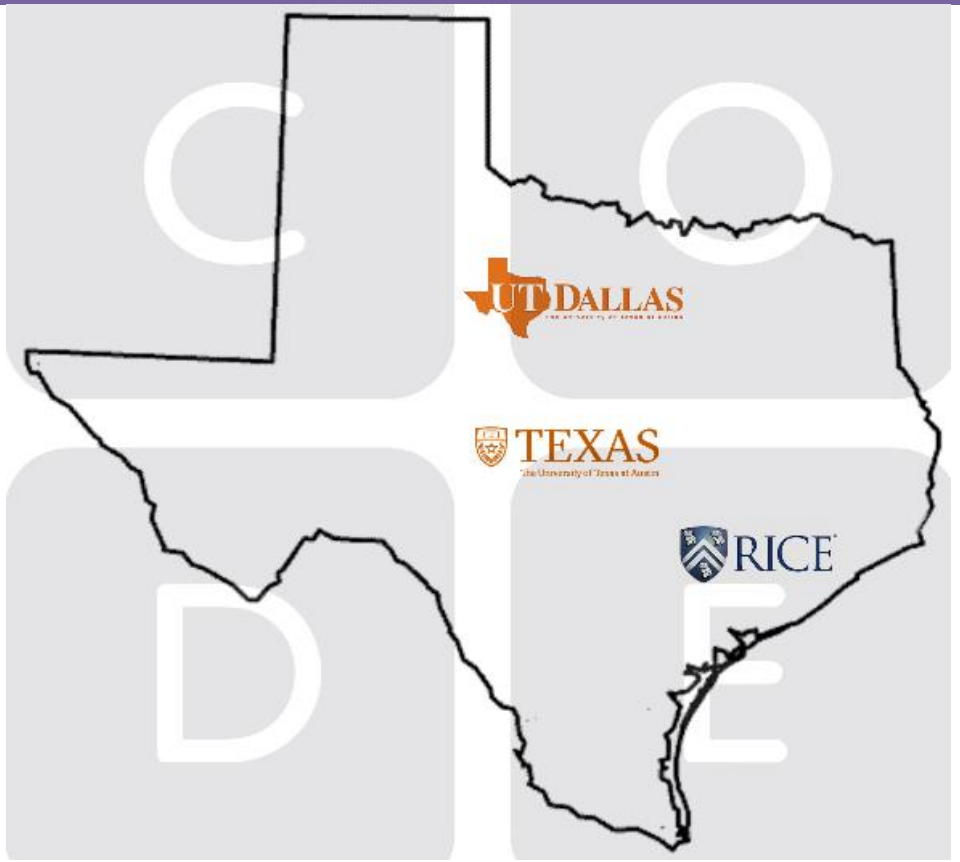
- Every student in every school should have the opportunity to learn computer science; and
- Computer Science should be part of the core curriculum, alongside other courses such as Biology, Chemistry, or Algebra.

RUSMP, a Code.org Regional Partner

- In 2016 Code.org initiated the Professional Learning Partner Program to help spread CS in a **local, sustainable** fashion. Recently the program name has changed to the **Regional Partner Program.**
- Code.org has selected more than 40 organizations from across the country to be Code.org Regional Partners.
- The goal of the Regional Partner Program is to help each organization establish and sustain itself as a local hub for Code.org professional learning and CS education.
- RUSMP is the Code.org Regional Partner for the Houston area.

Code.org Regional Partners in Texas

- Rice University School Mathematics Project
- Center for STEM Education at University of Texas at Austin
- Institute for Instructional Excellence at the University of Texas at Dallas



2016-2017 RUSMP/Code.org Programs

During the 2016-2017 year, RUSMP is offering professional development programs for:

- AP CS Principles
- Exploring CS
- CS in Middle School Science
- CS in Algebra

Code.org is providing funding for all four of these programs so there was no cost for teachers to participate in these programs.

2017-2018 RUSMP/Code.org Programs

During the 2017-2018 year, RUSMP will offer professional development programs for:

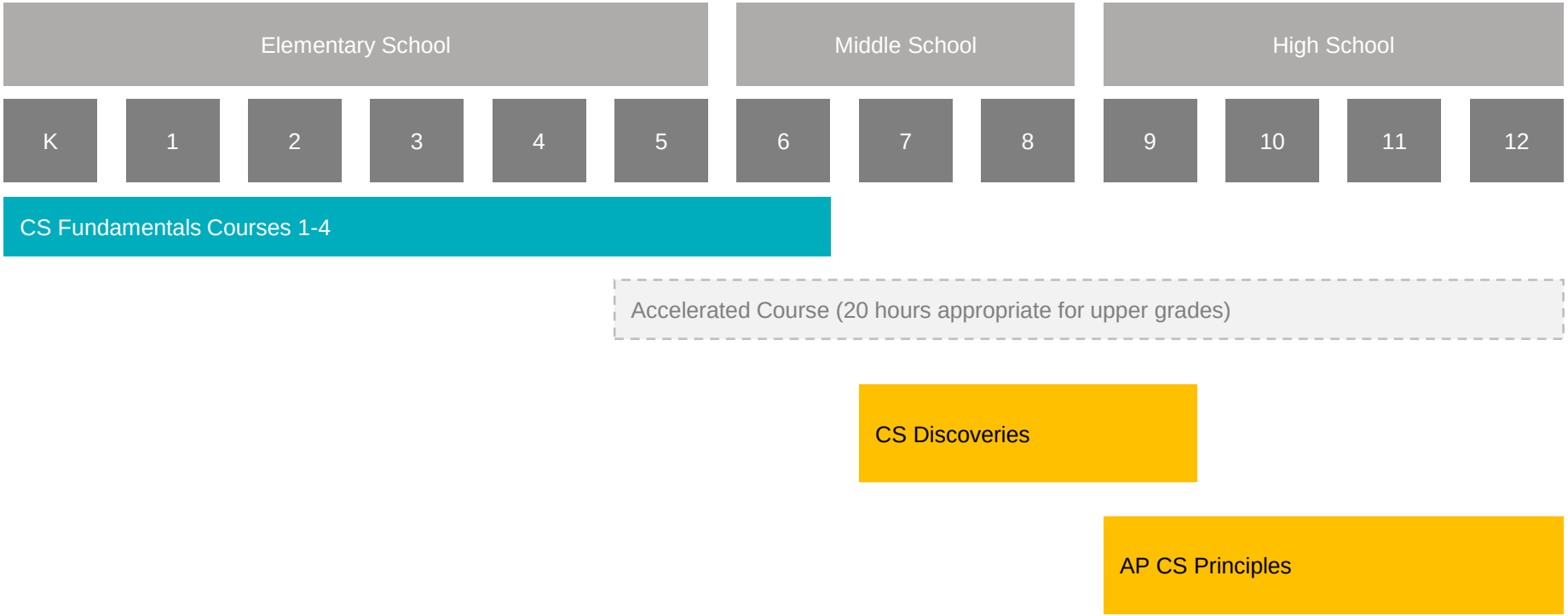
- AP CS Principles
- CS Discoveries (will replace Exploring CS)
- CS in Middle School Science
- CS in Algebra

2017-2018 RUSMP/Code.org Programs

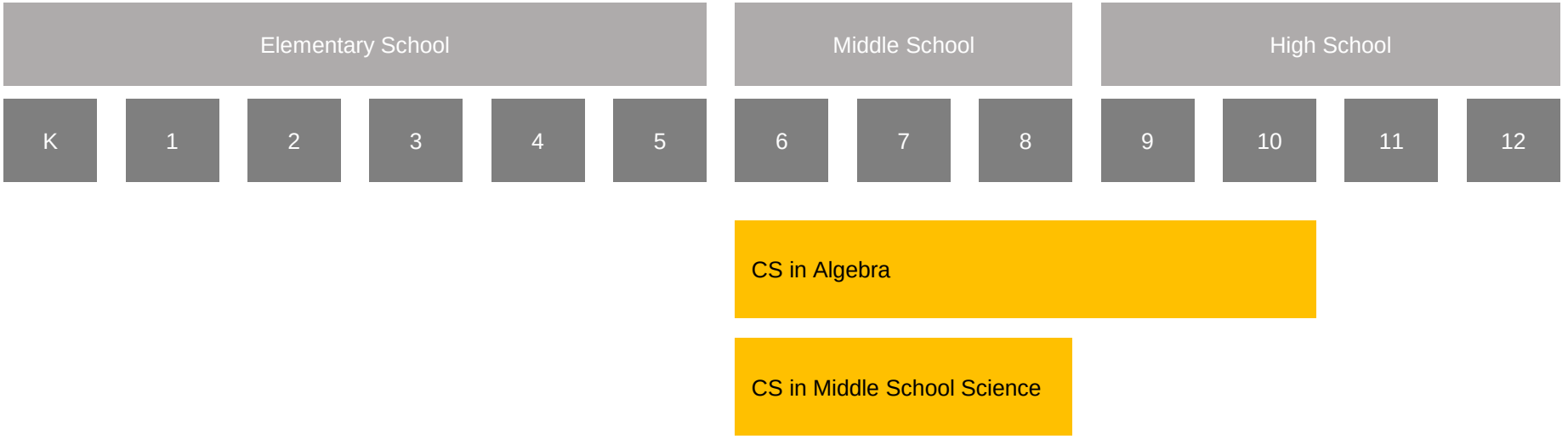
- Code.org will provide funding for AP CS Principles and CS Discoveries so that there will be no cost for teachers to participate in these two programs.
- There will be a fee to attend CS in Algebra or CS in Middle School Science workshops because Regional Partners will no longer receive funding from Code.org to offer these workshops.

Code.org Curricula

Code.org CS Curriculum Pathway



Other Code.org Programs

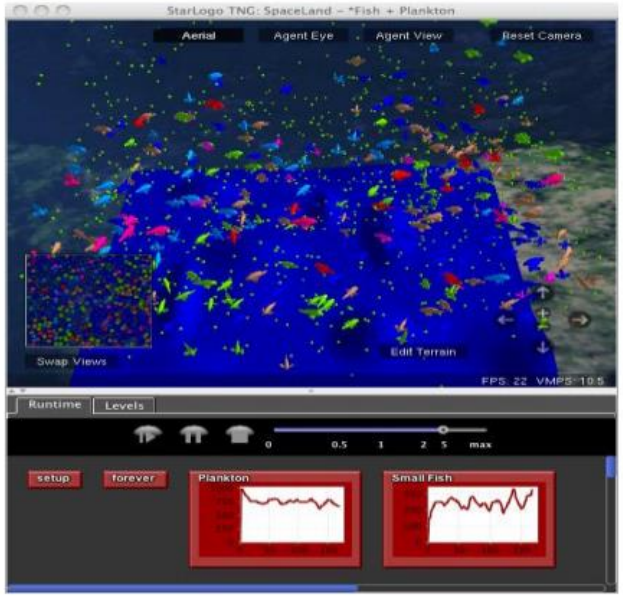


CS in Algebra

RUSMP will offer the CS in Algebra workshop on July 5-6, 2017 with one Saturday follow-up workshop during the academic year.

CS in Middle School Science

RUSMP will offer the CS in Middle School Science workshop on July 31-August 1, 2017 with two Saturday follow-up workshops during the academic year.



CS Discoveries

Take a minute to review the CS Discoveries one-pager.

CS Discoveries Course Overview: Semester 1

	Problem Solving	The Internet	Programming
Semester 1 **Exploration and Expression**	Unit 1 Computers and Logic 	Unit 2 Web Development 	Unit 3 Interactive Games and Animations 

CS Discoveries Course Overview: Semester 2

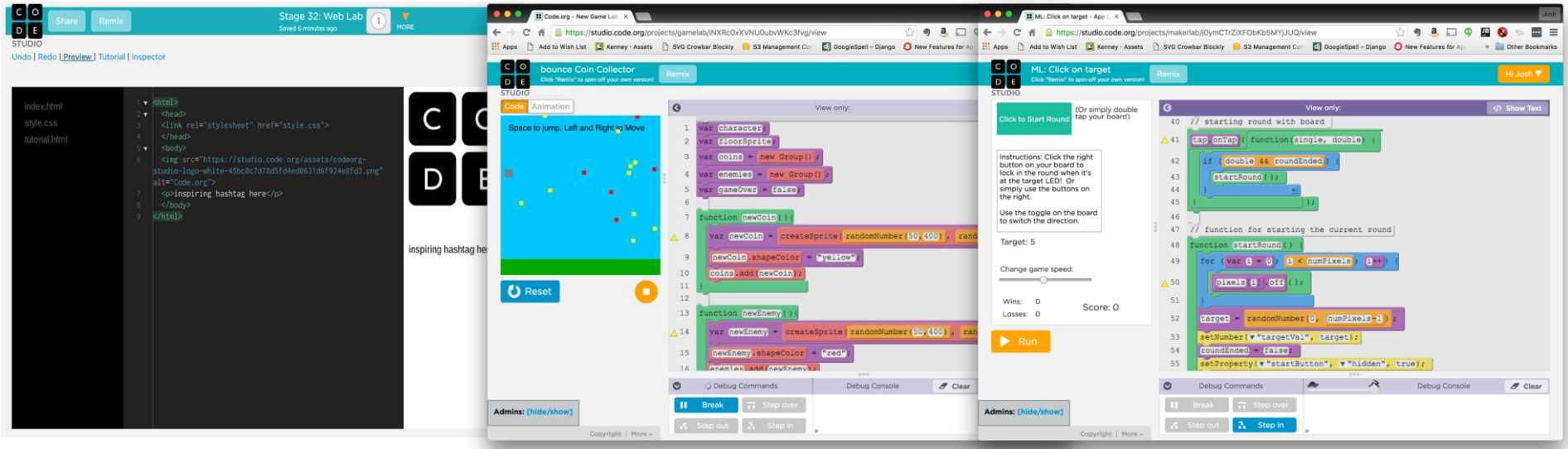
	Problem Solving	The Internet	Programming
Semester 2 **Innovation and Impact**	Unit 4 The Design Process 	Unit 5 Data and Society 	Unit 6 The Internet of Things 

Cool Tools

Web Lab

Game Lab

App Lab



CS Discoveries Tutorial Video

Professional Learning for CS Discoveries Teachers

- 5-day Summer TeacherCon
  - National conference hosted by Code.org (There is no cost during 2017-2018 year for teachers to participate.)
- 4 Follow-up Sessions
  - Hosted locally by RUSMP
- Online Support and Forums

CS Discoveries Teacher Application Requirements

- Requirements to participate:
  - School offers the course and it is on the master schedule.
  - Teacher commits to attending all professional learning.
  - Teacher who attends workshop is scheduled to teach the course.
  - Teacher has appropriate certifications to teach the course.
- **Principal signs off on above items.**
- Application will open in early 2017.
- Space is limited!

AP CS Principles

Take a minute to review the AP CS Principles one-pager.

Background of the AP CS Principles course

"The AP Program designed AP Computer Science Principles with the goal of creating leaders in computer science fields and attracting and engaging those who are traditionally underrepresented with essential computing tools and multidisciplinary opportunities."

The College Board

https://advancesinap.collegeboard.org/stem/computer-science-principles

The College Board AP CS Principles Framework

- Six **Computational Thinking Practices** capture important aspects of the engaging work that computer scientists do.
  - *Connecting* computing
  - *Creating* computational artifacts
  - *Abstracting*
  - *Analyzing* problems and artifacts
  - *Communicating*
  - *Collaborating*

- Seven **Big Ideas** encompass ideas foundational to studying computer science.
  - Creativity
  - Abstraction
  - Data and Information
  - Algorithms
  - Programming
  - The Internet
  - Global Impact

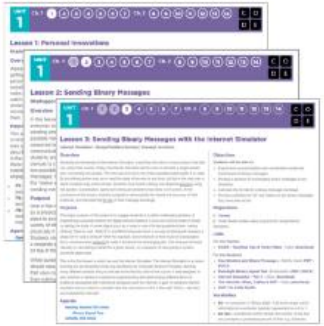
Code.org curriculum is endorsed by the College Board

- Code.org is recognized by the College Board as an endorsed provider of curriculum and professional development for AP CS Principles.
- Affirms that all components of Code.org CS Principles' offerings are aligned to the AP Curriculum Framework standards and the AP CS Principles assessment.
- Using an endorsed provider, such as Code.org, affords schools access to resources including an AP CS Principles syllabus pre-approved by the College Board's AP Course Audit, and access to officially recognized professional development.

Code.org AP CS Principles Curriculum Overview

Code.org AP CS Principles Resources

Lesson Plans



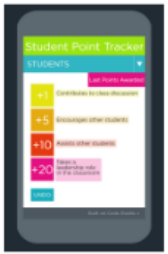
Discovery Based Tools

High Quality Videos

Code.org AP CS Principles Resources

Scaffolded Programming

Javascript Programming



Teacher Forums

Professional Learning for CS Principles

- 5-day Summer Conference
  - Houston workshop hosted by RUSMP (There is no cost during 2017-2018 year for teachers to participate.)
  - Monday, June 26, 2017 - Friday, June 30, 2017
- 4 Follow-up Sessions during the academic-year
  - Hosted by RUSMP
- Online Forum and Community
- Online Continuing Learning

CS Principles Teacher Application Requirements

- Requirements to participate:
  - School offers course and it is on the master schedule.
  - Teacher commits to attending all professional learning.
  - Teacher has appropriate certifications to teach the course.
  - Teacher who attends workshop is scheduled to teach course.
- **Principal signs off on above items.**
- Application will open in early 2017.

Lesson Experience

- Learn more about the CS Principles course by experiencing part of a lesson.
- Reflect on how the lesson connects to the big ideas of computer science and the goal of broadening participation.

Prompt

When you send text messages to a friend, do you spell every word correctly? Give examples of words and phrases that you might abbreviate.

- Take a minute to list examples.
- Prepare to share your examples with others in your small group.

Thinking Beyond

- Why do you use these abbreviations?
- What is the benefit?

Let's decode a message!

Activity Guide: Decode this message!

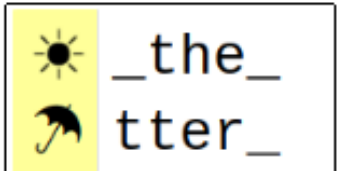
What's the original message?

Below is an encoded message. It's not necessarily a secret message but it does need to be decoded. Study the clues and key to reconstruct the original message.

Encoded Message:

★listen_to☀rain_★on☀window_pane

Key:



Original Message:

https://docs.google.com/document/d/1x89s9Xo6lwMJPQjJqhzPaBg_huwTF9LmV2PrUrESYZQ/edit

Video Clip

Let's Compress Some Text Ourselves

- Quick Demo
- Let's try it ourselves: https://studio.code.org/s/text-compression
  - Click on the widget.
  - Select either:
    - A tutor who tooted a flute...
    - She sells sea shells...

Lesson Debrief

- How did this lesson help you to understand more of what the Code.org CS Principles course is about?
- How might you present this lesson to other administrators or counselors to convince them to offer these courses on their campus?

Thank you!
rusmp.rice.edu/coding