Today’s Facilitators:

Alice Fisher
RUSMP Director of Technology Applications & Integration

Richard Parr
RUSMP Executive Director
Computer Science Education: Why it Matters
Impacts of Computing
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.
“It’s a civil rights issue when 75% of our students don’t have access to computer science.”

— Hadi Partovi
at the Grace Hopper Celebration for Women in Computing
October 15, 2015

#HourOfCode
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.
Computer Science

Big Ideas

“Big” Data and Information

Algorithms

Programming/Coding

The Internet

Abstraction and Problem Solving

Creativity

Global Impact

Credits: 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

In 2015, Google and Gallup conducted a survey of 1,800 students, 1,800 parents, 1,000 teachers, 9,600 principals, and 1,800 superintendents. What did they find?

In fact...

Parents are significantly more likely than other groups to think that computer science is more important than required courses and electives courses.

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 prioritize these skills in a supportive environment is active related to their development.

Impact of Computer Science

Computer Science has been at the cornerstone of many of the biggest innovations that we use in daily life. In 2020 a group from the Wharton School set out to figure out the 30 most important innovations from the past 30 years. In creating this list, the judges defined innovation as something that creates new opportunities for growth and development.

Top 30 innovations: 1979-2009

1. Internet, broadband, WWW
2. PC/Apple computers
3. Mobile phones
4. Email
5. DNA testing and sequencing/Royal genome
6. Magnetic Resonance Imaging
7. Non-invasive brain surgery (neurosurgery)
8. Open source software and services (e.g., Linux, Wikipedia)
9. Lighting devices
10. Cryogenic devices
11. GPS systems
12. E-commerce
13. Electronic banking
14. Oral contraceptives
15. Internet
16. Anti-viral
17. Network
18. Solar power
19. Large scale wind turbines
20. Robotics
21. Graphical user interface (GUI)
22. Digital photography/Imaging
23. RFID and applications (e.g., EZPass)
24. Gene therapy
25. Barcodes and scanners
26. ATM
27. Wifi
28. MP3
29. SSD/flash memory
30. Intravenous treatment for AIDS

Who’s Taking AP Computer Science?

Enrollment in AP Computer Science

The AP Computer Science (CS) program has existed for over 25 years, but AP-CS has the smallest enrollment of all AP programs. In fact, the 31,287 students that took the AP-CS test represented less than 1% of all AP tests taken in the US in 2014.

Representation of Women and Students of Color

In recent years the number of students taking the AP Computer Science exam has been on the rise, but while male students continue to represent a disproportionate high percentage of all AP-CS test takers. Only 20% of AP-CS test takers are taken by women, despite the fact that women take 14% of all 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
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.
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
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.
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

Elementary School:
- K
- 1
- 2
- 3
- 4
- 5

Middle School:
- 6
- 7
- 8

High School:
- 9
- 10
- 11
- 12

CS Fundamentals Courses 1-4

Accelerated Course (20 hours appropriate for upper grades)

CS Discoveries

AP CS Principles

@TeachCode | #CSforAll
Other Code.org Programs

Elementary School
K 1 2 3 4 5

Middle School
6 7 8

High School
9 10 11 12

CS in Algebra
CS in Middle School Science
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.
Take a minute to review the CS Discoveries one-pager.
# CS Discoveries Course Overview: Semester 1

<table>
<thead>
<tr>
<th>Problem Solving</th>
<th>The Internet</th>
<th>Programming</th>
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<tbody>
<tr>
<td>Semester 1</td>
<td>Unit 1</td>
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<tr>
<td>Exploration and</td>
<td>Computers and</td>
<td>Web Development</td>
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<tr>
<td>Expression</td>
<td>Logic</td>
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- **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**

Semester 2
Innovation and Impact

Unit 4
The Design Process

**The Internet**

Unit 5
Data and Society

**Programming**

Unit 6
The Internet of Things

@TeachCode | #CSforAll
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!
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
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 Resources

Lesson Plans

Discovery Based Tools

High Quality Videos
Code.org AP CS Principles Resources

Scaffolded Programming

Javascript Programming

Teacher Forums

@TeachCode | #CSforAll
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:
★listening_to★rain★on★window★pane

Original Message:

Key:

https://docs.google.com/document/d/1x89s9Xo6lwMJnPQjQghzPaB_g_huwTF9LmV2PrUrESYZQ/edit
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