Activate Computational Thinking
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WELCOME & INTRODUCTIONS

• Dr. Katherine Hayden
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  – Professor, Education Technology

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  – Professor, Computer Science & Information Systems

• Project Teachers
  – June Richards: 6th grade
  – Tonya Hendrix: 7th grade
  – Debbie DeLucia: 8th grade
PROJECT GOALS

• Project Teachers will gain understanding and knowledge of Computational Thinking (CT).
• Project Teachers will design and implement science lesson plans that integrate CT skills.
• Students who participate in ACT lesson activities will demonstrate the use of CT skills in the course of completing their assignments.
ACT APPROACH

CT Concepts & Capabilities
- Continuously learn and practice CT concepts during PD activities.
- Discuss outcomes during PLC meetings.
- Reflect after teaching CT lessons.

Pedagogy Consideration
- Apply appropriate strategies in designing CT integrated science lessons.
- Team-teach and observe to improve.
- Plan and share successes and challenges.

CT Integrated Lessons
- Develop through collaboration.
- Field-test through implementation.
- Refine through debrief and expert review.
ACT LOGIC MODEL

16 Science teachers receive:
ACT Model PD:
- Yr 1 - 50 hr Summer Academy - includes Student Summer Camp (teachers work with students)
- Yr 2 - 35 hr Summer Academy

- School year activities 40 hrs. face-to-face, 15 hrs. virtual –
  - CLS, PLC, and workshops
  - Coaching and mentoring

Teachers will:
- Gain understanding and knowledge of CT
- Create Lesson Plans with integrated CT
- Field test Lesson Plans with students in Summer Camp
- Conduct Collaborative Lesson Study on CT integrated lessons

Results

- Teachers integrate the use of CT skills in new standards-based science lessons
- Teachers incorporate the use of CT skills in their regular teaching practice
- Students exhibit the use of CT skills in their classwork.

Evaluation
Collect Data – Analyze and Interpret – Report = Resulting in program and delivery improvements
COMPUTATIONAL THINKING
AND
THE NEXT GENERATION SCIENCE STANDARDS

Samantha Greenstein
Earl Warren Middle School
WHAT IS COMPUTATIONAL THINKING?

Critical Thinking Skills + Computing Power = Computational Thinking
WHY COMPUTATIONAL THINKING?

- ISTE Initiative
- 21st Century Skills
- High-Level Thinking Compliments Common Core
  - CCSS.ELA-Literacy.WHST.6-8.1 - Write arguments focused on discipline-specific content.
- Next Generation Science Standards
  - Science and Engineering Practice 5: Using Mathematics and Computational Thinking
KEY COMPUTATIONAL THINKING SKILLS

- Data Collection
- Data Analysis
- Data Representation
- Problem Decomposition
- Abstraction
- Algorithms and Procedures
- Automation
- Simulation
- Parallelization
Using Mathematics and Computational Thinking

• Computers can enhance the power of mathematics by automating calculations, approximating solutions to problems that cannot be calculated precisely, and analyzing large data sets available on the Internet to identify meaningful patterns.
Using Mathematics and Computational Thinking

• Students are expected to use laboratory tools connected to computers for observing, measuring, recording, and processing data.
Using Mathematics and Computational Thinking

• Students are expected to engage in computational thinking, which involves strategies for organizing and searching data, creating sequences of steps called algorithms, and using and developing new simulations of natural and designed systems.
WHAT DOES IT LOOK LIKE?

Project Teachers

• Share a lesson you have taught that engaged your students in Computational Thinking.
• Share the impact of the project on your teaching and your students.
CHEMICAL COMPOSITION OF MATTER: A 6TH GRADE EXAMPLE

• Teaching CT skills as well as science content
• Focus on data collection and representation
• Chemical composition of universe, Earth’s crust, human body, or plants.
• Students in pairs formulate question, access data on choice of given websites, and record.
• Class discussion and revision.
SURPRISES

• Of my 31 students, 9 recorded nothing, 3 students wrote some information in sentences, 19 made charts.

• Of those 19, 8 copied the entire chart from the website, including information not relevant to their question.

• Of the remaining 11 “successful” students, most had no idea of what the data meant.
• 7th Grade Evolution & Natural Selection
• Students work in pairs
• CT Focus: Data Collection and Analysis

Who Want’s to Live a Million Years?
Interactive Simulation Tool (free)
• Choose characteristics that help an organism survive a million years
• Collect data regarding what contribute to survival
• Create a survival plan for another team to follow
• 8th Grade Force & Motion
• Students work in groups of 3 - 4
• CT Focus: Problem Decomposition
• Coming up with a plan
• Iteratively test and revise their plan for 3 times
• Debrief how they used problem decomposition
COME UP WITH A PLAN...

• How fast does your object go?
• You have 10 minutes to come up with a plan to find out how fast your object goes.
• Only write with your **BLACK** MARKER on the **PLAIN** butcher paper.
• What we’ve learned.
• Next Steps
• Questions?