Computational Thinking Overview

CIRCL Webinar Series
Webinar 1
January 30, 2018
CIRCL • A Network to Amplify Impact of Technology-Enhanced Learning

Center for Innovative Research in Cyberlearning seeks to amplify research-based voices by:
- Addressing common needs and new directions
- Building relationships & nurturing communities
- Creating broader impact together

CIRCL is a partnership between:

Digital Promise
Accelerating Innovation in Education

EDC Learning transforms lives.

SRI Education

NORC at the University of Chicago

Funded by grants IIS-1441631,
CIRCL • Connect, Collaborate, Create

Meet Tammy Clegg

CIRCL perspectives offer a window into the different worlds of various stakeholders in the cyberlearning community — what drives their work, what they need to be successful, and what they think the community should be.

Share your perspective.

Tammy Clegg is a Learning Scientist and an Assistant Professor at the Maryland College of Education and the iSchool at the University of Maryland. Prior to receiving her PhD at Georgia Tech working with Janet Kolodner, Tammy conducted a post-doc at the University of Maryland in Participatory Design with Allison Druin, and is now a faculty member at the same University. Her interests are in developing technology to support relevant learning environments, participatory design with children.

Interview, which took place January 27, 2018.

Computational Thinking Webinar

By Pati Ruiz, Sarah Hampton, Riley Leary, Judi Fusco, and Patti Schank

For the last few months, we've been reading, thinking, and talking about computational thinking (CT) in preparation for three webinar series. Webinars for Teachers and Parents on the topic. The webinars are on January 30, February 6, and February 13. Go to the link above to sign up for the webinar and get all the details.

circleducators.org
CIRCL • Primers, Projects, Designs Themes

Primers are brief summaries of key topics in the field of cyberlearning. They are used to build capacity and to give people a sense of cyberlearning’s main themes. Primers are developed by small teams and licensed under a Creative Commons Attribution 4.0 International License.

Cyberlearning Community Report (2017)
Computational Thinking Series Overview

Episode 2
- Overview: computational thinking (CT)?
- CT Terms
- Why is CT important?
- Teacher Episode
- Interpreting relationships in data using graphs

Episode 3
- Parent Episode
- What activities can parents do to support CT development at home?
AGENDA

I. What is Computational Thinking?
II. Background
III. CT Skills
IV. Why these are important skills and dispositions to develop to be good citizens?
V. What to expect in the rest of the series.
There are some variations on the definition of CT, but we will focus on this one:

Computational thinking (CT) is the range of processes that help people learn by engaging the power of computing to set up and solve problems and automate a broad range of processes.
Computational Thinking - CT

• 1980 - Seymour Papert
• 2006 – Jeannette Wing
• 2010 – Jan Cuny, Larry Snyder, and Jeannette M. Wing

“Computational thinking is the thought processes involved in formulating problems and their solutions so that the solutions are represented in a form that can be effectively carried out by an information-processing agent.”
Thinking ◀▶ Doing
A Bit of History
1953 – The Human Computers of NASA
1955 – Computing Group

1952 - Grace Hopper
COMPUTING THE FUTURE
Where does computational thinking fit in?

Digital Literacy

Computational Thinking

Programming

Computer Science

This is a remix of Colin Angevine’s work in http://digitalpromise.org/2017/12/06/advancing-computational-thinking-across-k-12-education/ and licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.
Computational thinking (CT) is the range of processes that help people learn by engaging the power of computing to set up and solve problems and automate a broad range of processes.
Computational Thinking

• Programming is one way to practice computational thinking skills but it is not the only way to develop these skills.
• Computers and other technologies support the development of CT skills, but are not always essential.
Computational Thinking Skills

- Problem Decomposition
- Abstraction
- Pattern Recognition
- Algorithm
Problem decomposition

Decomposing large complex tasks into manageable modular subtasks.
Abstraction

Defining multiple layers of a problem and understanding the relationship among the layers.

Yo camino a la escuela.
Ella camina a la escuela.
Nosotros caminamos a la escuela.
Abstraction

Defining multiple layers of a problem understanding the relationship among the layers.
Pattern Recognition

Iteratively developing solutions and systematically detecting and correcting errors.
Algorithms

Formulating problems so that their solutions can be represented as computational steps.

Treasure Map

Treasure Map can be used to create a map of a sequence to follow. This materials allows 2 to 4 pictures to sequence. You can choose a parchment paper style or plain background (to save ink).

The Treasure Map is a materials that can be used in many ways and for many different types of lessons. Here are a few examples:

- Create a Map to follow to find a special treasure
- Create a Map to follow a character's path within a story.
  - Map the 3 Pigs Homes for the Wolf to follow.
  - Map the items Goldilocks used: Bowls, Chairs, and Beds
  - Map the travels of the Gingerbread Man
- Follow the map of specific tasks to earn a reward.
Computational Thinking Skills

- Problem Decomposition
- Abstraction
- Pattern Recognition
- Algorithm
Computational Thinking Dispositions

- Confidence in dealing with complexity
- Persistence in working with difficult problems
- Tolerance for ambiguity

- The ability to deal with open-ended problems
- The ability to communicate and work with others to achieve a common goal or solution
CT is…

Formulating problems in a way that enables us to use a computer and other tools to help solve them.

Logically organizing and analyzing data.

Representing data through abstractions such as models and simulations.

Automating solutions through algorithmic thinking (a series of ordered steps).

Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources.

Generalizing and transferring this problem-solving process to a wide variety of problems.
Computational thinking (CT) is the range of processes that help people learn by engaging the power of computing to set up and solve problems and automate a broad range of processes.
What’s Next

• How do you begin to put this in your classroom?
• How can you do this with your children?
Thank You!
Questions