How Parents Can Support CT

Webinar Series: Computational Thinking for Teachers and Parents

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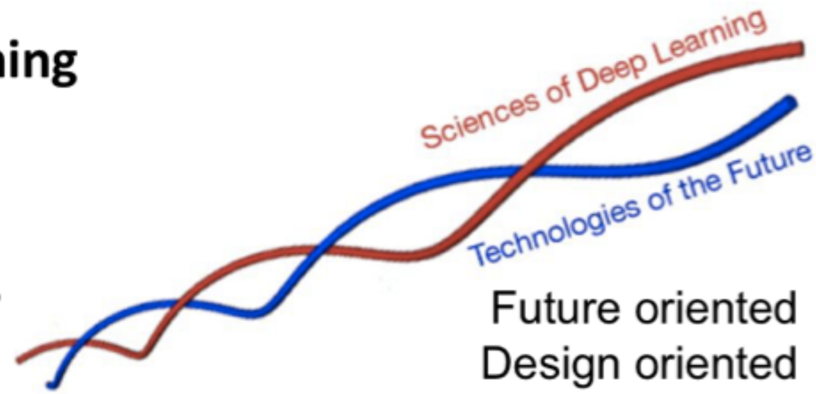
CIRCL• **A Network to Amplify Impact of Technology-Enhanced Learning**

The **Center for Innovative Research in Cyberlearning** seeks to amplify research-based voices by:

- **A**ddressing common needs and new directions
- **B**uilding relationships & nurturing communities
- **C**reating broader impact together



Future oriented
Design oriented
Equity oriented
Community oriented

CIRCL is a partnership between:

Digital Promise
Accelerating Innovation in Education

SRI Education

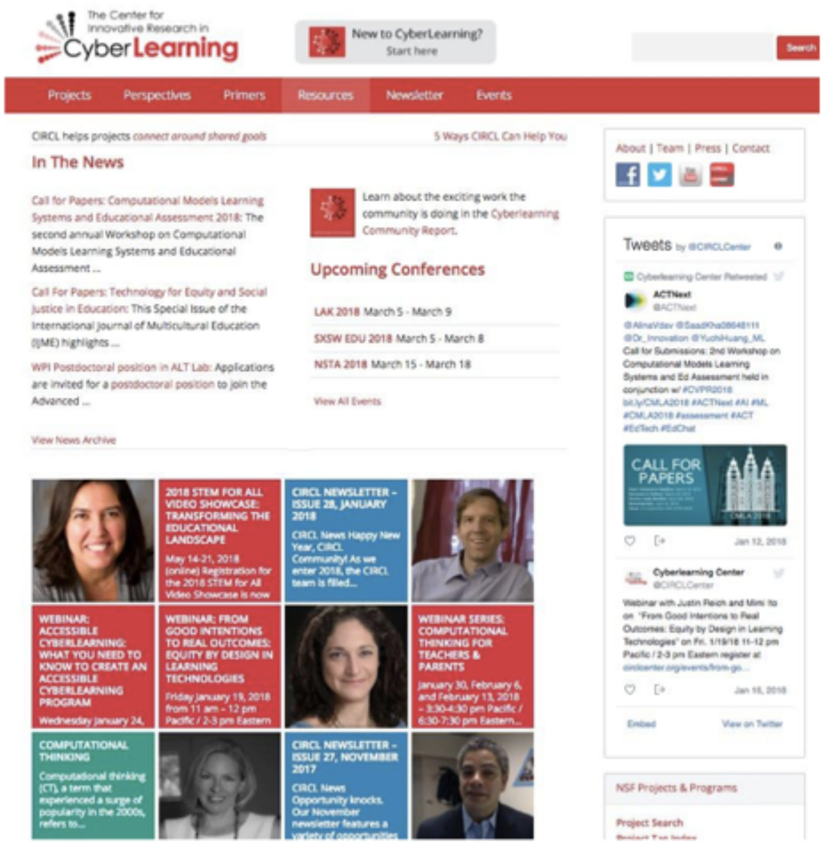
EDC Learning transforms lives.

NORC at the UNIVERSITY of CHICAGO

NSF

Funded by grants IIS-1233722, IIS-1441631, IIS-1556486

CIRCL• Connect, Collaborate, Create



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CIRCL• Primers, Projects, Designs Themes

Primers

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

Want to write or contribute to a primer? Learn how.

COMPUTATIONAL THINKING
Computational thinking (CT), a term that experienced a surge of popularity in the 2000s, refers to...

SPEECH TECHNOLOGIES AND LEARNING
The classroom learning environment is filled with speech in all forms —classroom discourse has notably been called...

DATA SCIENCE EDUCATION
Data Science is an interdisciplinary field that seeks to derive insights and knowledge from the analysis...

PERSISTENCE IN EDUCATION
Perseverance has become part of the everyday language of education. The misconception that intellectual power alone...

CITIZEN SCIENCE
Citizen science is the practice of public participation and collaboration in scientific research or scientific exploration...

REMOTE LABS
Labs are widely considered to be essential to learning science and engineering. Remote labs can overcome...

LOOKING AHEAD: TRENDS THAT WILL SHAPE CYBERLEARNING
This primer organizes two dozen current trends that we feel are most relevant into five categories:...

SMART AND CONNECTED COMMUNITIES FOR LEARNING
Smart and connected communities for learning (SCCL) leverage networks and technology to foster

EVIDENCE-CENTERED DESIGN
Evidence-centered design, or ECD for short, takes the art of test design and turns it into...

UNDERSTANDING UNIVERSAL DESIGN FOR LEARNING
UDL is a research-based framework intended to guide the design of learning technologies that are accessible...

THE CUTTING EDGE OF INFORMAL LEARNING: MAKERS, MOBILE, AND MORE!
Cyberlearning spans in-school and out-of-school learning – and these days, a lot of meaningful learning is...

GAMES AND VIRTUAL WORLDS
Computer-based games and virtual worlds provide opportunities for players to think about choices, take action, and...

PARTNERING FOR

TECHNOLOGY

COLLABORATIVE

EDUCATIONAL DATA

Cyberlearning Community Report (2017)

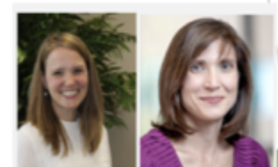
Computational Thinking Series Overview

Episode 1

- Overview: computational thinking (CT)?
- CT Terms
- Why is CT important?

Episode 2

- CT in Schools: Primary, Upper Elementary, Middle, and High
- Getting started and schoolwide initiatives



Episode 3

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

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Agenda

- What is Computational Thinking?
- Why Computational Thinking?
- Search Activity
- Resources for Parents

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What is computational thinking?

Thoughts from Jeannette Wing

- "A way that humans, not computers, think."
- "A way human beings think about the world and its problems and how we might solve those problems."
- "It is not ~~trying to get humans to think like computers~~."

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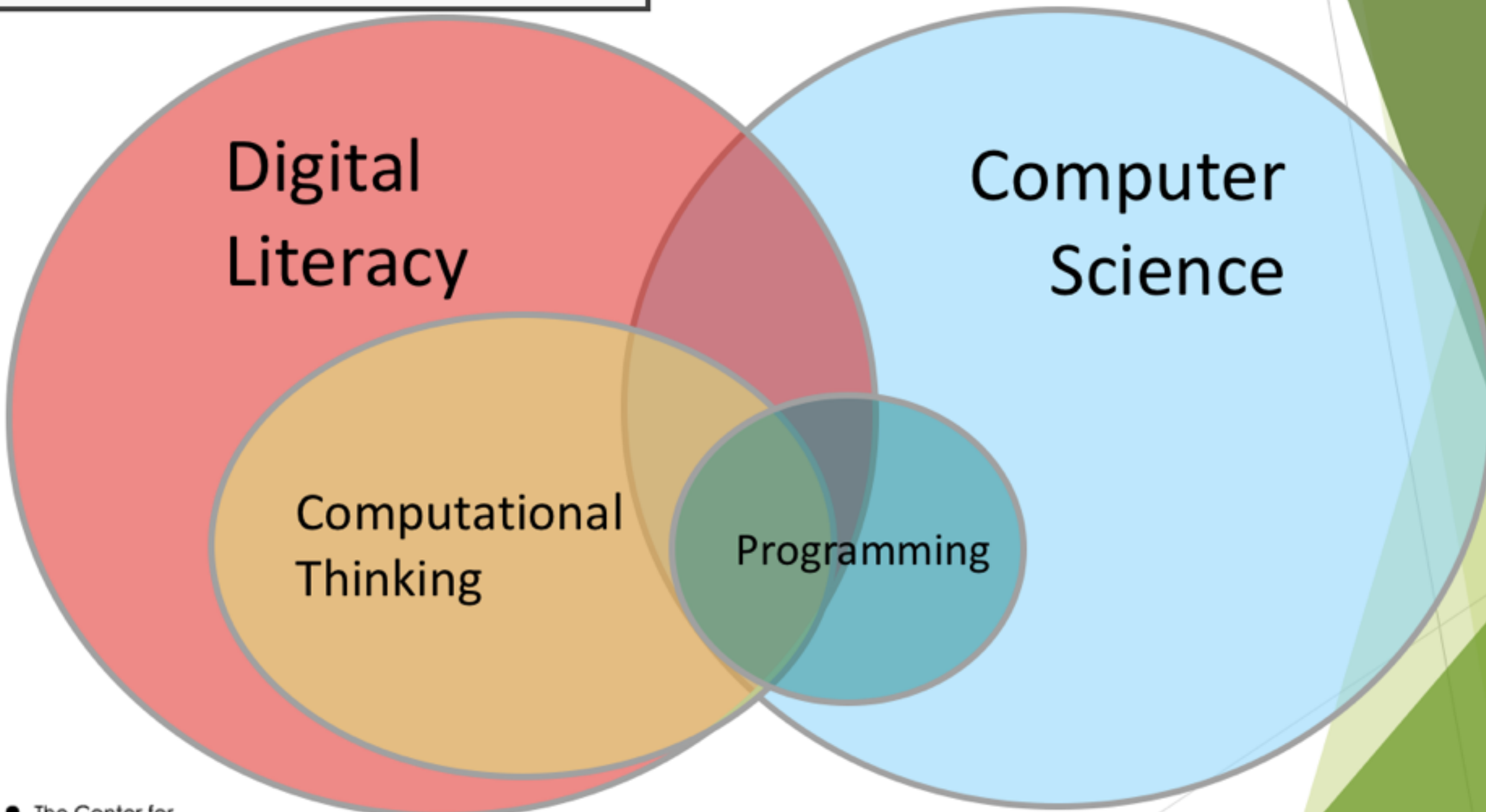
computational
thinking
problem
process
solution
concept
abstraction
science
way
design
understand
computer
solving
understanding
solve
discipline
formulating
debugging
effectively
efficient
control
also
hardware
software
representation
modularity
mean
datum
step
tool
system
use
help
behavior
idea
powerful
reason
human
structure
range
fundamental
analyzing
win
world
engineering
developmentally
diverse
two
broad
include
involved
agent
offering
learning
engage
power
five
math
situation
represented
foundational
childhood
thought
literacy
language
effect
form
foreign
mind
sequencing
student
habit
kind
art
set
learn
child
span
early
algorithm
leverage
linked
practice
evaluate
appropriate
coding
information
education
technology
carried
strongly
described
complex
facilitate
processing
cause
computing
automate
engaging
opportunity

Where does computational thinking fit in?



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Computational Thinking

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 Skills

Problem Decomposition

Decomposing large complex tasks into manageable modular subtasks

Abstraction

Defining multiple layers of abstraction, understanding the relationships between the layers

Pattern Recognition

Iteratively developing solutions and systematically detecting and correcting errors through pattern recognition

Algorithms

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

Why Computational Thinking (CT)?

- More prepared to succeed in a technologically-driven economy
- Better equipped for interpersonal relationships and civic participation

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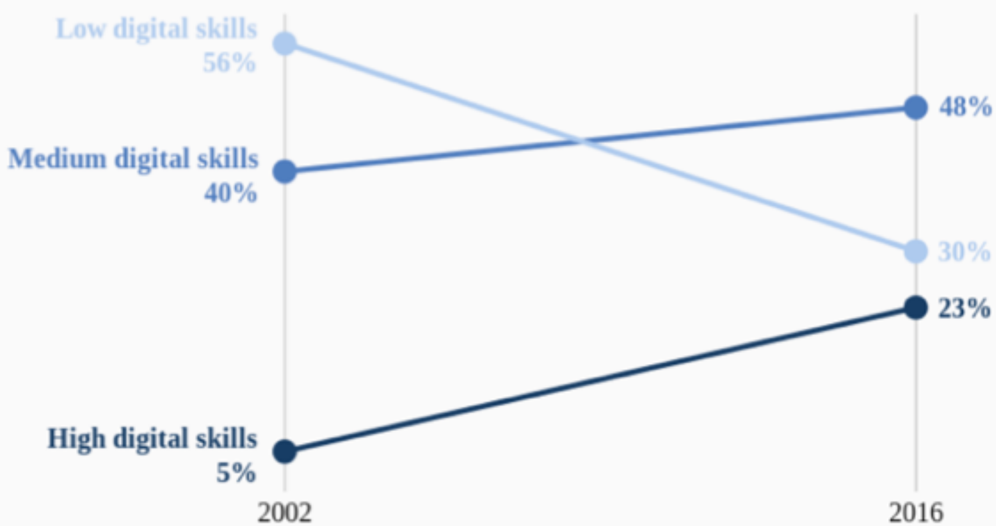
Digitalization and the American workforce

Share of jobs in low, medium, and high digital skill occupations

2002 and 2016



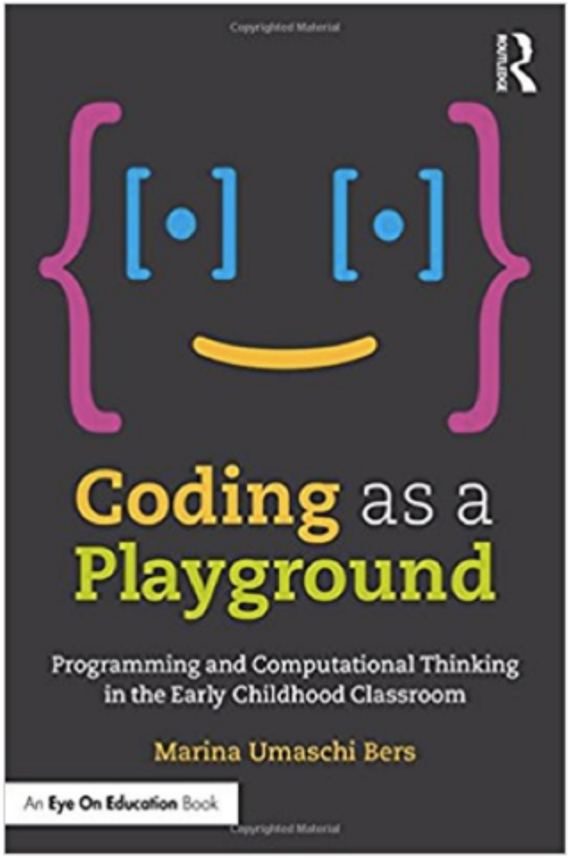
The need for digital skills has been steadily increasing.

"High digital skills" jobs **grew** by 18%.

"Medium digital skills jobs **grew** by 8%

"Low digital skills" jobs **decreased** by 26%.

https://www.brookings.edu/research/digitalization-and-the-american-workforce/



Computation as a Literacy

- Computational literacy resembles textual literacy (Vee, 2013)
- Computer literacy empowers people (Bers, 2018)
- "Those who can produce digital literacy will do better than those who can only consume them." (Bers, 2018)
- "Coding is more than a technical skill; it is a way to achieve literacy in the twenty-first century, like reading and writing." (Bers, 2018)

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The Computational Thinking Leadership Toolkit lists all these benefits:

- CT expands children's **creative process** and their abilities to **innovate**
- CT prepares students for **success in college**
- CT prepares students to be competitive in a **global workforce**
- CT prepares students for **jobs of the future** and access to **well-paying jobs** today
- CT reinforces and extends **higher-order thinking** skills

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Modeling CT

Binary Search Activity

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What is central to the problem and what can be ignored?

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What is central to the problem and what can be ignored?

- What CT characteristic does that model?

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We can model the problem with fewer doors without losing the heart of the problem. Let's play the game with 16 doors.

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Now play the game with 100 doors.

Now play the original game with 400 doors.

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Were there similarities in how to win all three games? Did you find a strategy that worked every time?

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Were there strategies that worked for the 4x4 that did not scale to the 20x20?

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Were there strategies that worked for the 4x4 that did not scale to the 20x20?

- What CT characteristic does that model?

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Write a series of steps that explains how to do the strategy we just discussed.

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Write a series of steps that explains the strategy we just discussed.

Step 1: Divide the total number of doors by two.

Step 2: If the number is a whole number, open that door. Else, round up to a whole number (or truncate) and open that door.

Step 3: If the number behind the door is the desired number, stop because you found it! Else, go on to step 4.

Step 4: If the number is less than the desired number, eliminate the first half of the doors and loop to Step 1. Else, eliminate the second half of the doors and loop to Step 1.

Write a series of steps that explains the strategy we just discussed.

- What CT characteristic does that model?

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How Can You Foster CT?

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Model it.

When you recognize that you are engaged in CT, start thinking out loud.

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Look for opportunities.

Point out and praise	Point out and praise kids when you see them using CT
Encourage	Encourage them to create more efficient solutions when they might be content to just get something working.
Connect	Connect specific solutions to more general scenarios.

Family Game Night

- Robot Turtles board game
- Computer Science Unplugged activities
- Family Design Journal activities using ScratchJr.
- Try out the game I demonstrated at home

All resources mentioned in this presentation are available on:
http://circlcenter.org/events/computational-thinking-for-teachers-and-parents/resources/

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Put that screen time to good use.

Older Kids

- Zoombinis
- Human Resource Machine
- Scratch

Younger Kids

- Scratch, Jr.
- Lightbot
- Daisy the Dinosaur
- Kinderlogo
- Kodeable

Screenshots from Zoombinis app

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The 6 Ps

Projects + Peers + Passion + Play + Parents = Phun*

The annoying acorn
"R" Age 6

Fairies Quest
"R" Age 7

The yummy carrot
"A" Age 5

*Am I carrying the P thing too Phar? Don't forget personalize and persevere!

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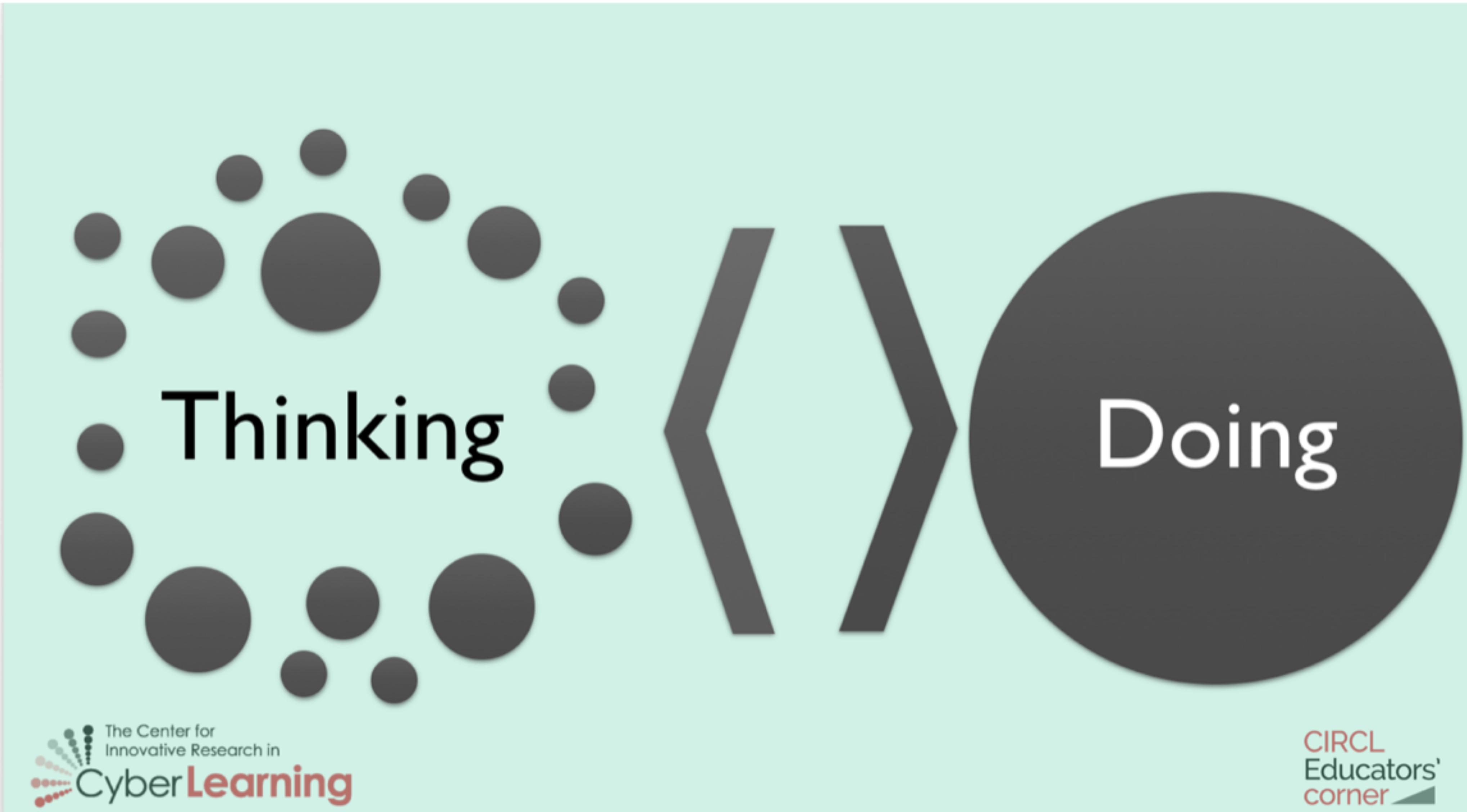
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Human Resource Machine

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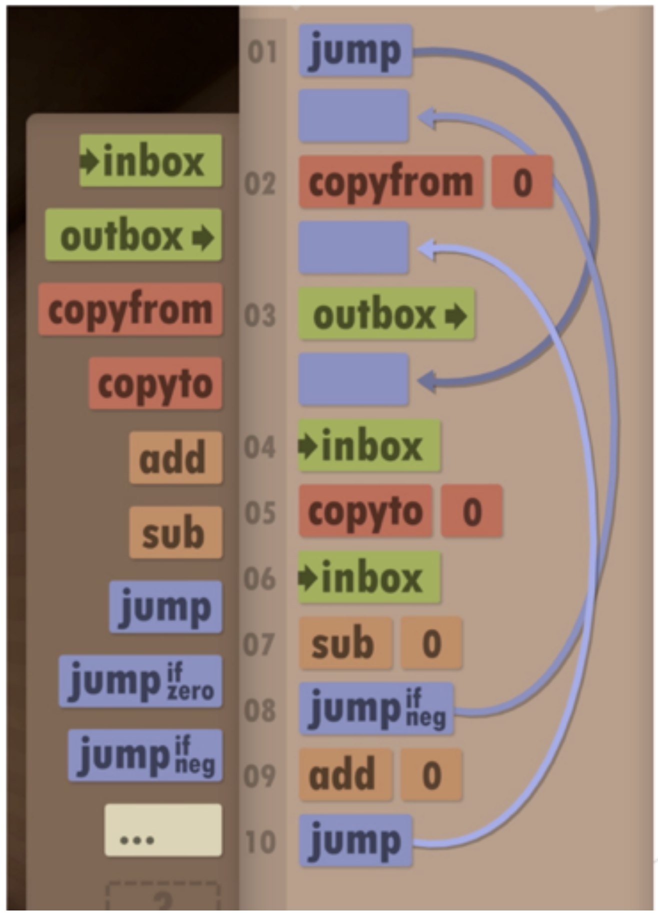
Human Resource Machine



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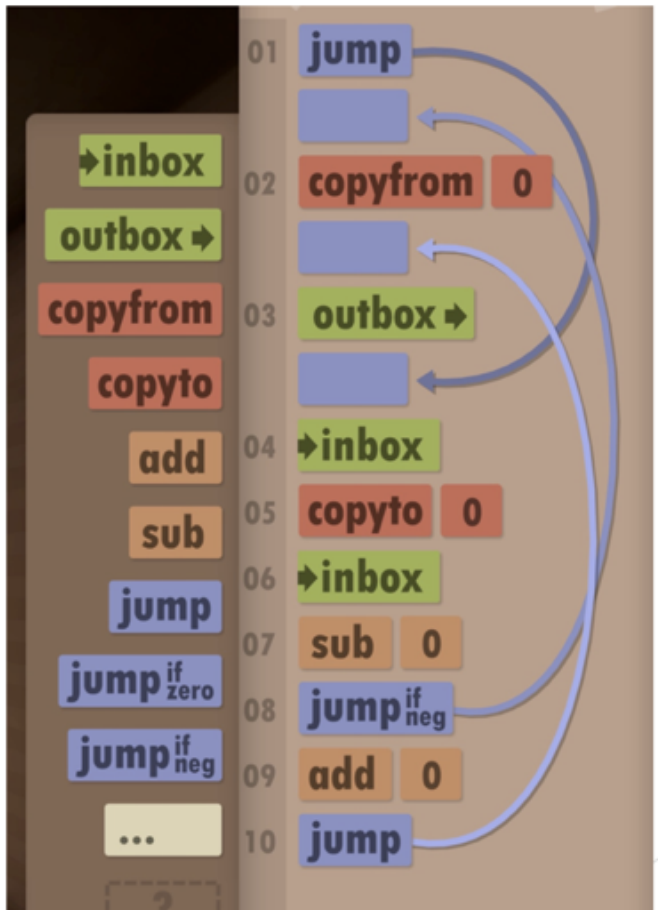
Human Resource Machine

10 and 6 -- first to the out box
2 and 3 -- second to the out box
6 and 6 -- either to the out box



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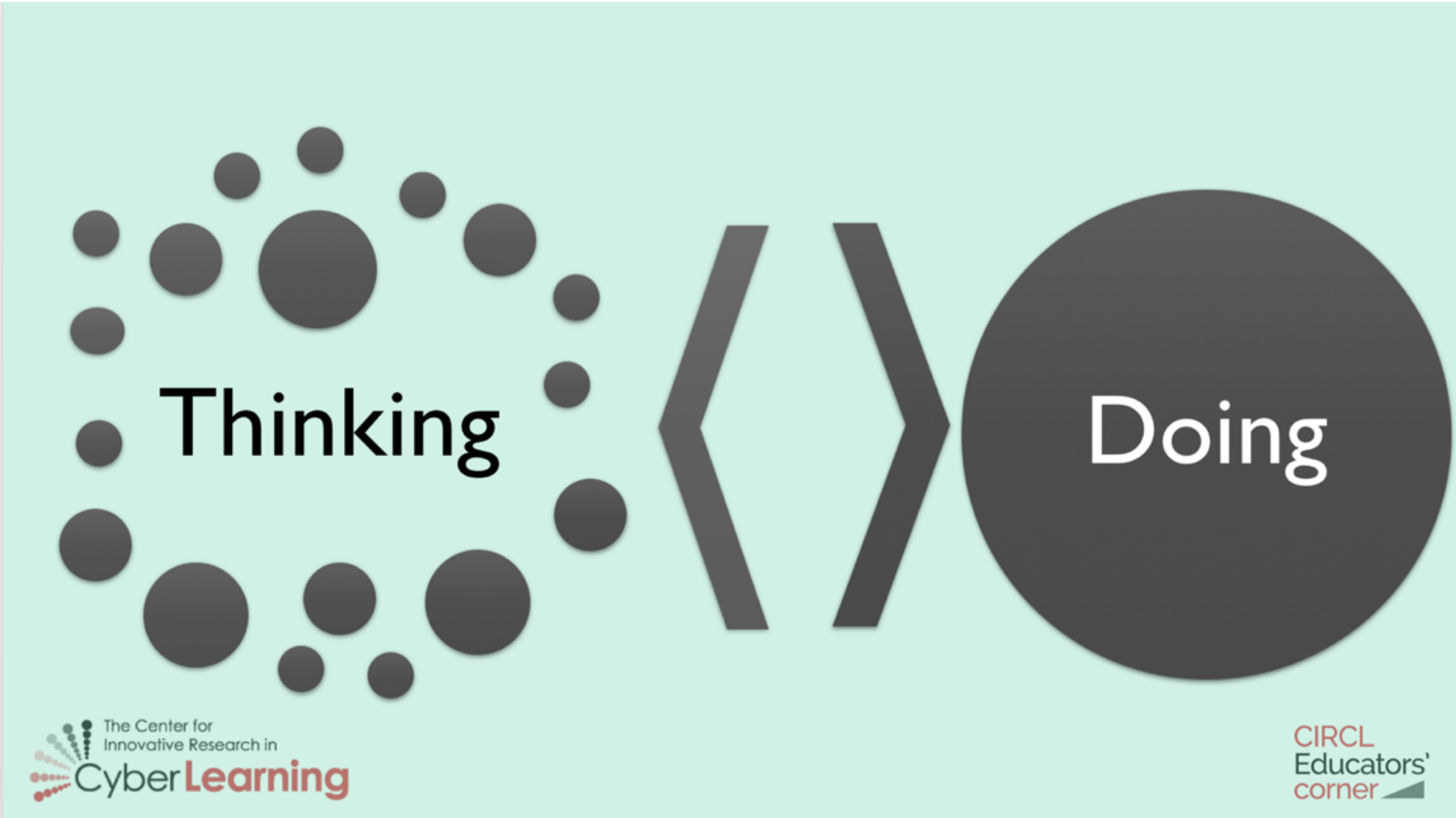
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Types of Resources for CT

Unplugged activities -- includes binary search game, board games, card games, puzzles, recipes, & thinking exercises

"Plugged" or Coding activities -- includes apps, block & script languages, & robots (make screen time count)

Robots -- some require a computer interface; some have tangible interfaces for young kids so no screen time

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Tips and Tricks

Learning is more than a "beautiful product" or "dog and pony show"

Projects - kids should lead, parents should help

Play is such an important part of learning

Failure is okay - iteration improves

Learn with your child and show lifelong learning

Learning is messy and can be painful, but it's part of the process

Final Tip—Have PHUN!

Thank you, Crunchy84 @ Ebay for the basketball game pictures.

Merlin is still alive and well at my house!

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Thoughts, Questions, Concerns?

"We believe that those in possession of computational competencies will be better positioned to take advantage of a world with ubiquitous computing. Early experiences with this way of problem solving will....generate interest and prime students for success in this growing field rife with opportunity."

Grover, S. & Pea, R. (2013). Computational Thinking in K-12: A Review of the State of the Field. *Educational Researcher, 42(1)*, 38-43.

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