Computational Thinking Boosters: Algorithmic Thinking 3-8

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Link to recording

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Introductions
Agenda

What: 30min CT Boosters(3-8)

Plan for today:
● 5 minutes: Introduction & Vocabulary
● 15 minutes: Lesson Ideas
● 5 minutes: Q & A
Guiding Question:

- Why do we need detailed directions?
- Have you ever tried to follow directions that are not clear? What happened?
- What kinds of directions do you think computers need?
Technology & Computer Science in KY

7 Big Ideas of Technology
- Global Collaborator
- **Computational Thinker**
- Creative Communicator
- Empowered Learner
- Digital Citizen
- Knowledge Constructor
- Innovative Designer

5 Key Concepts of CS
- Networks & the Internet
- **Using Algorithms & Programming**
- Data Analysis
- Computing Systems
- Impacts of Computing
Kentucky Academic Standards (KAS) for Computer Science

**Concept**: Algorithms & Programming

**Subconcept**: Algorithms

E-AP-01: Create, follow, compare and refine algorithms for a task.

M-AP-04: Create flowcharts and/or pseudocode to address complex problems as algorithms.
KAS Technology Standards for 3-8

● CT1. Develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions. Learning Priority:
  ○ A: Formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.
  ○ D. Understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

● CT2. Apply strategies for understanding and solving problems by using technological methods to develop and test solutions. Learning Priority C: Create and test automated solutions.
  ○ indicator: Use digital tools to identify and create algorithms, with guidance and support.
Characteristics of Algorithms

Algorithms are precise step-by-step plans or procedures to meet an end goal or to solve a problem; algorithmic thinking is the skill involved in developing an algorithm.

- Shuchi Grover in *Computer Science in K-12: An A-To-Z Handbook on Teaching Programming*

- **Finite**: They must always terminate (end) after a finite number of steps.
- **Input**: an algorithm has zero or more inputs. (The ingredients)
- **Outputs**: An algorithm generally has one or more outputs. (The results)
- **Effective**: An algorithm is generally expected to be effective.
- **Definiteness**: Each step must be precisely defined. Actions are carried out in a rigorous and unambiguous way. (Clear and easily interpreted.)
An algorithm must be seen to be believed, and the best way to learn what an algorithm is all about is to try it.

-Donald Knuth in *The Art of Computer Programming, Volume 1*

**Examples:**

- Maps and Directions
- Cooking/Baking
- [Sorting Algorithms](https://computer-science-unplugged.org/program/algorithm/)
  Computer Science Unplugged
**Vocabulary: Algorithms**

**Words to teach:**

- **Algorithm** - A list of steps to finish a task
- **Bug** - Part of a program that does not work correctly
- **Debugging** - Finding and fixing problems in an algorithm or program
- **Loop** - The action of doing something over and over again
- **Program** - An algorithm that has been coded into something that can be run by a machine
- **Repeat** - To do something again
- **Decomposition** - Break a problem down into smaller, simpler parts
- **Abstraction** - To filter out unnecessary components within commands
- **Sequencing** - Determine the best order for the algorithm to follow
- **Pattern Recognition** - Recognition of patterns and regularities in data
When to teach Algorithms

Teachers might use algorithmic thinking lessons when:

- Teaching their content
- As a stand alone lesson
- As a social emotional lesson
- With problem-based strategies
- As a review/synthesis

When you teach algorithms depends upon your students, the grade level, the content, and the context.
Students will use this unplugged lesson to code the shortest distance through a maze. This could be applied to various content areas such as:

- moving through a map
- ordering a historical timeline
- ordering the parts of a story
Code.org

CS Fundamentals Lessons:

● Dice Race
● My Robotic Friends
● Real-life Algorithms: Paper Planes
● Real-life Algorithms: Plant a Seed
● Tangrams
Flowcharts

- A diagram that shows a process, made up of boxes representing steps, decision, inputs and outputs.
- This step-by-step program will need planning, and to do this we use an algorithm.
A regularly updated, evolving
Corona Virus
Cheat Sheet

What should I do?!?
01. How do I protect myself and my family and our whole community?

Yes!

Are you freaking out?

Yes!

We get it. This is a stressful time. Let's figure this out together.

No.

Are you sick?

Yes!

Have you had close contact with anyone diagnosed with the Corona Virus?

Yes!

Are you currently in or have you been in close contact with someone who has been diagnosed with the Corona Virus?

Yes!

Stop the spread.

No.

Oh, boy. Are you still saying, "What's the fuss? It's just like the flu."??

Okay, wrong. The Corona Virus, a.k.a 'COVID-19', is more contagious and more dangerous than the flu. A ton of people have Corona & a ton more will get it. Some will even die. The only way to minimize that is through education & behavior change. So...

Good. Okay, so let's figure this out together.
Scratch

Students will use Scratch to code:

- Rock Cycle
- Animal Ecosystems
- Story retellings or new endings
- Content can be expressed through an interactive illustration, game or story.

YouTube Video
App Inventor

Video Tutorials

App Content Ideas:
- Build an App that solves a problem for your community
- Healthcare
- Tourist needs
- Quiz Game
- Vocabulary Practice
- Math Practice
Create a **storyboard** for an App