Grade Six Computer Science

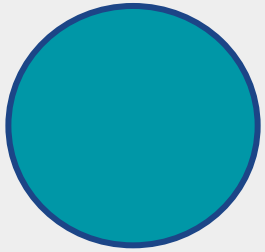
IF you teach THEN they will learn

Alberta Regional Consortia

Electrical and Computer Engineering

The most promising and profitable jobs of now and the future.

2013 Over the next 10 years...



There will be

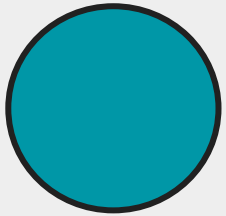
1.4 million

Programming jobs to

With only

400 000

Graduates in computer science



Leaving

1 million

empty jobs!

CODE.ORG

Computing jobs are the #1 source of new wages in the US

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.

There are technology jobs in every field:

ORGANIZING IDEA

Matter: Understandings of the physical world are deepened through investigating matter and energy.

ORGANIZING IDEA

Energy: Understandings of the physical world are deepened through investigating matter and energy.

ORGANIZING IDEA

Earth Systems: Understandings of the living world, Earth, and space are deepened through investigating natural systems and their

ORGANIZING IDEA

Living Systems: Understandings of the living world, Earth, and space are deepened through investigating natural systems and th

ORGANIZING IDEA

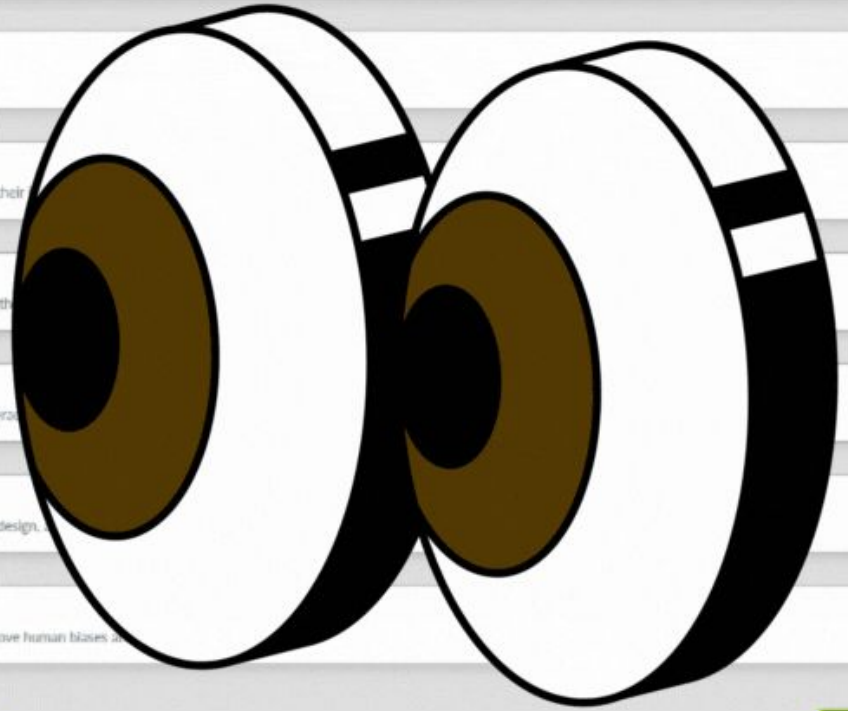
Space: Understandings of the living world, Earth, and space are deepened through investigating natural systems and their inter

ORGANIZING IDEA

Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design

ORGANIZING IDEA

Scientific Methods: Investigation of the physical world is enhanced through the use of scientific methods that attempt to remove human biases



Organizing Idea	**Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and computational thinking.**
Guiding Question	**In what ways are abstraction, design, and coding related?**
Learning Outcome	**Students examine abstraction in relation to design and coding, and describe impacts of technologies.**

Knowledge	Understanding	Skills & Procedures
The process of abstraction includes • determining what details to keep and what to ignore • removing unnecessary details • identifying important information • generalizing patterns Information is data that is organized to be more useful. An abstraction is a simplified version of something complex. Abstractions can make daily life easier; e.g., • simple controls on appliances • light switches • steering wheels • apps Computational artifacts can be designed to address societal needs and wants; e.g., • weather modelling • communications • automotive controls • medical research • apps	Abstraction is used in design and coding of computational artifacts to make problems easier to think about.	Apply abstraction during the design process. Identify examples of abstractions encountered in daily life. Discuss the role of design and coding in society. Use a visual block-based language to design code that includes relevant design structures.

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Knowledge	Understanding	Skills & Procedures
Structures used in coding include • sequences • conditionals (if-then-else statements) • loops Sequence structures are ordered sets of instructions within code. Conditional structures are statements that tell computers to complete different actions based on different situations.	Abstraction is used in design and coding of computational artifacts to make problems easier to think about.	Apply abstraction during the design process. Identify examples of abstractions encountered in daily life. Discuss the role of design and coding in society. Use a visual block-based language to design code that includes relevant design structures.

Organizing Idea	**Computer Science: Problem solving and scientific inquiry are developed through the knowledgeable application of creativity, design, and computational thinking.**
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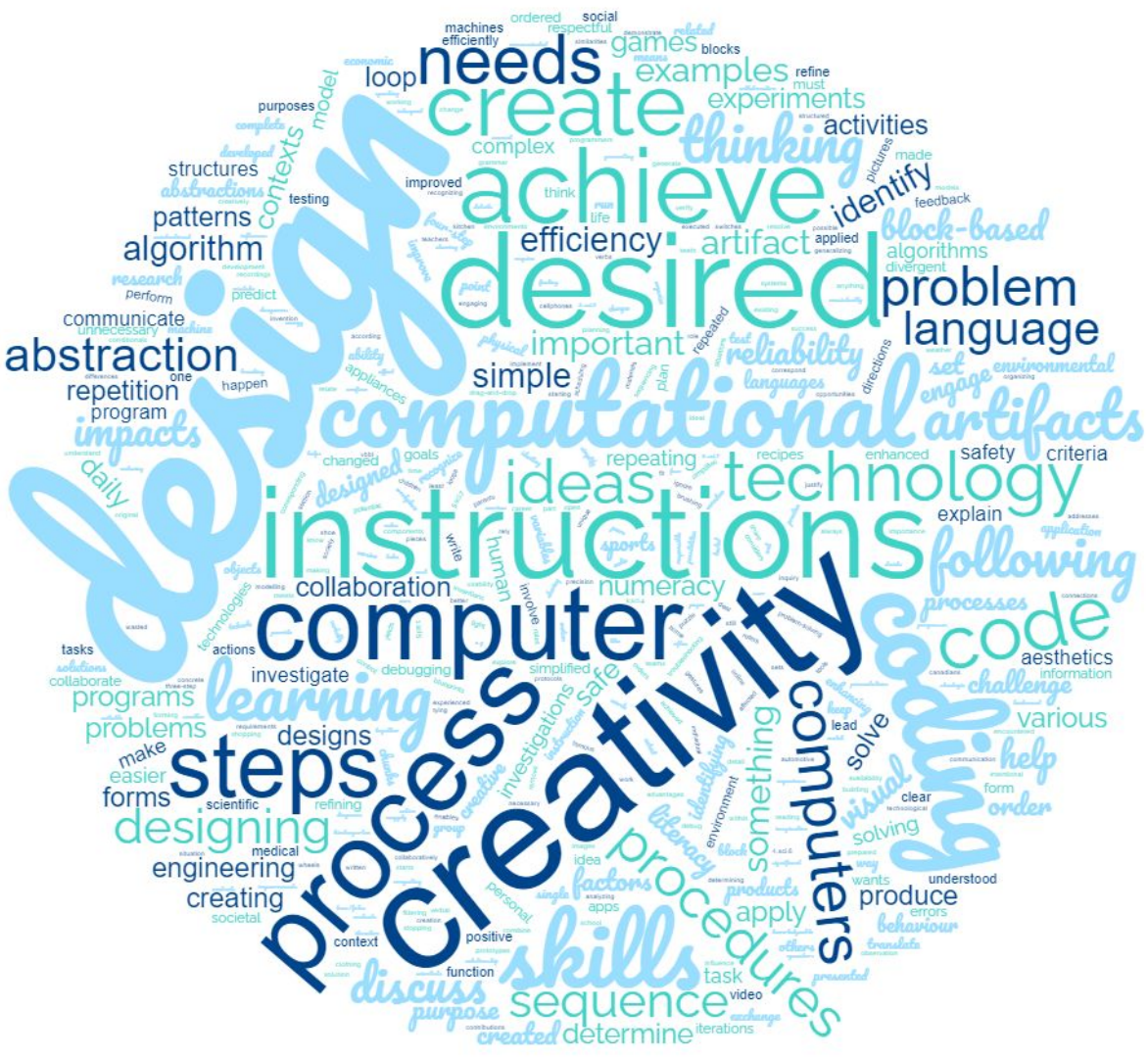
Knowledge	Understanding	Skills & Procedures
The use of computers, coding, and technology can have impacts that are • personal • social • environmental • economic Impacts of computers, coding, or technology may be intentional or unintentional.	Computers, coding, and technology can be used in ways that have positive or negative impacts.	Discuss how computers, coding, or technology have had impacts. Predict possible impacts of computers, coding, or technology.

Problem solving and **scientific inquiry** are developed through the knowledgeable application of **creativity**, **design**, and **computational thinking**.



Creativity

ORIGINALITY

Creative thinking often results in ideas or solutions that are unique and haven't been thought of before. It involves breaking away from established patterns and norms.

RISK TAKING

Creative thinkers are often willing to take risks by exploring unconventional ideas or challenging the status quo.

IMAGINATION

Imagination is at the core of creative thinking. It involves the ability to visualize and conceptualize ideas and scenarios that don't currently exist.

FLEXIBILITY

Creative thinkers are open to exploring various possibilities and are willing to adapt their thinking when confronted with new information or challenges. They can switch between different modes of thinking.

Design Thinking Process

Learn About
Your Audience

Empathize

Define

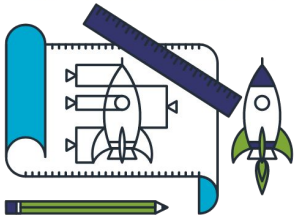
Construct Point
of View Based
on User Needs

Brainstorm and
Come up with
Creative Solutions

Ideate

Prototype

Build
Representation
of Your Ideas



Test Your Ideas

Test

Empathize → Define → Ideate → Prototype → Test

Learn about the audience for whom you will be designing.

Walk a mile in their shoes.

Empathize

As you watch the video, start to think about what this person needs. Also be prepared to talk about how the video made you feel.

Think about…

- How you would feel in Mandy's position?
- What kind of person does Mandy seem like?
- What qualities does the video show you about Mandy?

Define

What is Mandy's problem?

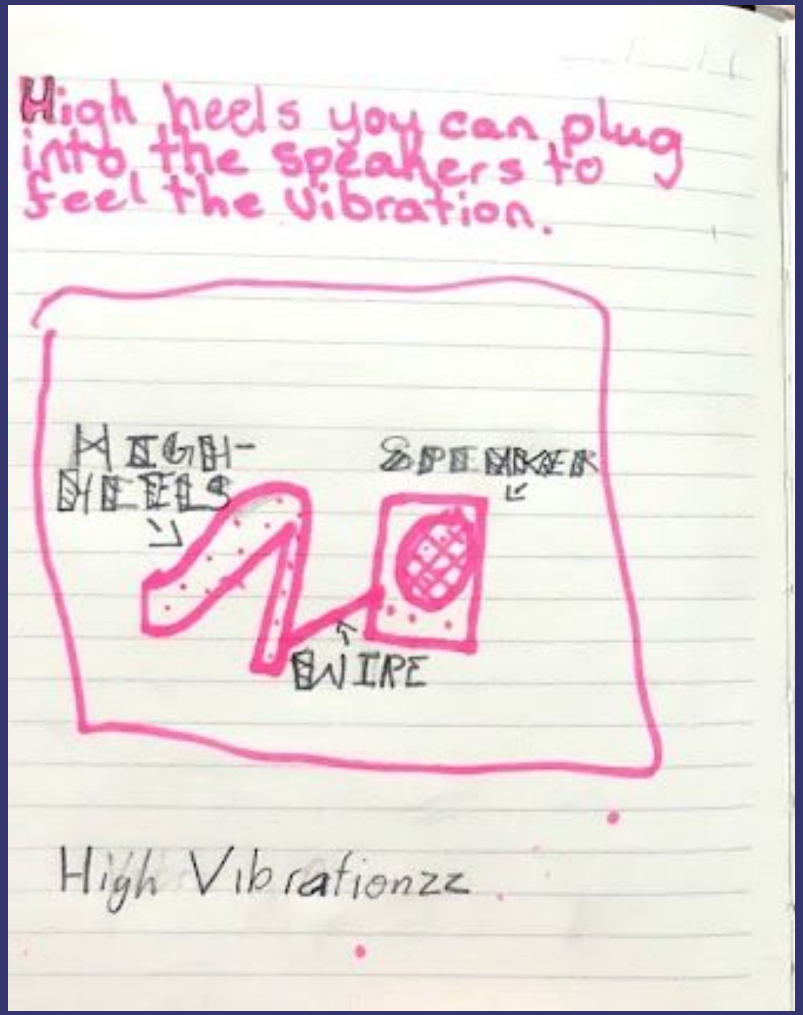
Tip: It's not that she is deaf.

This is an impairment that cannot be fixed and Mandy has figure out how to sing even though she cannot hear.

How does Mandy currently deal with her problem?

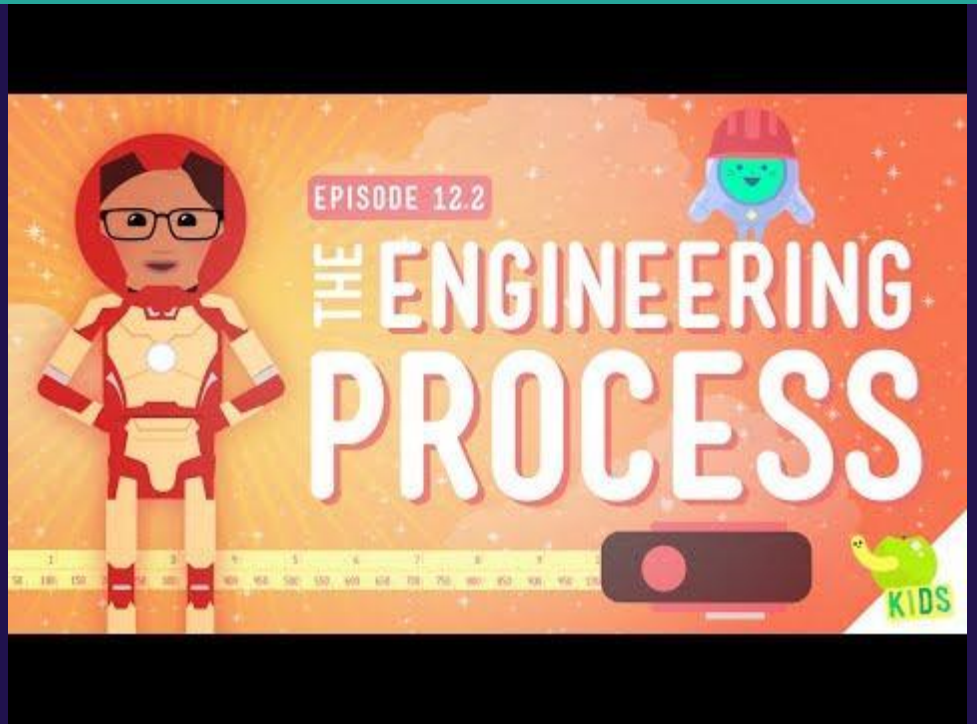
She sings in her stocking feet so she can feel the vibrations.

- Earrings with wireless to sense vibrations
- Shoes with no soles or holes to feel
- Something to wear under clothes connected to speakers
- A chair that picks up the vibrations
- Bracelet
- Hair accessories



Empathize → **Define** → Ideate → Prototype → Test

Use what you know about your audience to determine exactly what the problem you are going to solve is.



Empathize → Define → **Ideate** → Prototype → Test

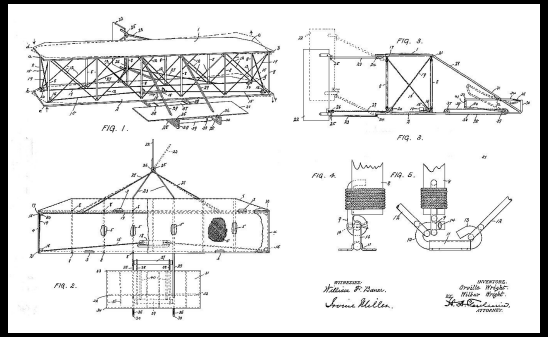
There are NO bad ideas!

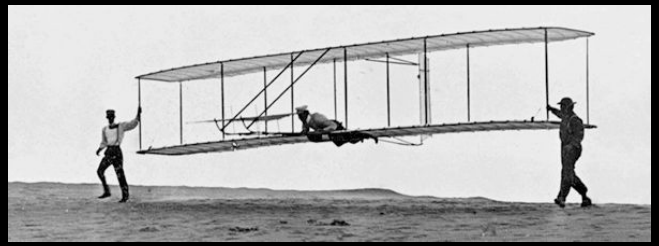
Think about your audience's needs!

Quantity over Quality!

Ideas! Ideas! Ideas!

Empathize → Define → Ideate → **Prototype** → Test





Empathize → Define → Ideate → Prototype → **Test**

If at first you don't succeed,
TRY
TRY
Again...and again... and again.

Did you know? The Wright Brothers had 2 failures before they were successful with flight.

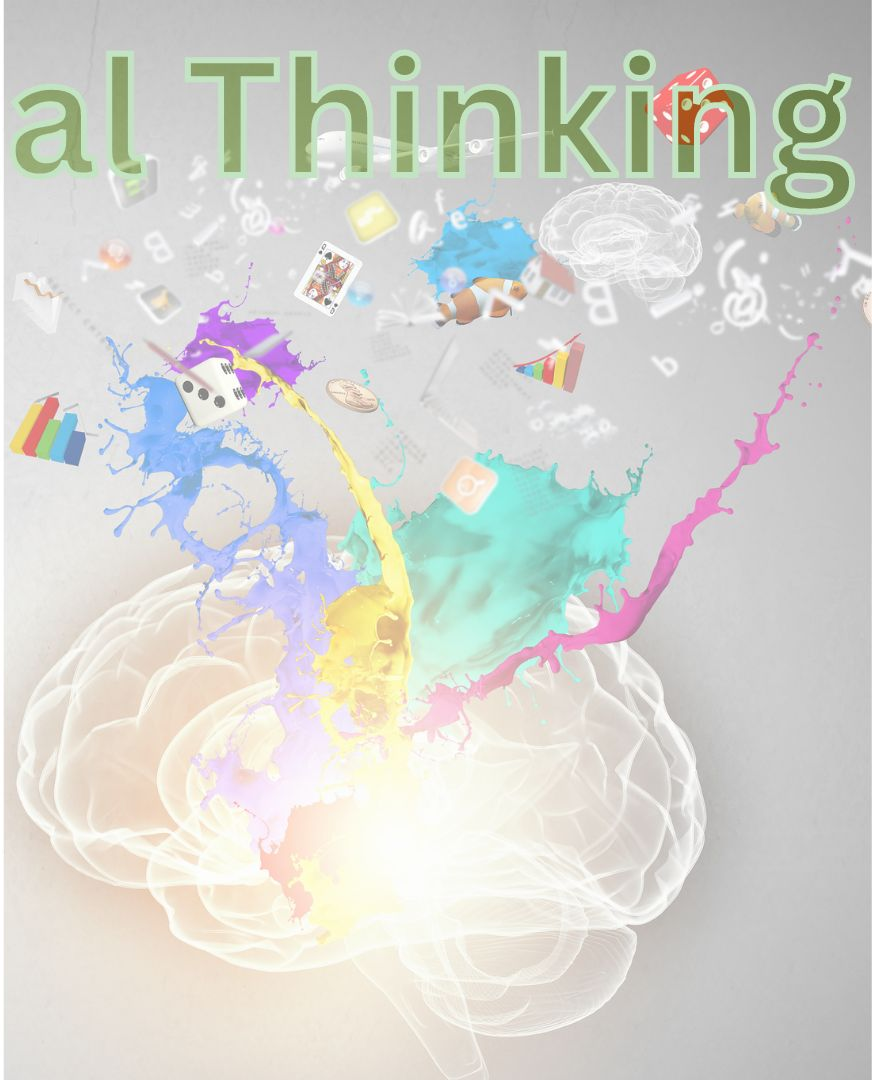
Computational Thinking

Decomposition

Pattern Recognition

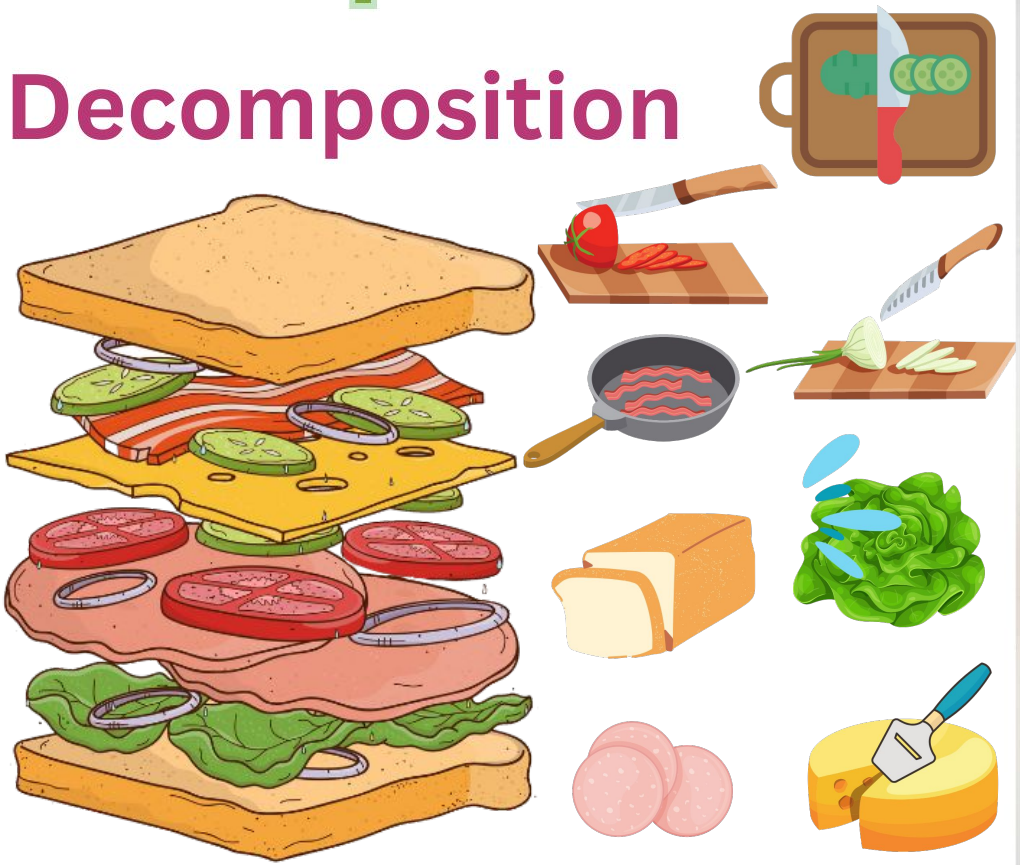
Pattern Abstraction

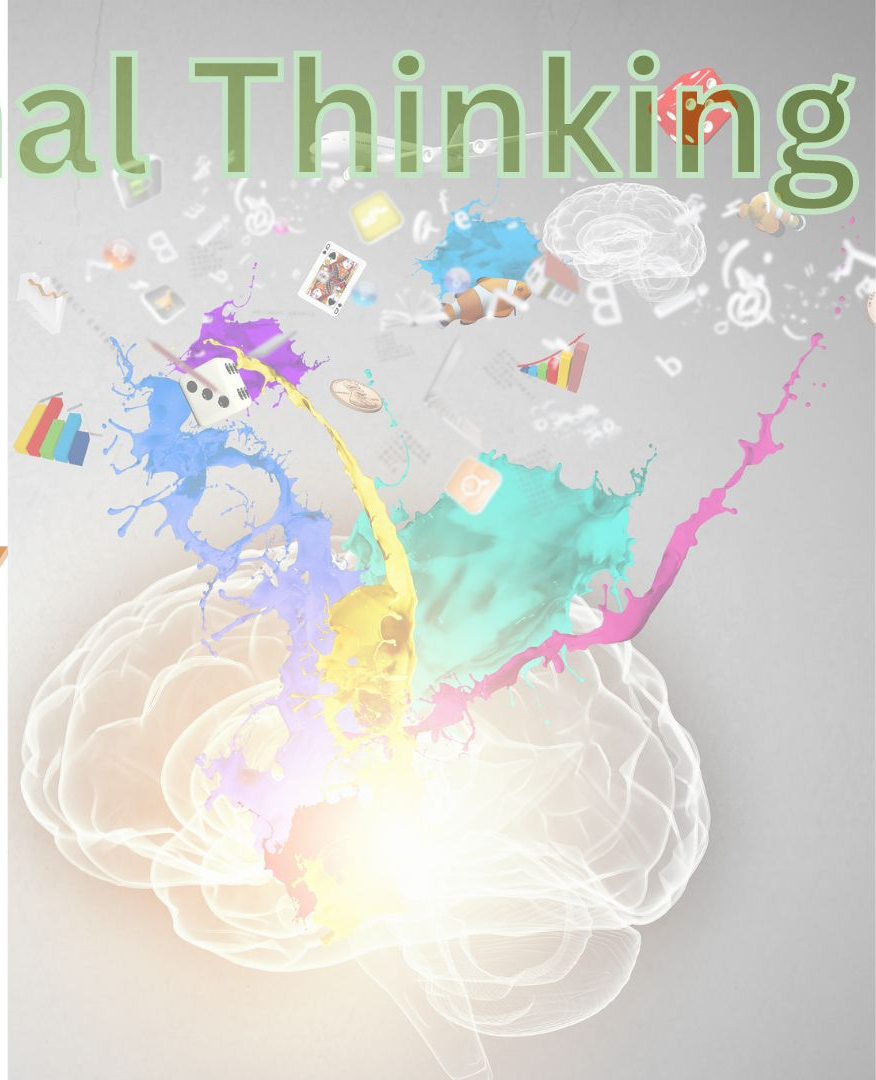
Algorithm Design



Computational Thinking

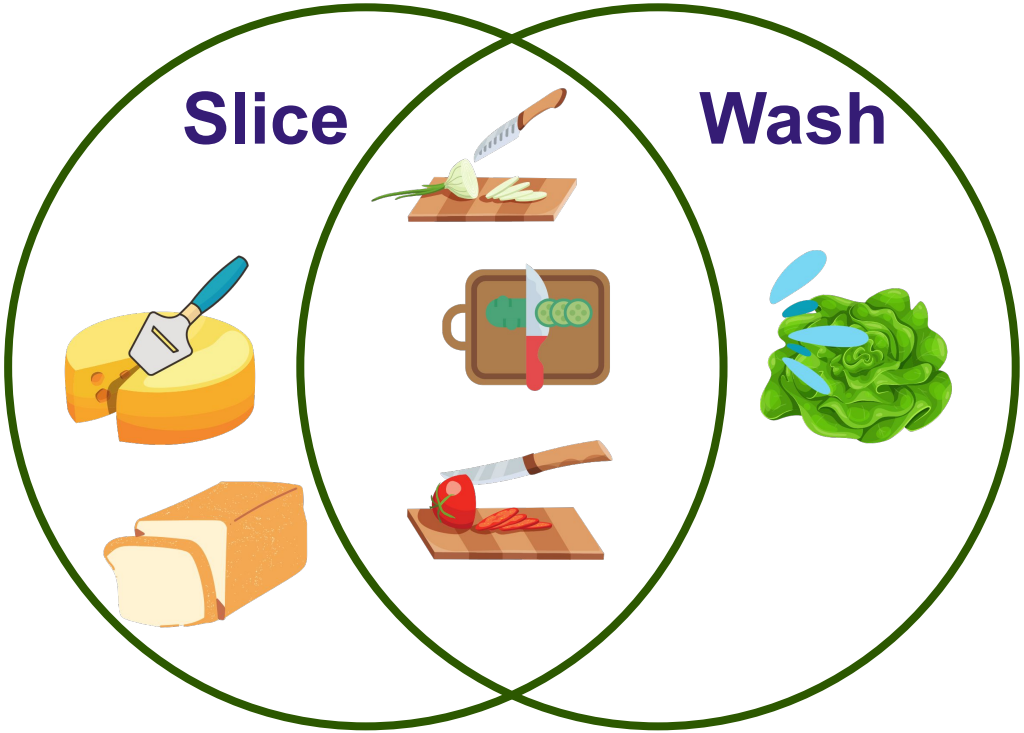
Decomposition

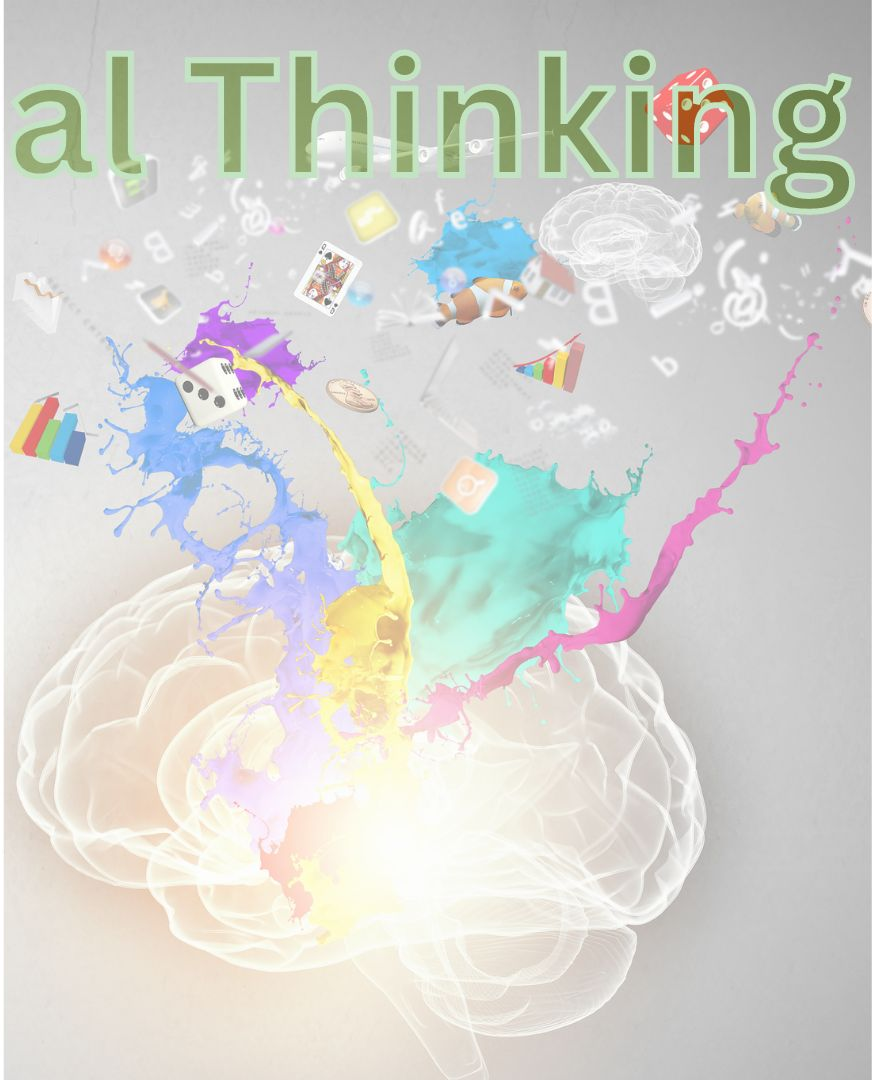




Computational Thinking

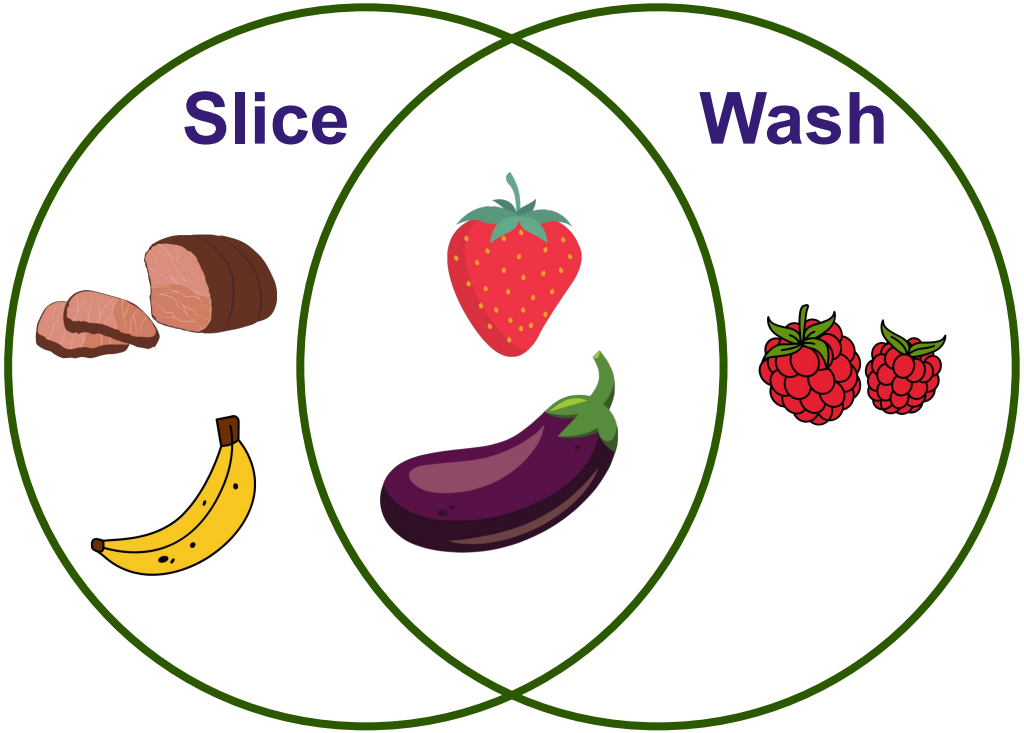
Pattern Recognition

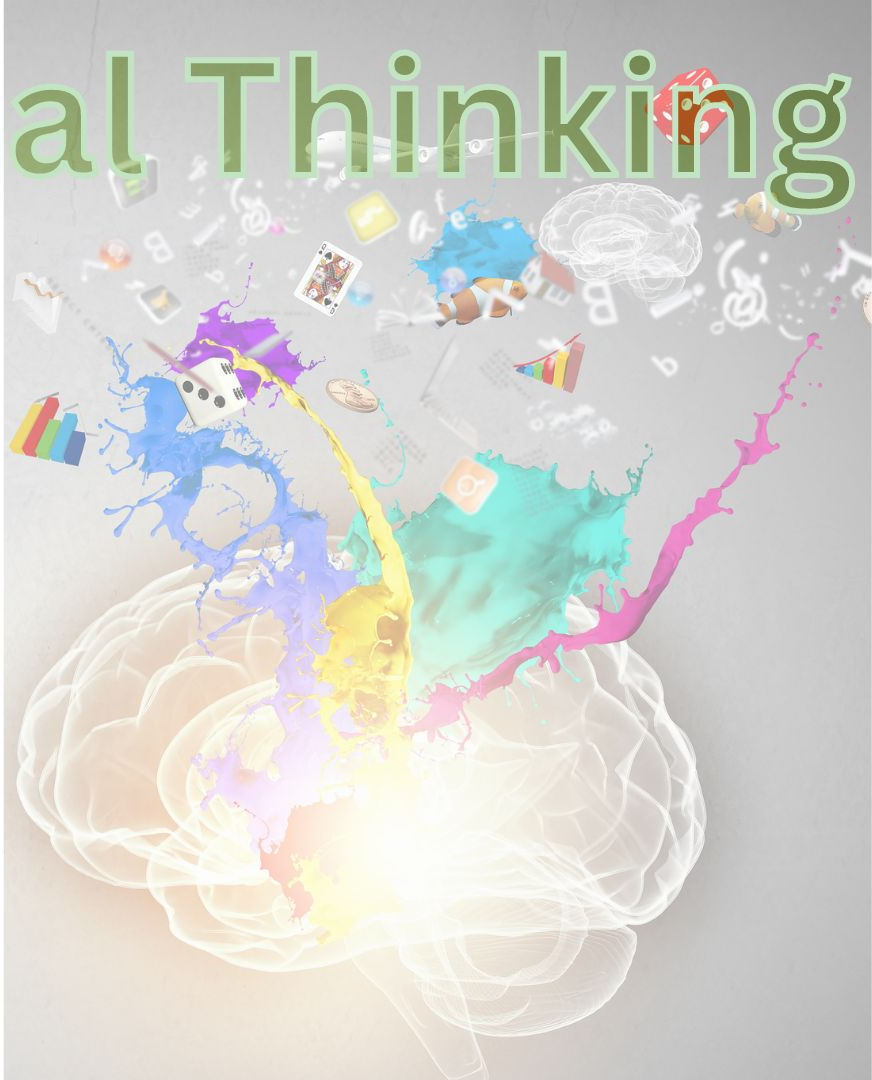




Computational Thinking

Pattern Abstraction





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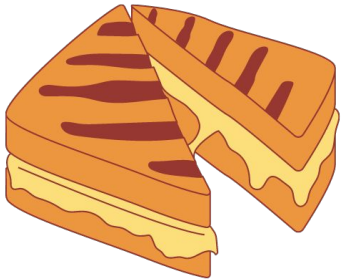
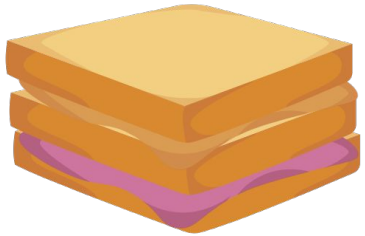
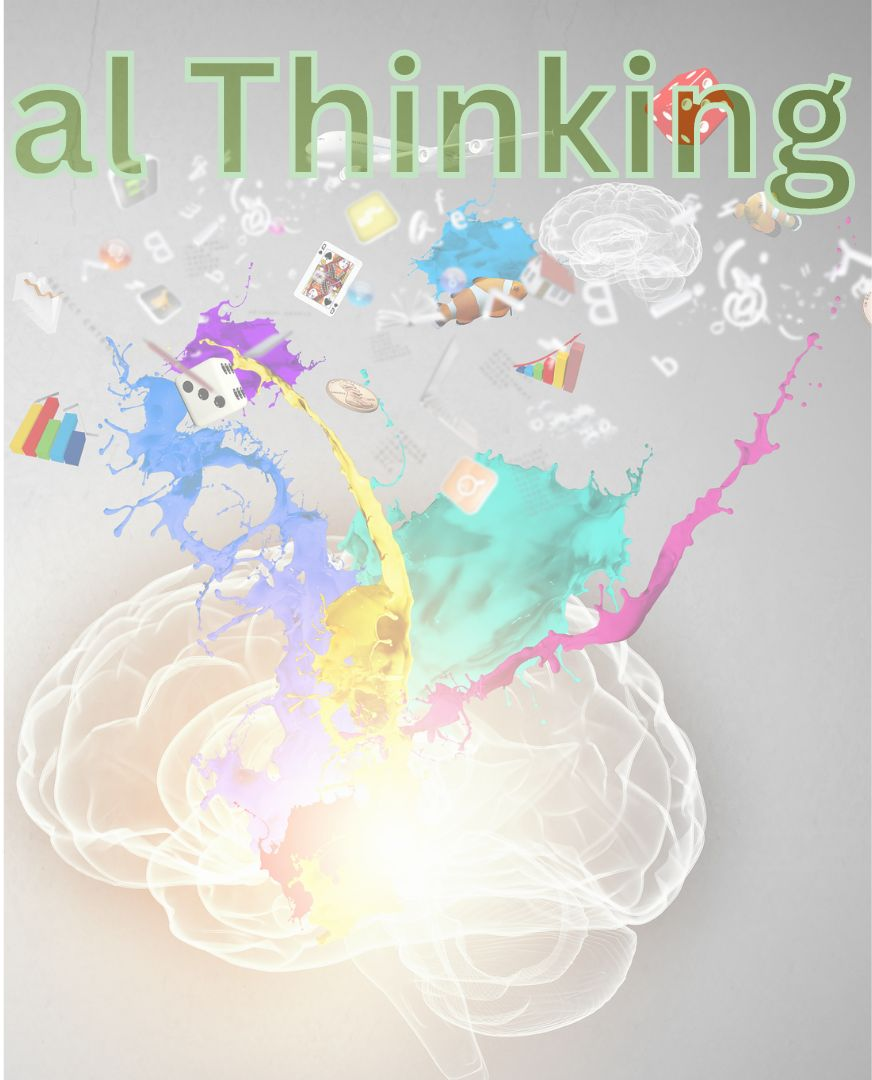


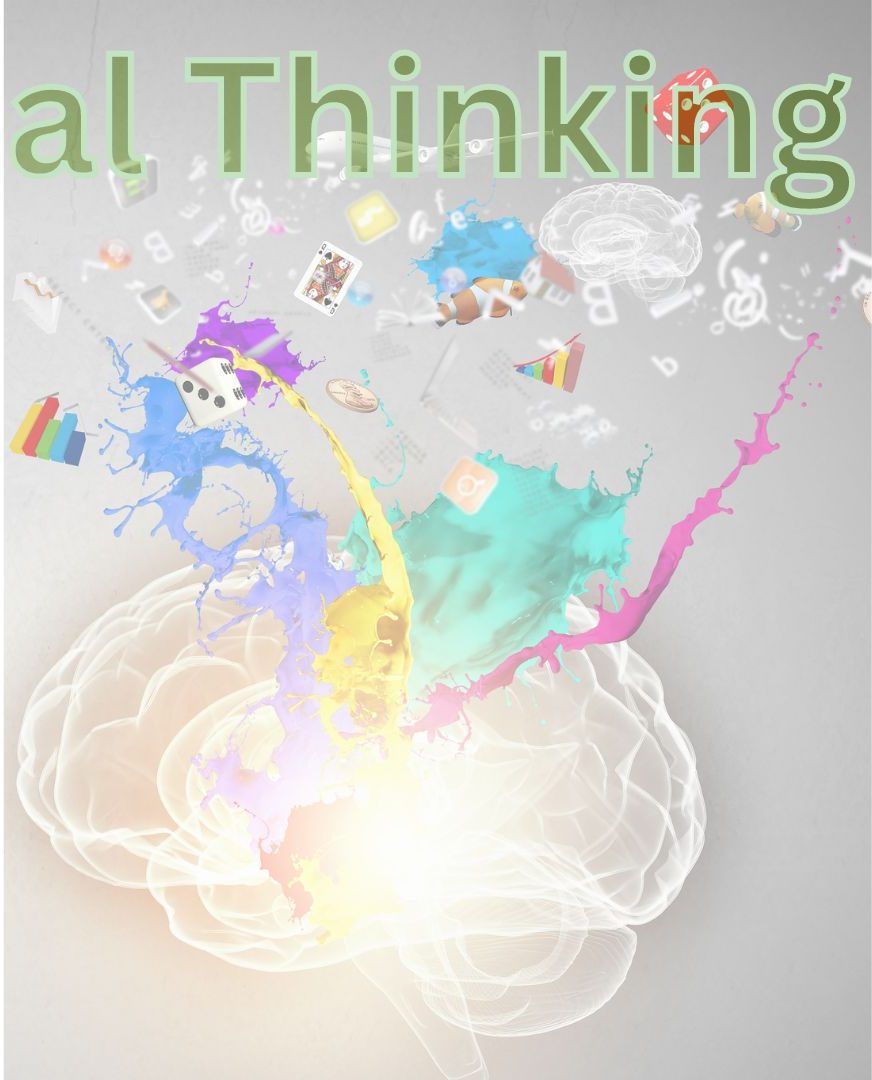




Computational Thinking

Algorithm Design

1. First prepare ingredients
    a. If it is a fruit or vegetable then wash it
    b. If it is raw meat then cook it
    c. If it is in a package then open it
    d. If it is big then slice it
2. Layer the ingredients
    a. Start with a piece of bread
    b. Repeat adding next ingredient until done
    c. End with a piece of bread



Ears

To listen to the ideas of others

Eyes

To make observations

Mouth

To collaborate & share your conclusions with others

Hands

To do experiments & record observations

Curious Mind

To make predictions & hypothesis. To think deeply about the world.

Strong Heart

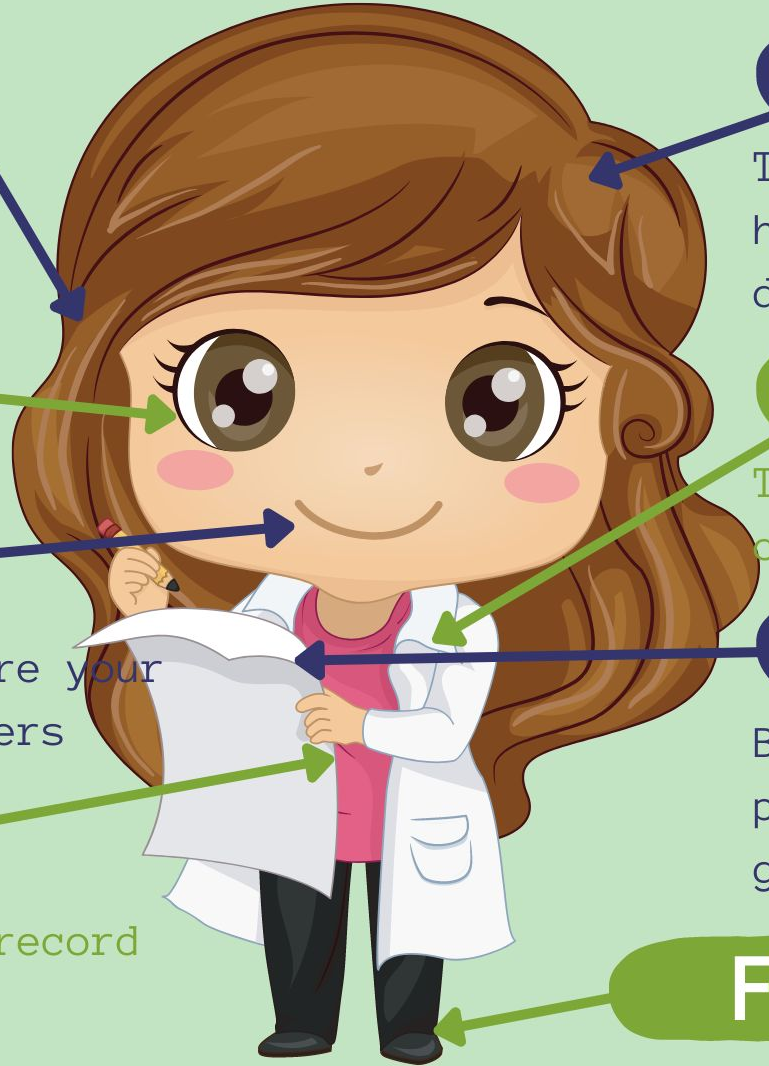
To be brave and take chances!

Tools

Beakers, Chromebooks, pencils, magnifying glasses & more

Feet

To move safely



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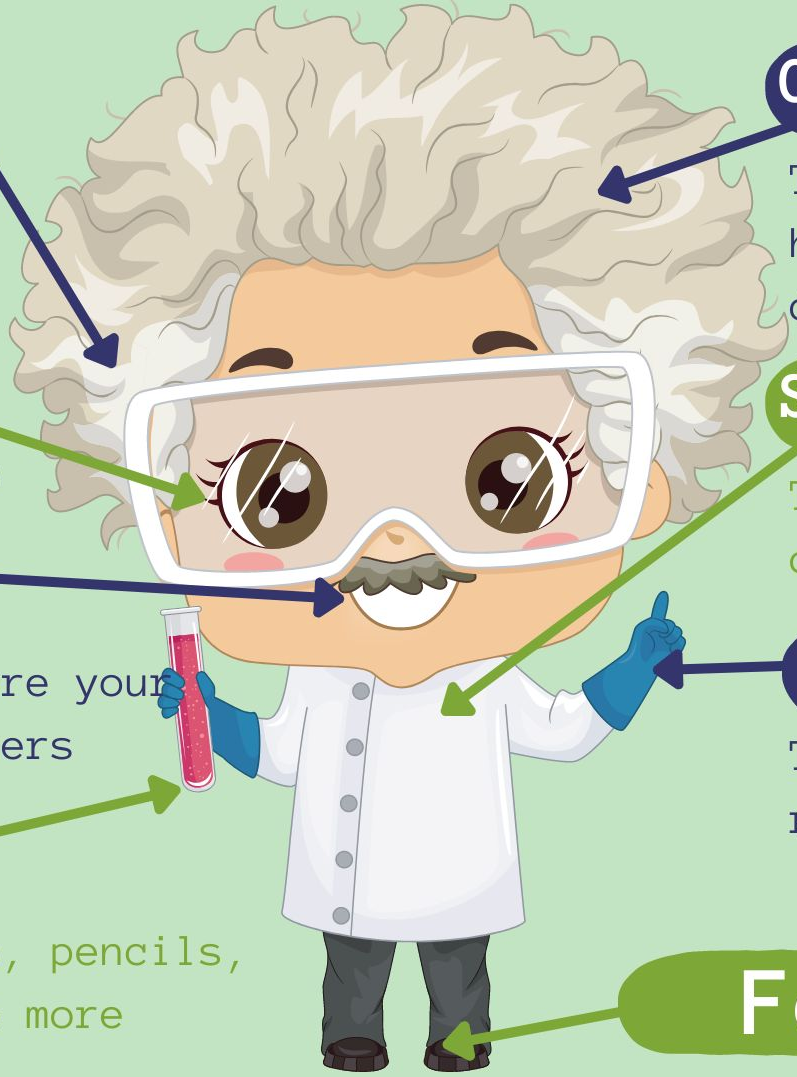

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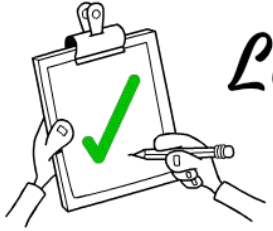


Learning Outcomes

K Children interpret instructions in the learning environment.

1 Students investigate instructions and their influence on actions and outcomes.

2 Students apply creativity when designing instructions to achieve a desired outcome.

3 Students investigate creativity and its relationship to computational thinking.

4 Students investigate and apply design in the context of computer science and technology.

5 Students create and justify a design that could be used by a human or machine to address a challenge.

6 Students create and refine computational artifacts through the use of design and abstraction.

Attack of the Kidbots

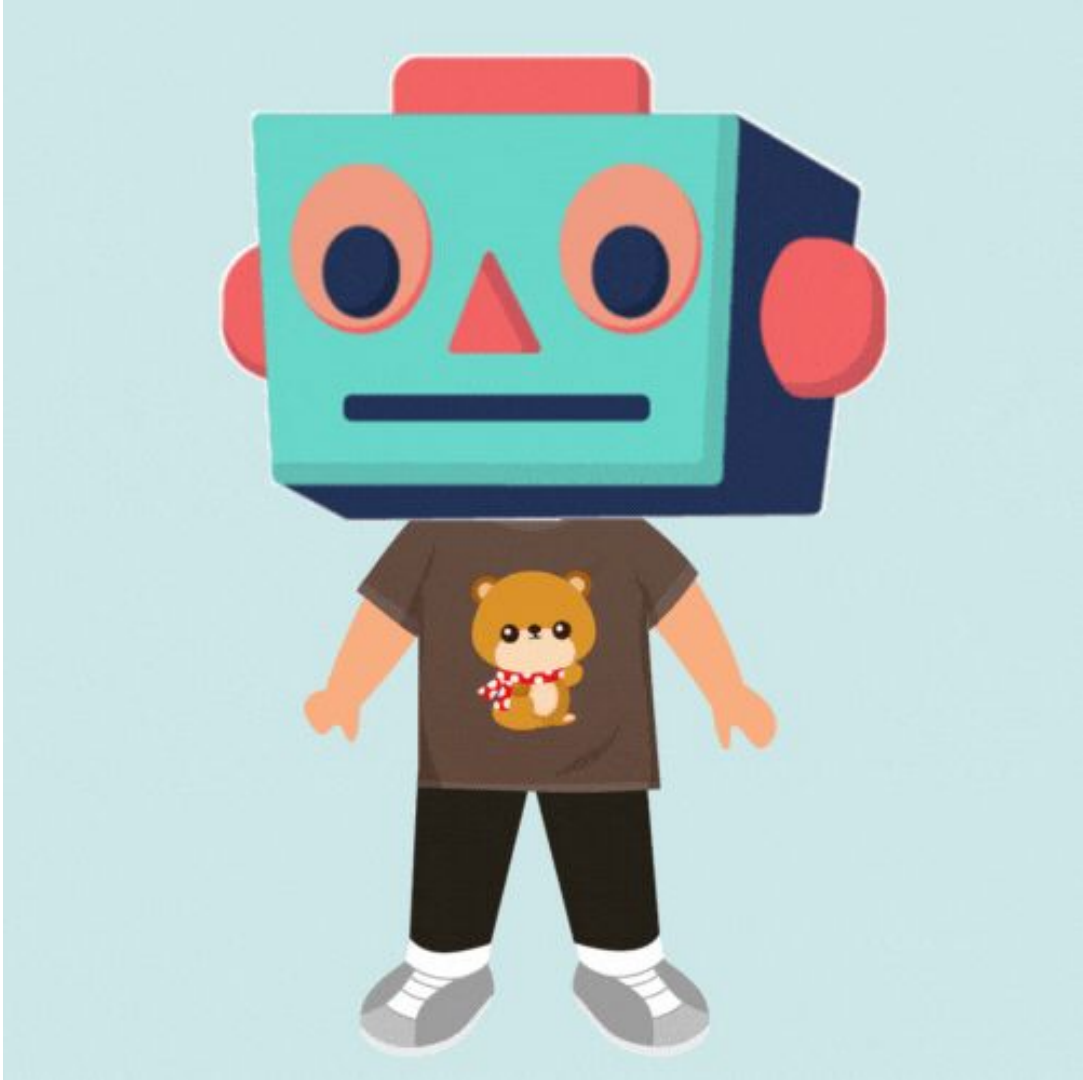
Classroom routines

Learning instructions

Other subject areas

Outside of school

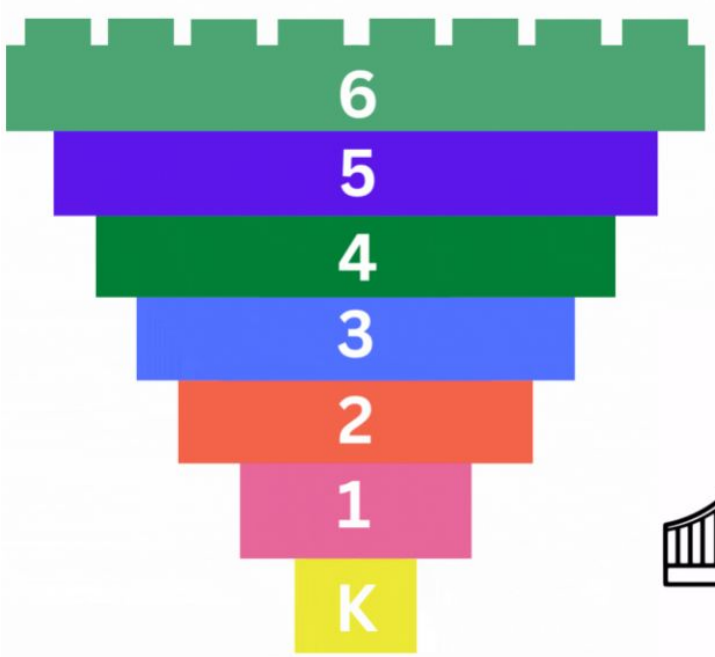
- Community
- Family
- The world
- In nature



Coding Knowledge

Grade 2

Debugging is the process of identifying and removing errors in a set of instructions to achieve a desired outcome.



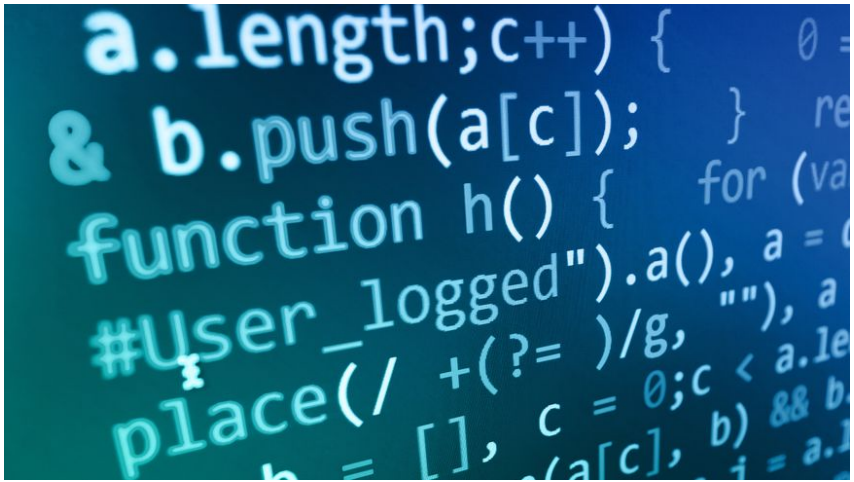
Bridging Gaps

Debugging can increase the reliability of instructions.

Many daily activities include repeated steps, such as

- brushing teeth
- tying one shoe and then using the same process on the other shoe

Coding consists of many languages that computers understand.




Search
Home
Discover
Apps
Pose


1:21
18°C


COOLING
75
78


Yale
1
2
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6
CARD
7
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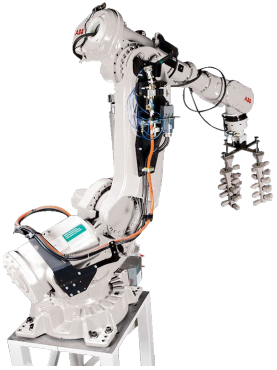
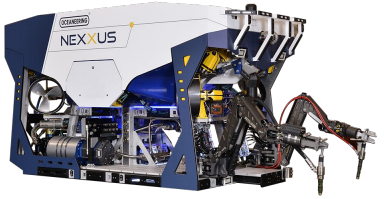
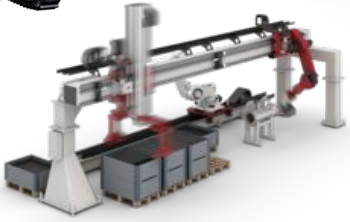
#

ROBOTS!!!

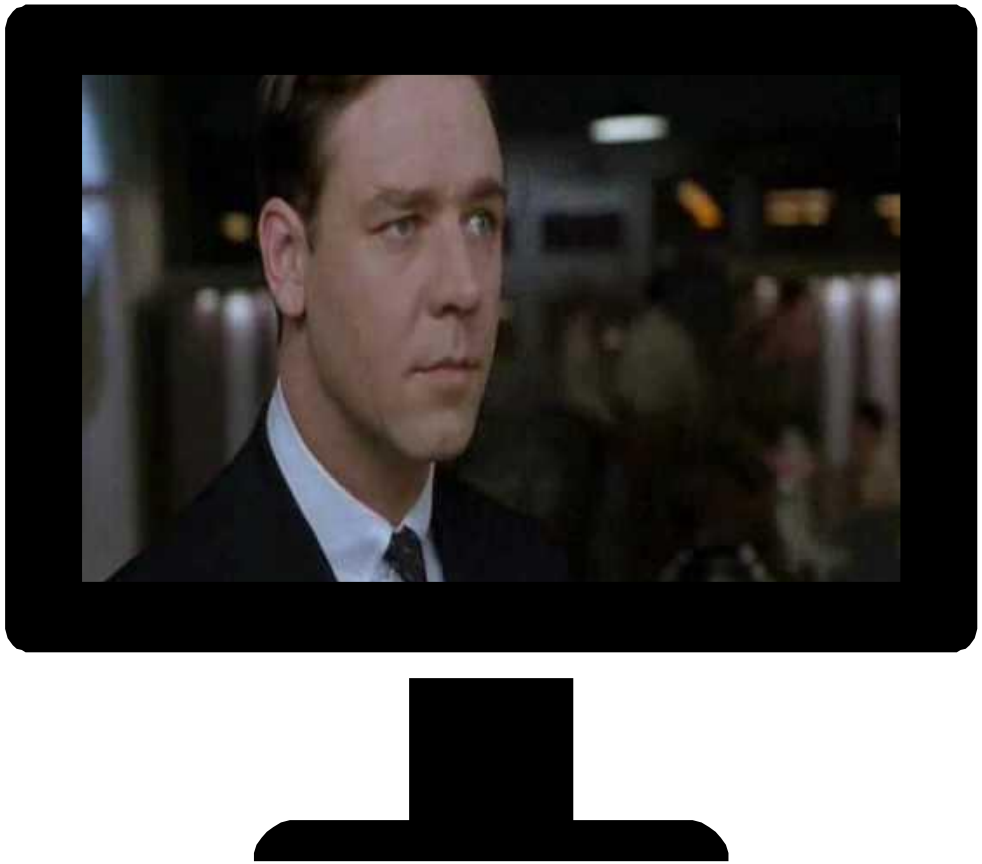




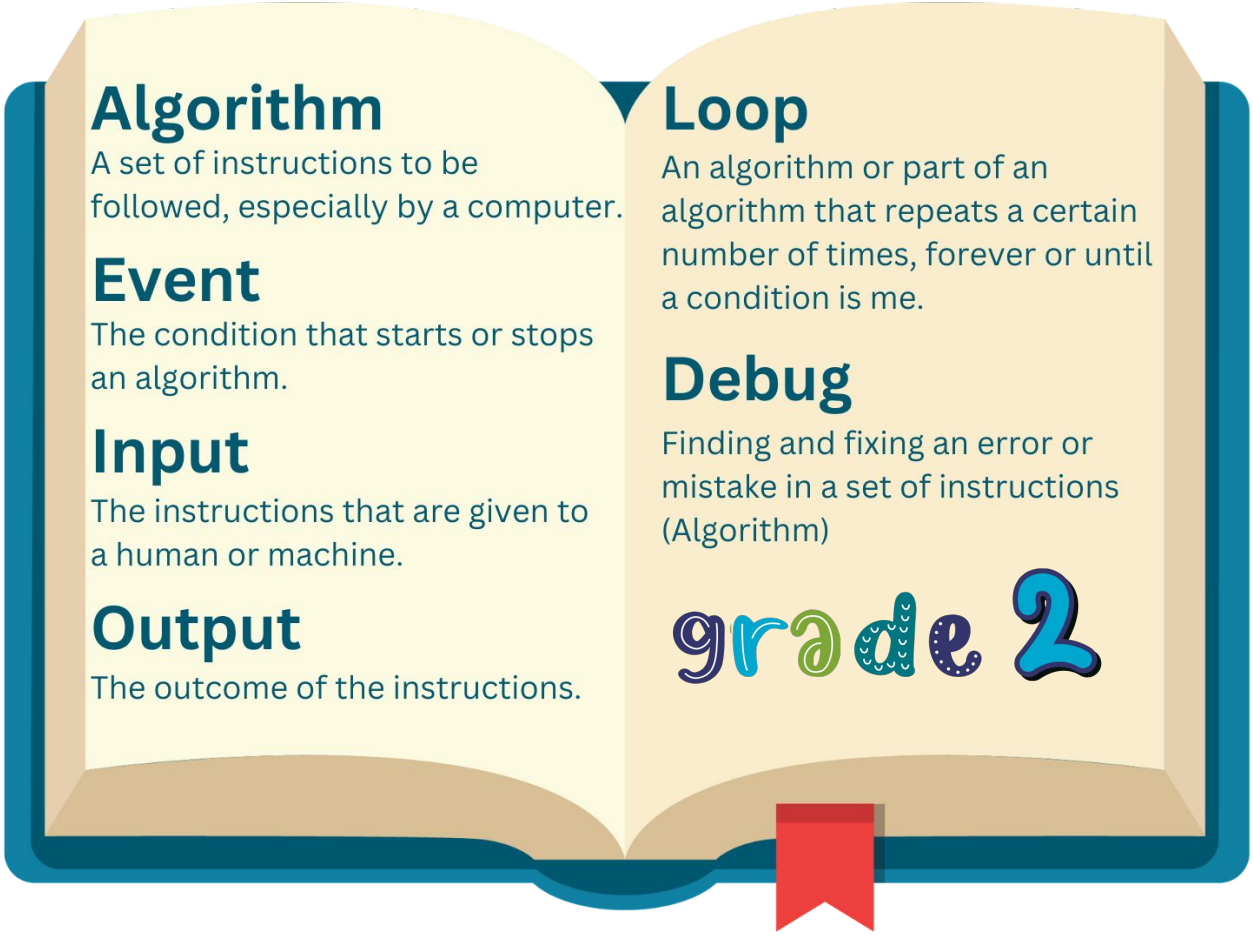


Coding

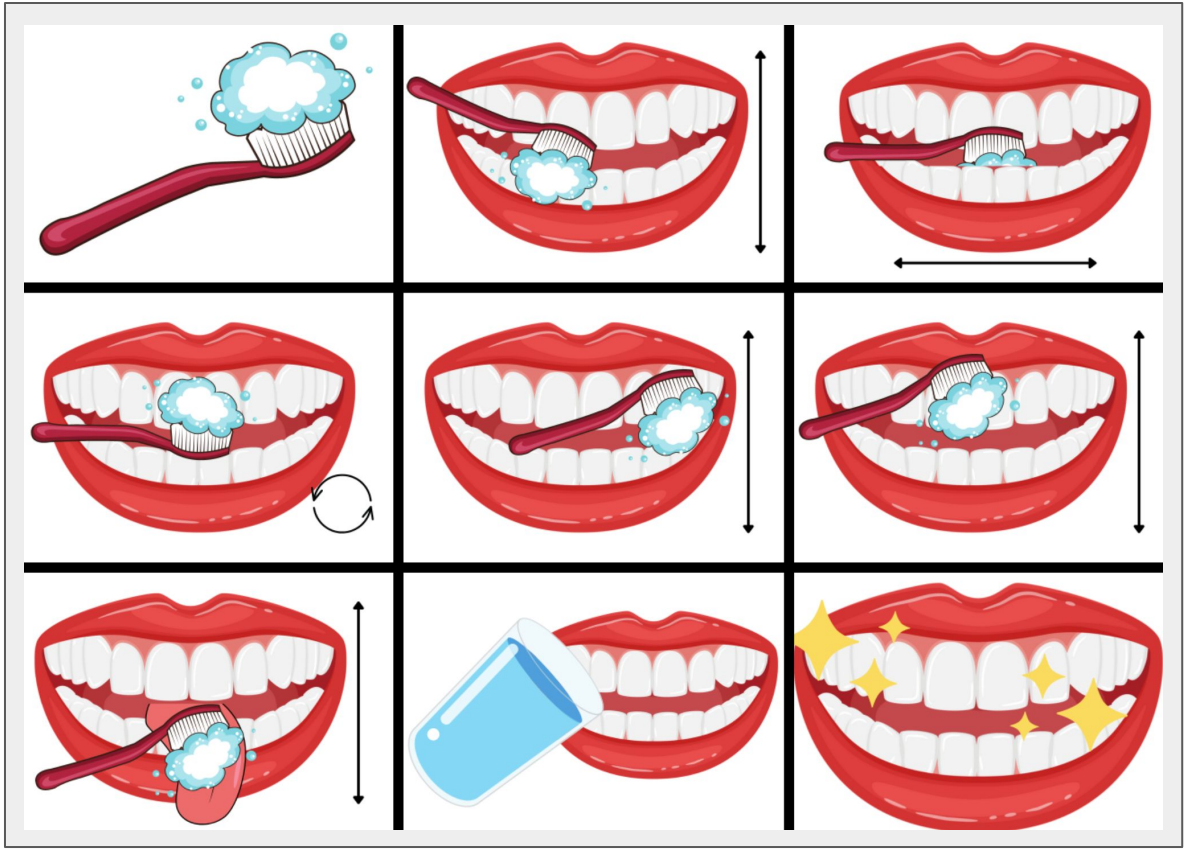
What we think it is…



Computer Science Vocabulary



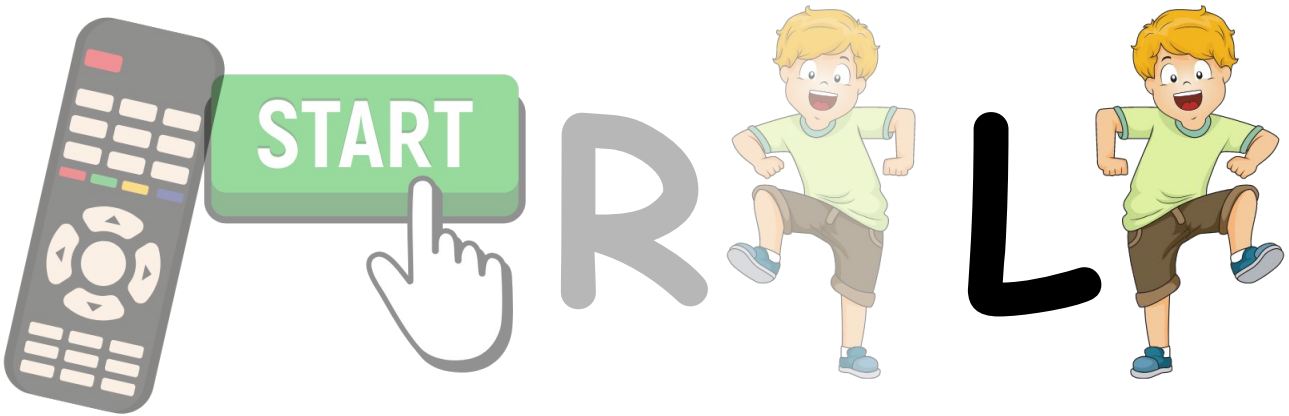
What Coding Really is



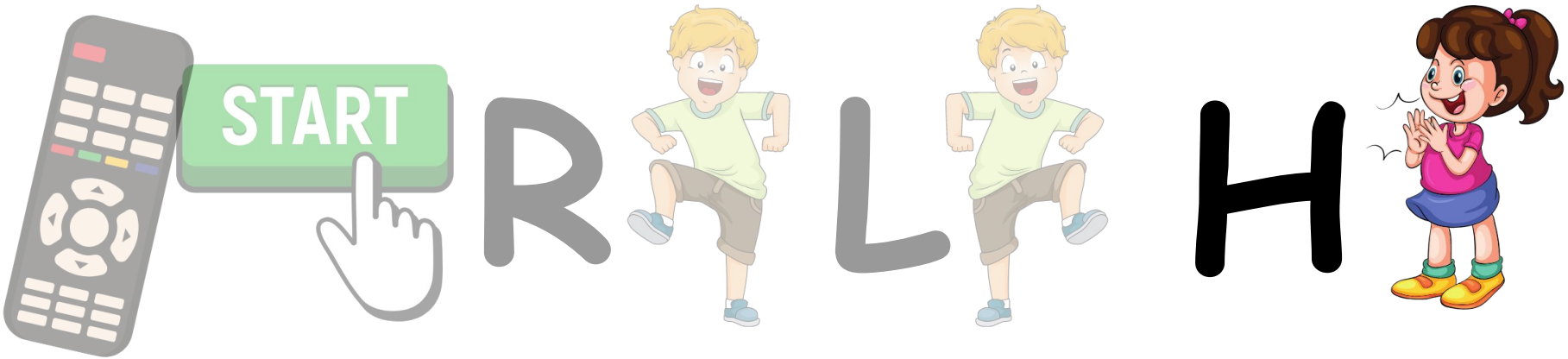
EVENT

INPUT / OUTPUT

ALGORITHM



ALGORITHM



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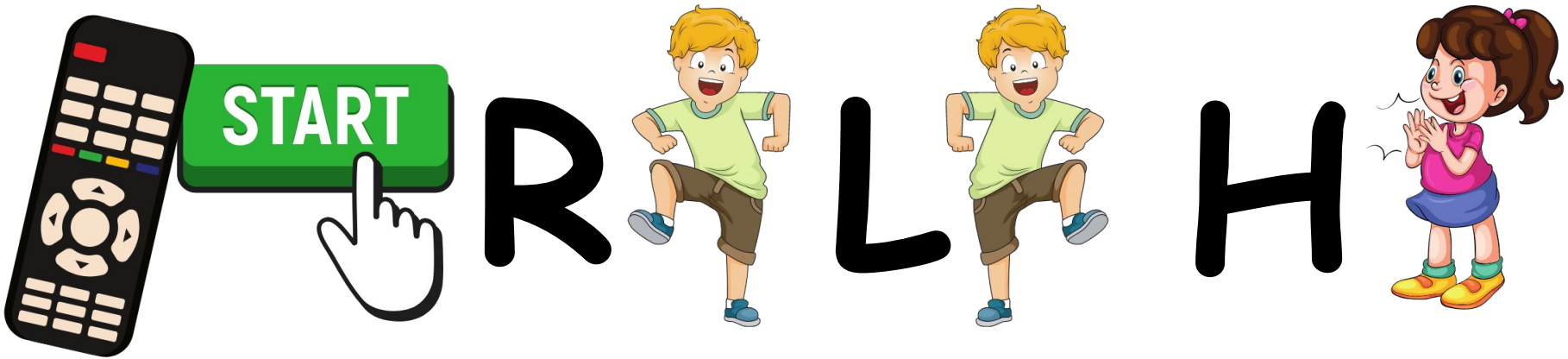
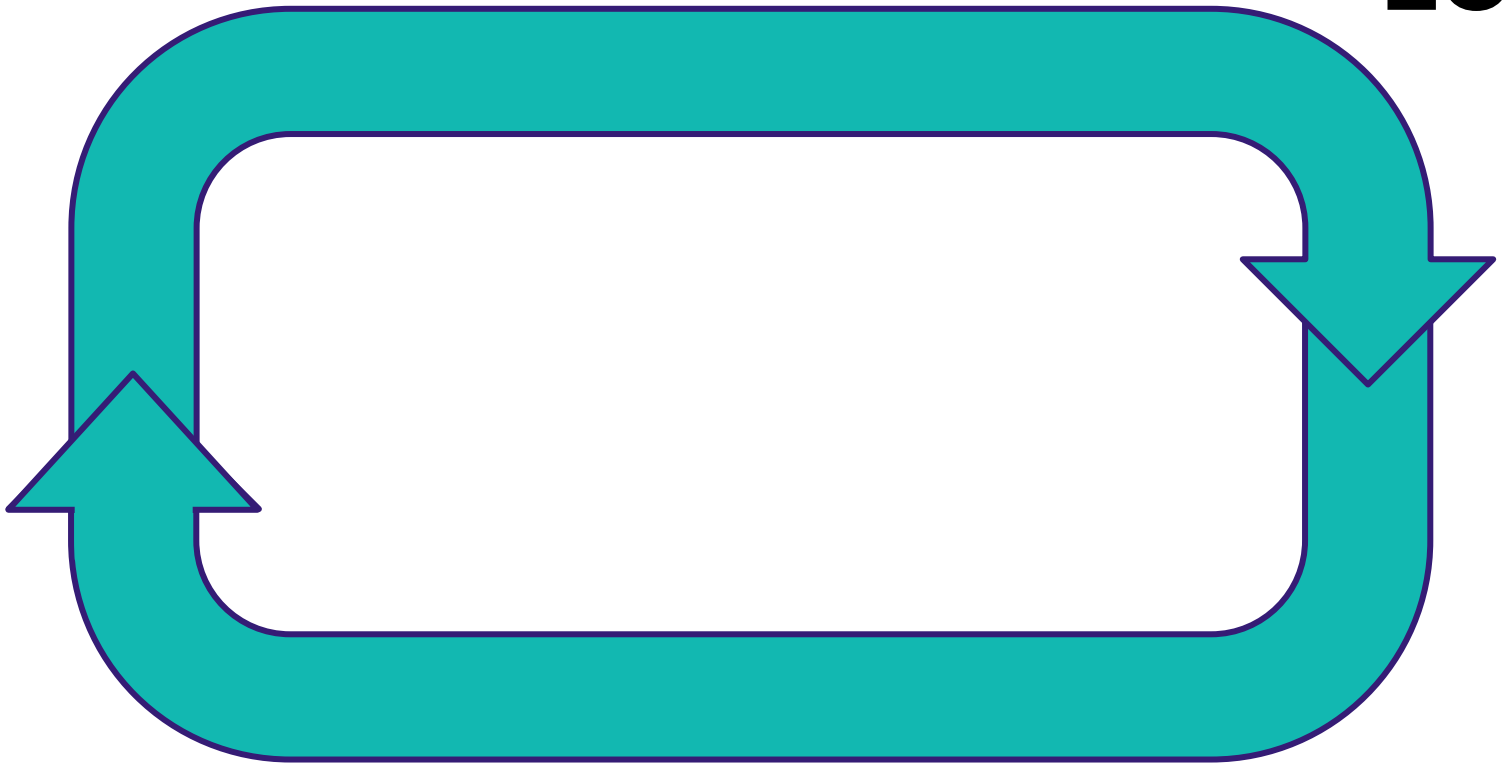


R H

L H

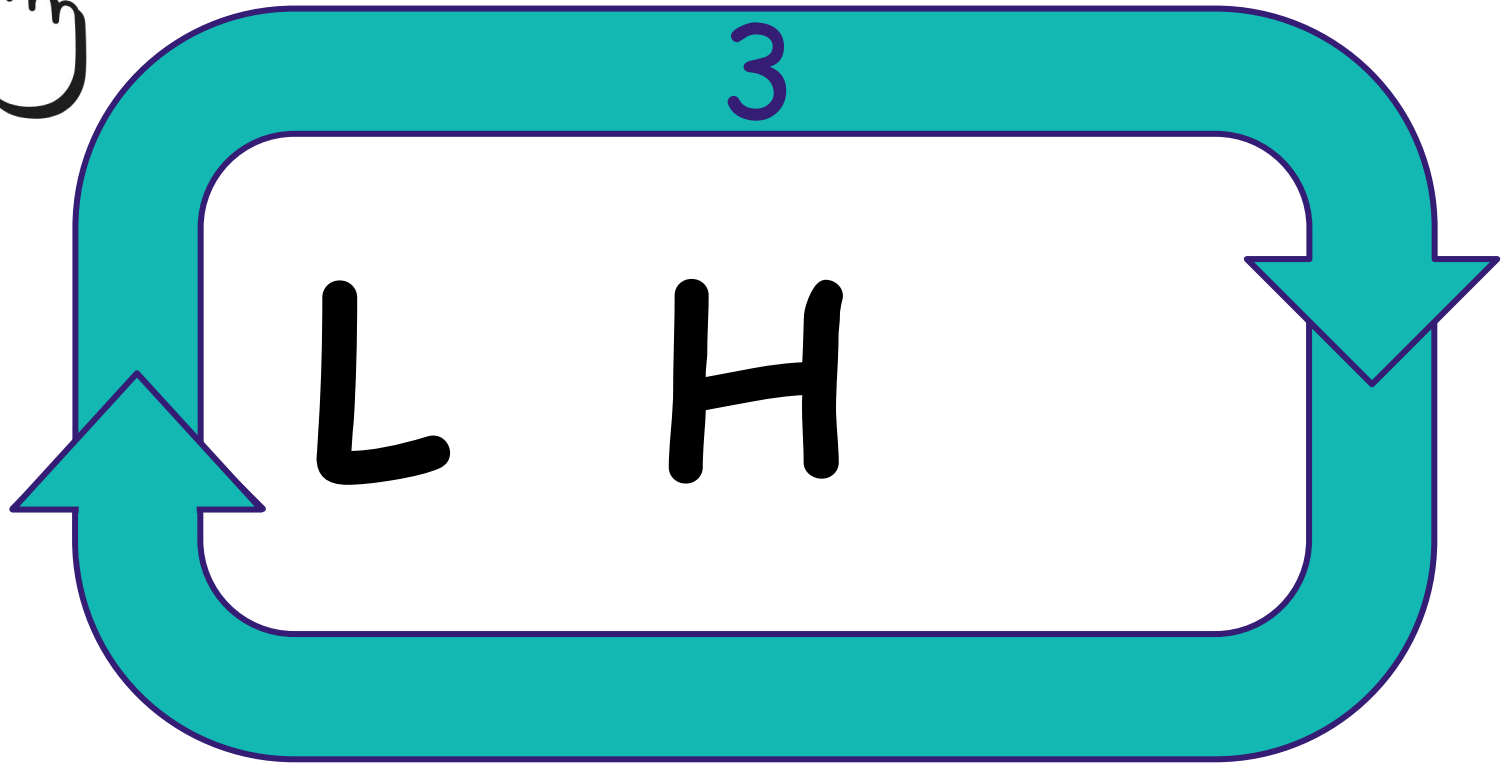
L H R

LOOP



START

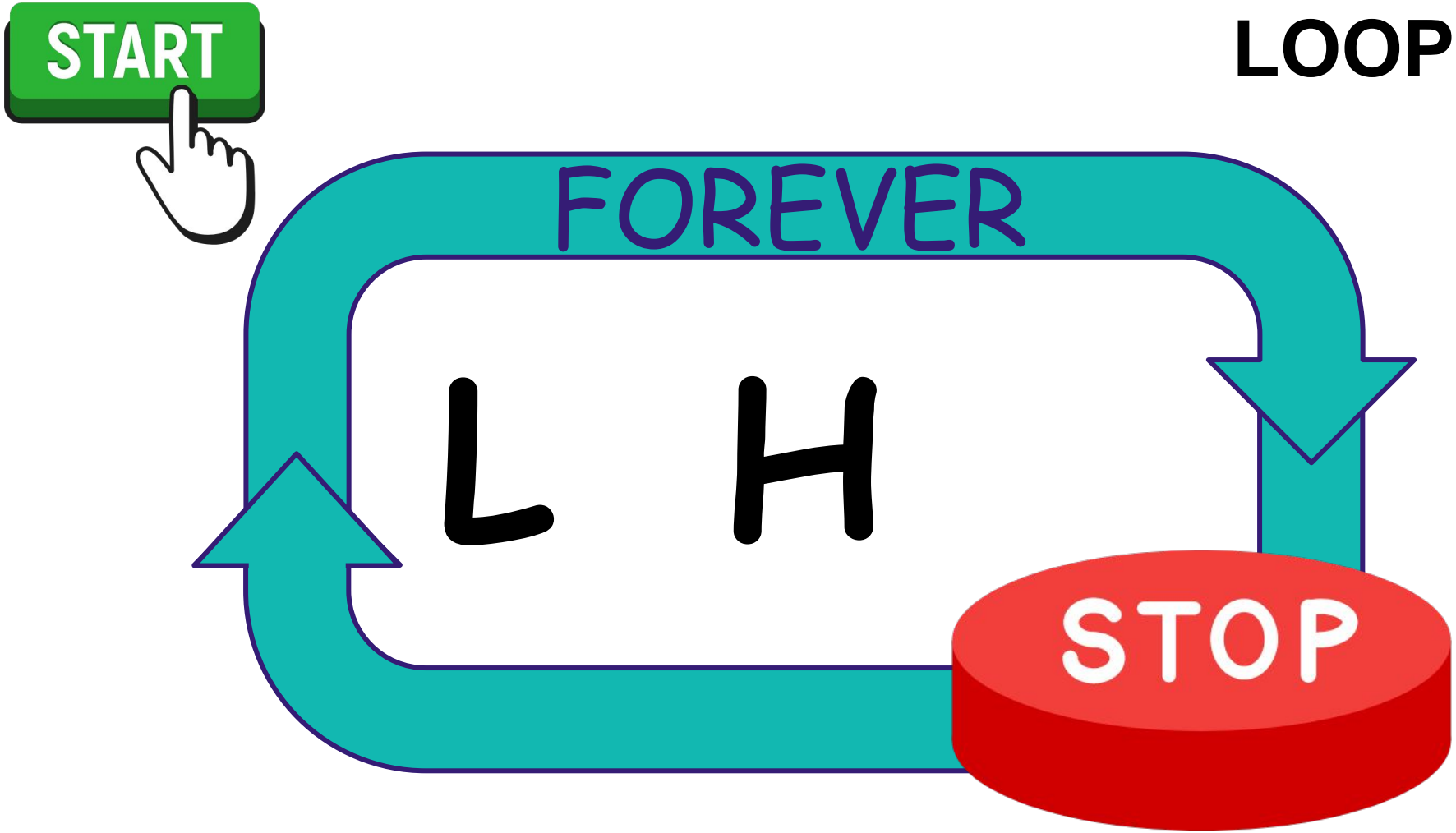
LOOP



START

LOOP

LOOP



START

LOOP

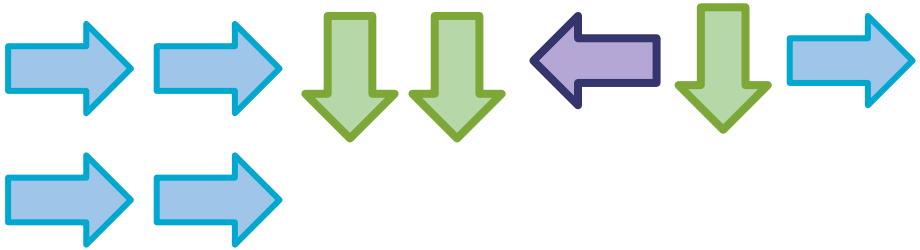
START

LOOP

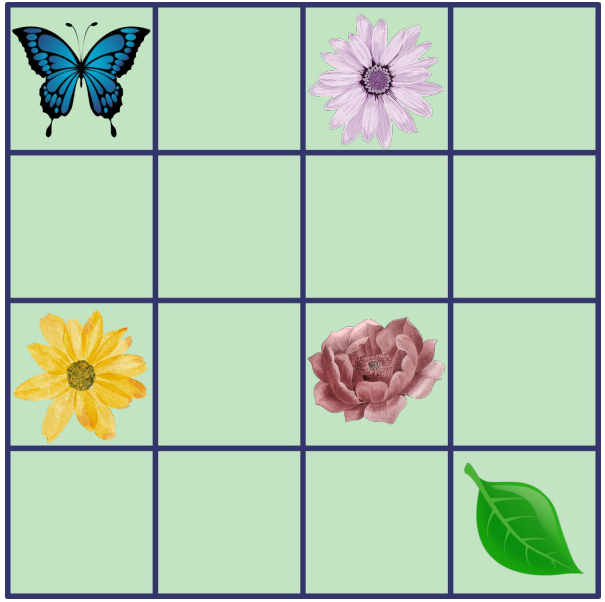
FOREVER

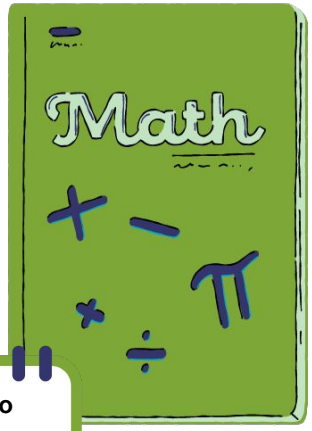
START

EVENT



Will this set of instructions get the butterfly to all 3 flowers and end at the leaf?





Collaborate to design an algorithm to solve a problem.

SKILLS & PROCEDURES

Create a set of instructions for counting by 2's.

Can you use a "repeat" to make it more refined?

Trade with a friend and check each other's instructions

2, 4, 6, 8,
10, 11, 13,
15, 17, 19

Max was skip counting by 2's but he made a mistake somewhere.

Can you find the mistake? What did Max do wrong? Can you fix his mistake?

KNOWLEDGE

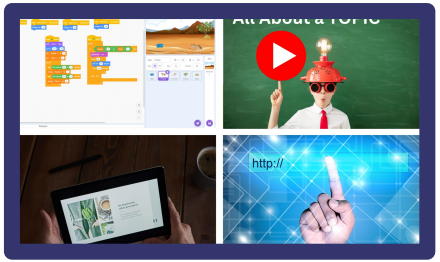
The process of abstraction includes
• determining what details to keep and what to ignore
• removing unnecessary details
• identifying important information
• generalizing patterns

Information is data that is organized to be more useful.

An abstraction is a simplified version of something complex.

Abstractions can make daily life easier; e.g.,
• simple controls on appliances
• light switches
• steering wheels
• apps

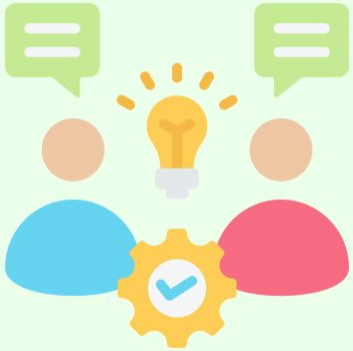
Computational artifacts can be designed to address societal needs and wants; e.g.,
• weather modelling
• communications
• automotive controls
• medical research
• apps



Structures used in coding include
• sequences
• conditionals (if-then-else statements)
• loops

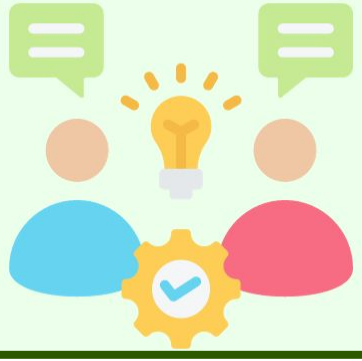
Sequence structures are ordered sets of instructions within code.

Conditional structures are statements that tell computers to complete different actions based on different situations.



UNDERSTANDING

Abstraction is used in design and coding of computational artifacts to make problems easier to think about.



SKILLS & PROCEDURES

UNDERSTANDING
Abstraction is used in design and coding of computational artifacts to make problems easier to think about.

- Apply abstraction during the design process.
- Identify examples of abstractions encountered in daily life.
- Discuss the role of design and coding in society.
- Use a visual block-based language to design code that includes relevant design structures.

SKILLS & PROCEDURES

KNOWLEDGE

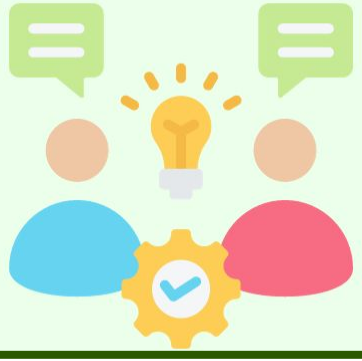
The use of computers, coding, and technology can have impacts that are

- personal
- social
- environmental
- economic

Impacts of computers, coding, or technology may be intentional or unintentional.

UNDERSTANDING

Computers, coding, and technology can be used in ways that have positive or negative impacts.



SKILLS & PROCEDURES

UNDERSTANDING
Computers, coding, and technology can be used in ways that have positive or negative impacts.

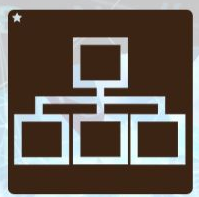
Discuss how computers, coding, or technology have had impacts.

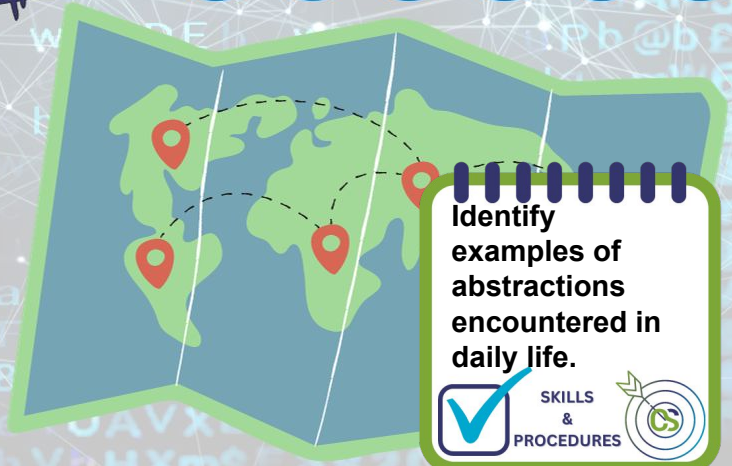
SKILLS & PROCEDURES

Predict possible impacts of computers, coding, or technology.

SKILLS & PROCEDURES

ABSTRACTION



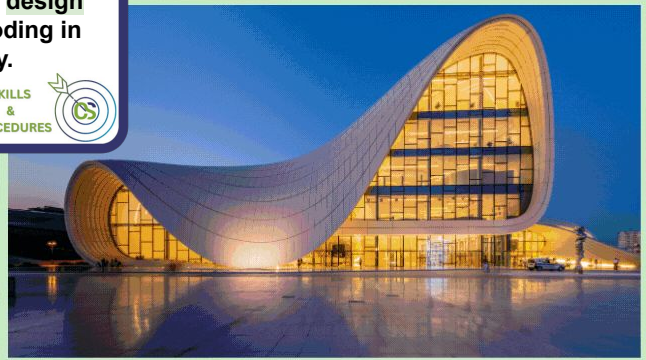


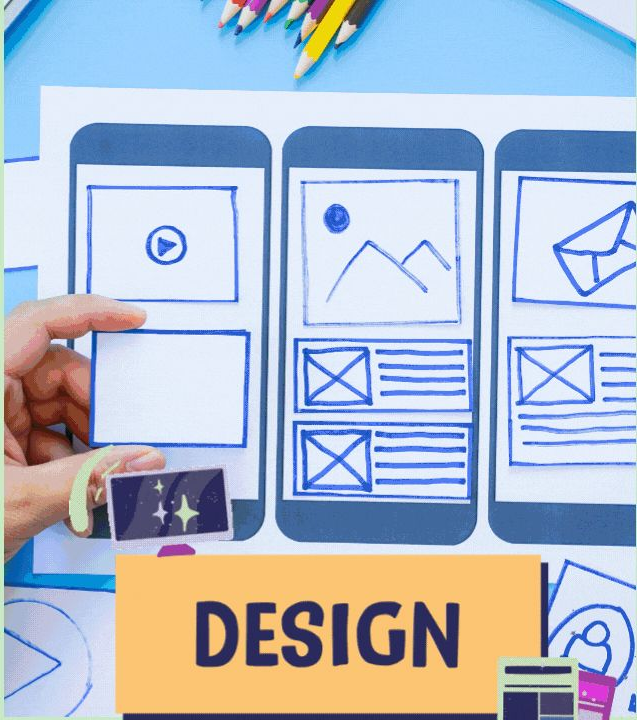
Identify examples of abstractions encountered in daily life.

SKILLS & PROCEDURES

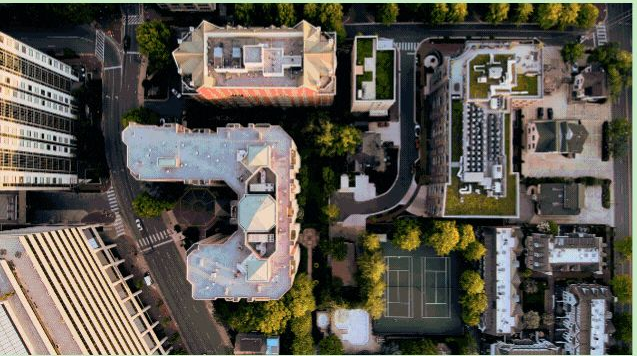
Discuss the role of design and coding in society.

SKILLS & PROCEDURES



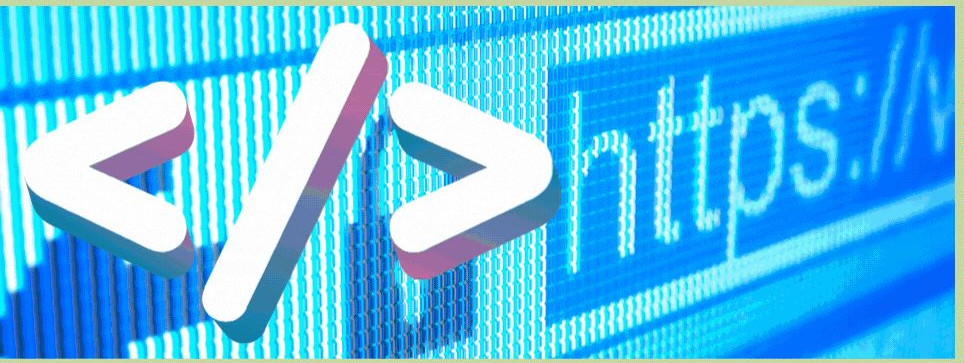


DESIGN



Discuss the role of design and coding in society.

SKILLS & PROCEDURES

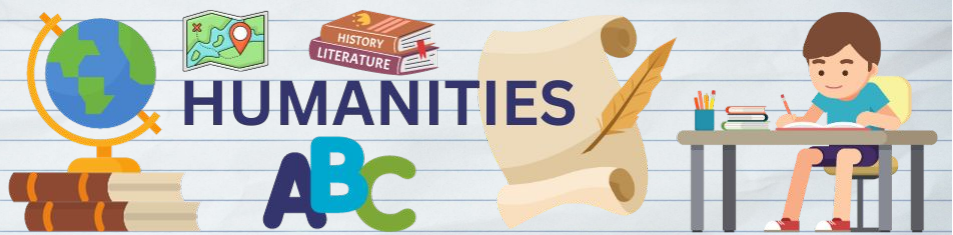


Discuss how computers, coding, or technology have had impacts.

SKILLS & PROCEDURES

Create a picture or 3D model of your vision of a future world.

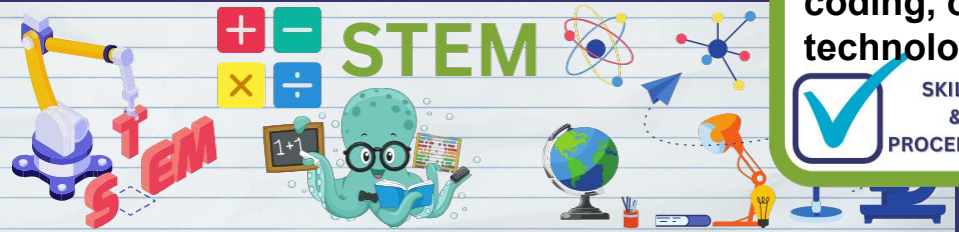
How might the Arts be impacted by technology in the future?



Write about what a future world might look like.

How might communication be impacted by technology?

Predict possible impacts of computers, coding, or technology.



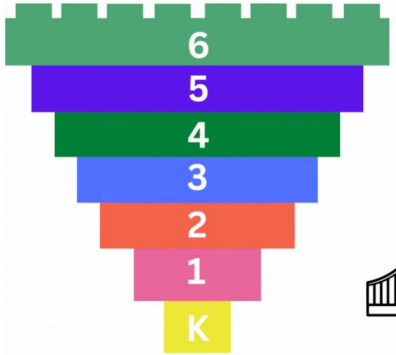
Research technology concepts and evaluate the likelihood they will exist one day.

Use a program like Scratch to create a story or game about the future.

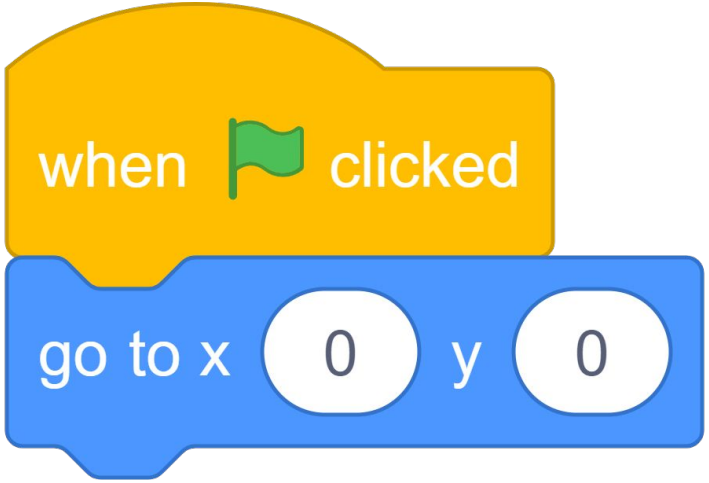
Research technology concepts related to health and medicine. What concepts do you think would be the most impactful on human health?

Use a visual block-based language to design code that includes relevant design structures.

SKILLS & PROCEDURES



Bridging Gaps



grade 5

Relate a block of code to an outcome or a behaviour.

SKILLS & PROCEDURES

Explain what will happen when single or multiple blocks of code are executed.

SKILLS & PROCEDURES

Translate a given algorithm to code using a visual block-based language.

SKILLS & PROCEDURES

Design an algorithm that includes a loop and translate it into code.

SKILLS & PROCEDURES

Mrs. D's SCRATCHTIVITIES

https://bit.ly/ScratchCheatCards

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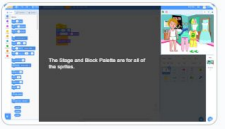
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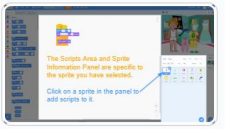

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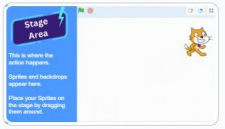

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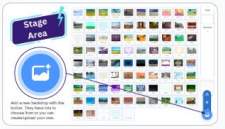

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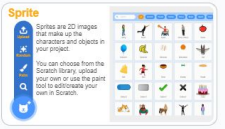

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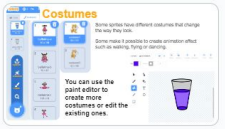

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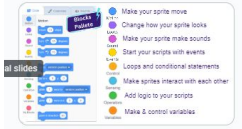

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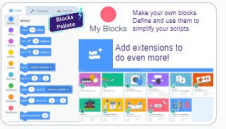

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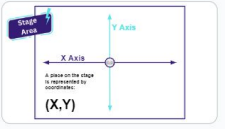

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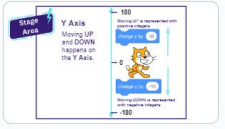

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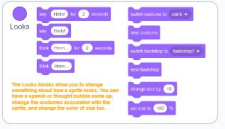

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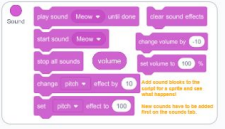

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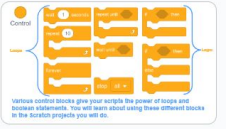

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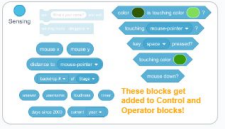

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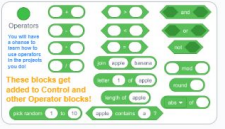

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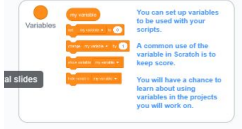

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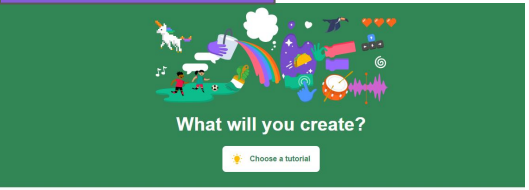
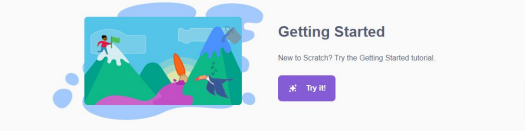
SCRATCH

scratch.mit.edu

IDEAS





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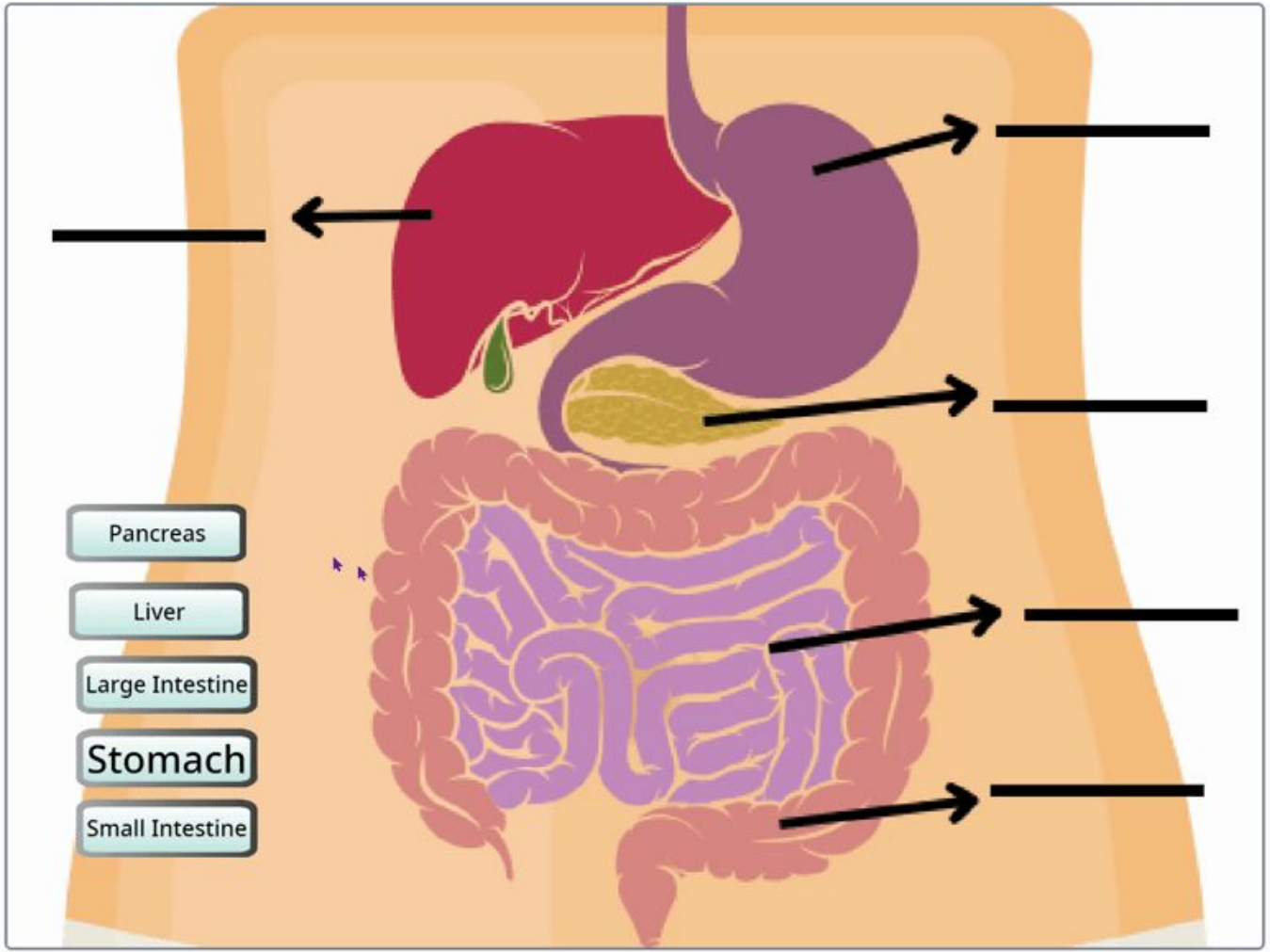
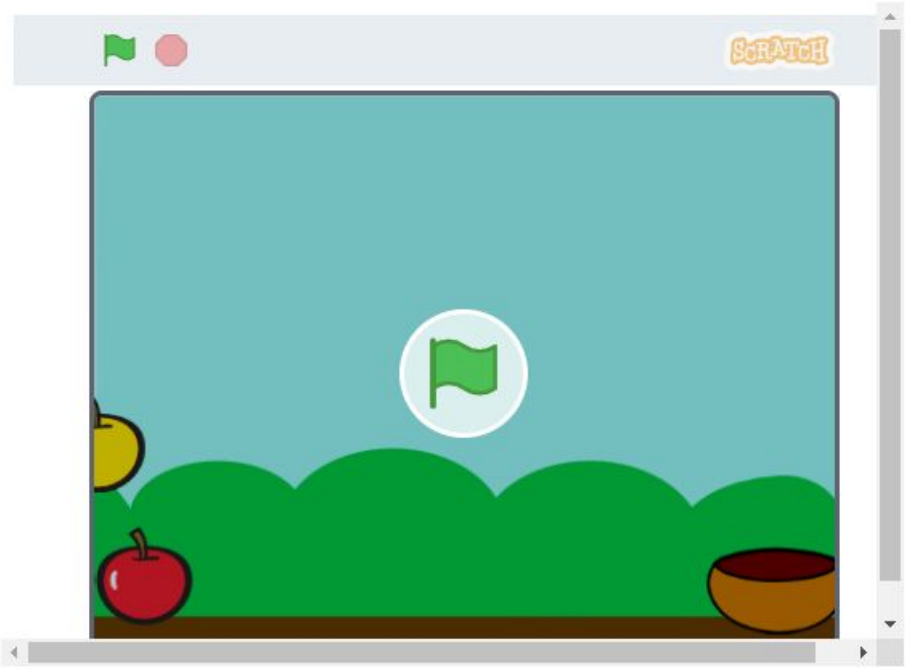
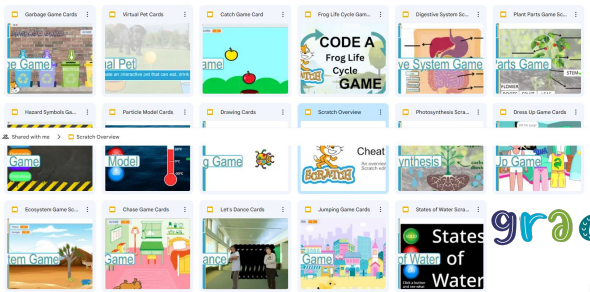


CATCH GAME

Instructions

Example





Relate a block of code to an outcome or a behaviour.

SKILLS & PROCESSES

Explain what will happen when single or multiple blocks of code are executed.

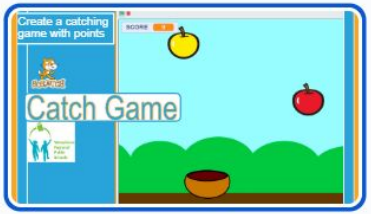
SKILLS & PROCESSES

Translate a given algorithm to code using a visual block-based language.

SKILLS & PROCESSES

Design an algorithm that includes a loop and translate it into code.

SKILLS & PROCESSES



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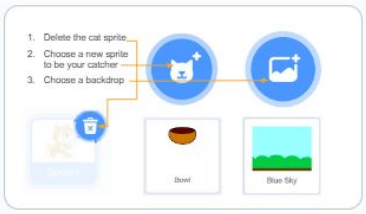

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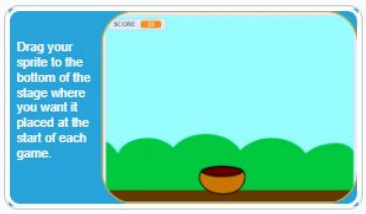

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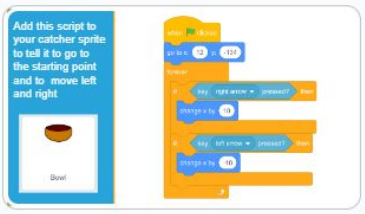

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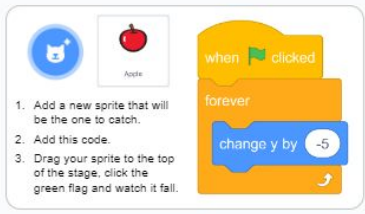

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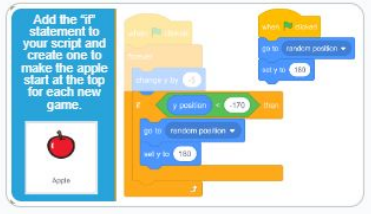

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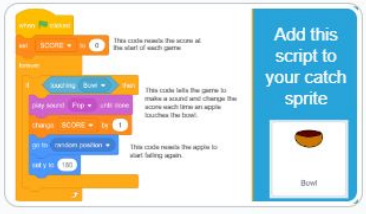

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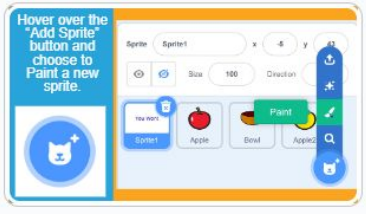

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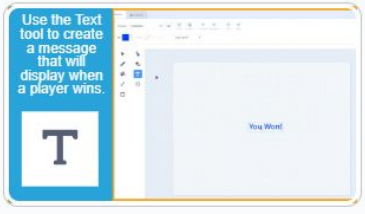

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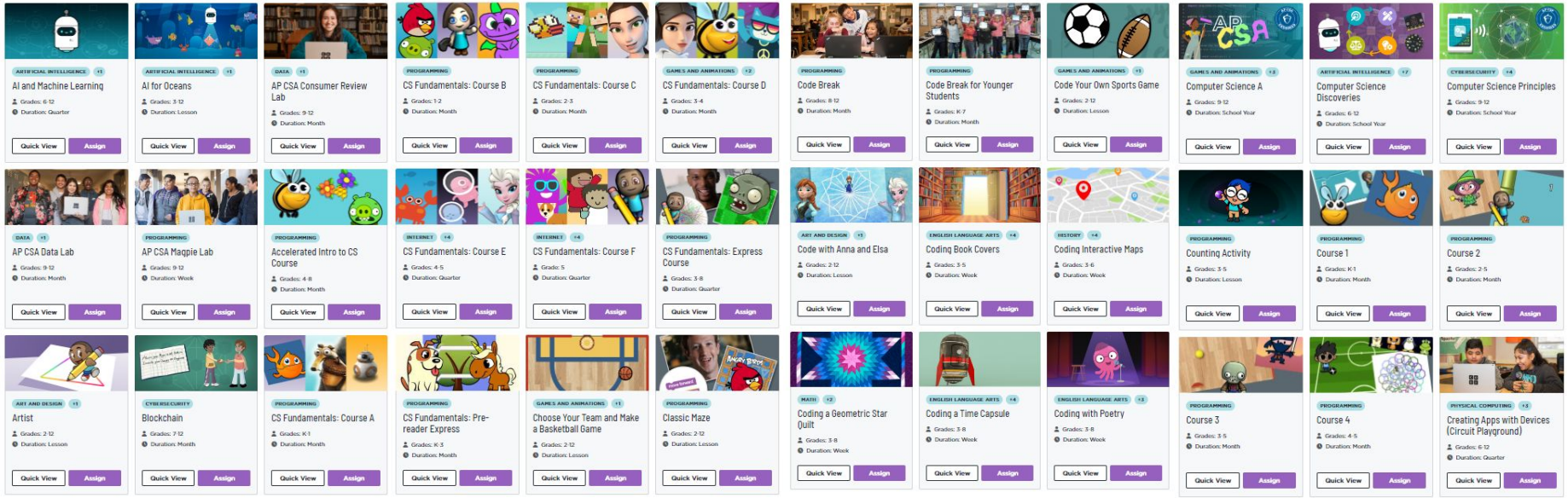
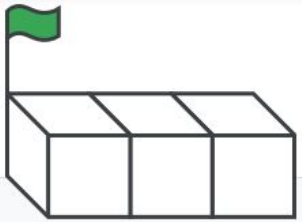
CODE.ORG

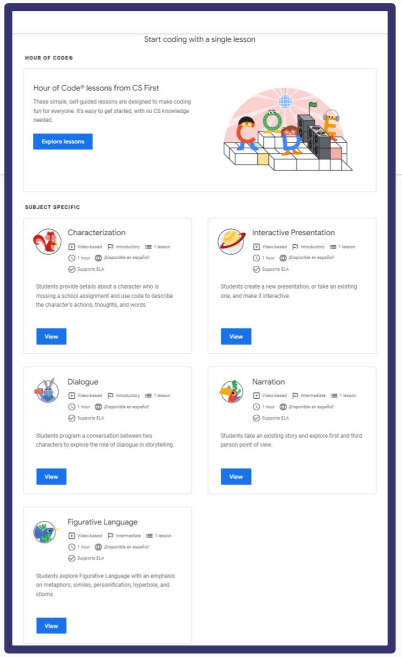
Curriculum Catalog

Find the perfect fit for your learning environment: Code.org courses, tutorials, and more designed for all ages and experience levels.



Google CS First





Get started with CS First

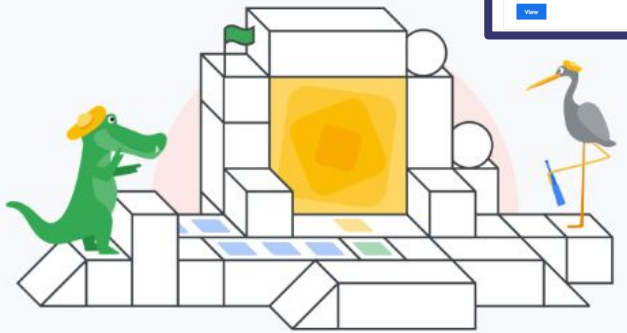
Coding instructions like hints, highlights, and text-to-speech live inside *Scratch for CS First*

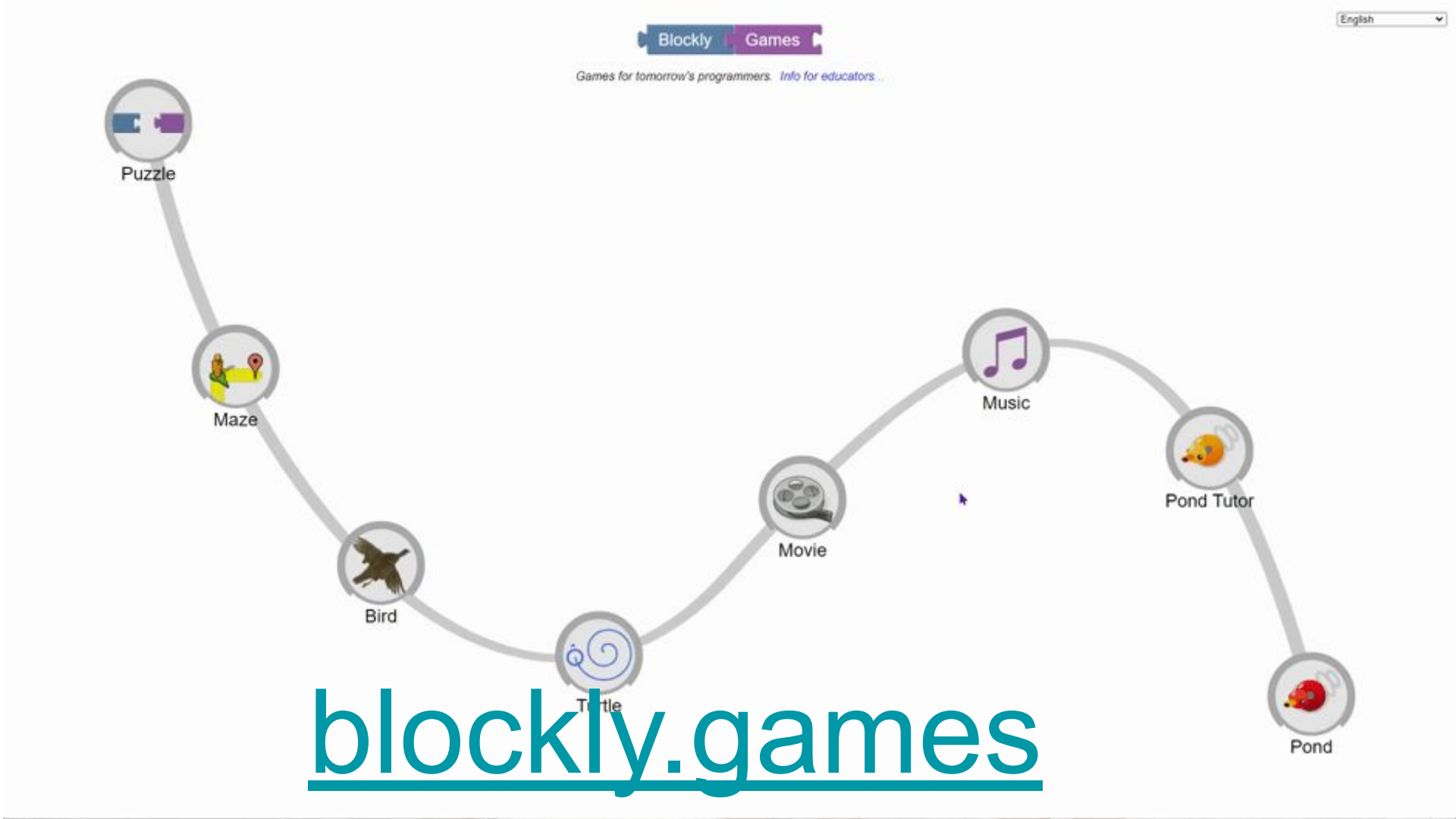
Welcome to CS First

Text-based · Introductory · 4 lessons · 4–6 hours

Students go on a first journey through Scratch for CS First with four fun projects that introduce the core elements of Scratch and foundational coding skills.

View

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Games for tomorrow's programmers. Info for educators...
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Puzzle
Maze
Bird
Turtle
Movie
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Pond Tutor
Pond
blockly.games

Toys!!!

Your ATA Library

The Alberta Teachers' Association

Kits in Your ATA Library

- Makerkits A-D
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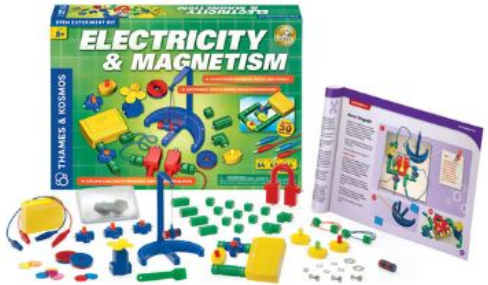
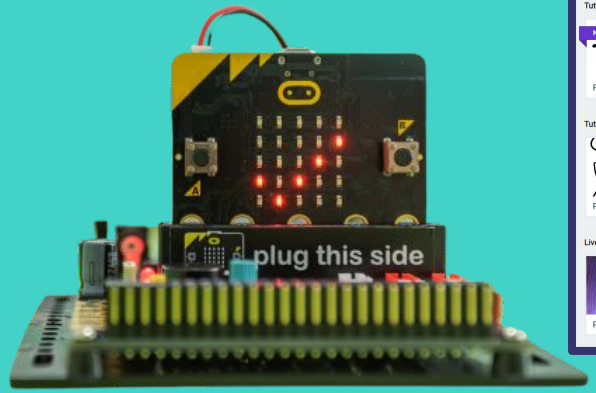


Toys!!!

micro:bits



Sphero Minis