# Grade Four Computer Science

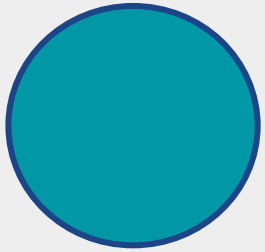
IF you teach THEN they will learn

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

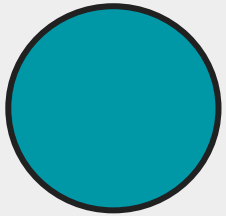
**1.4 million**

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

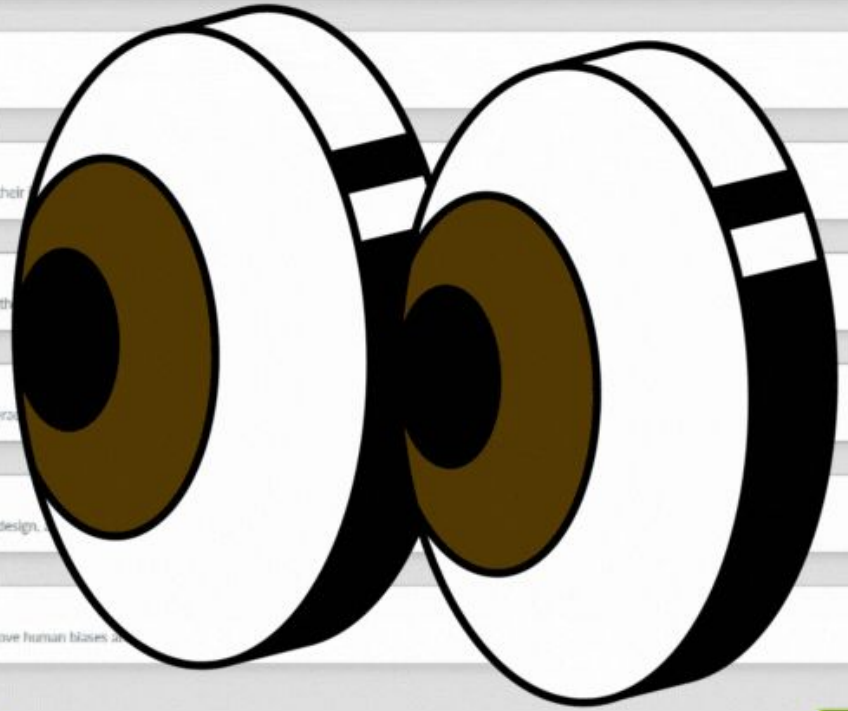
Space: Understandings of the living world, Earth, and space are deepened through investigating natural systems and their inter

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** | **How can design meet needs?** |
| **Learning Outcome** | **Students examine and apply design processes to meet needs.** |

| Knowledge | Understanding | Skills & Procedures |
|---|---|---|
| Design processes include<br>• understanding the problem<br>• forming ideas (ideating)<br>• planning<br>• creating<br>• analyzing<br>• testing<br>• troubleshooting<br><br>Feedback helps to ensure all needs are considered during the design process.<br><br>An algorithm is a sequence of instructions.<br><br>Artifacts are objects or products made by humans, machines, or computers through the process of design. | Design involves processes that can transform ideas into artifacts that meet needs. | Plan and create an artifact to meet a need.<br><br>Provide feedback to others during the design process.<br><br>Test an artifact to confirm that it meets intended needs.<br><br>Collaborate to design an algorithm to solve a problem.<br><br>.Examine availability and cost of materials during design. |

| | |
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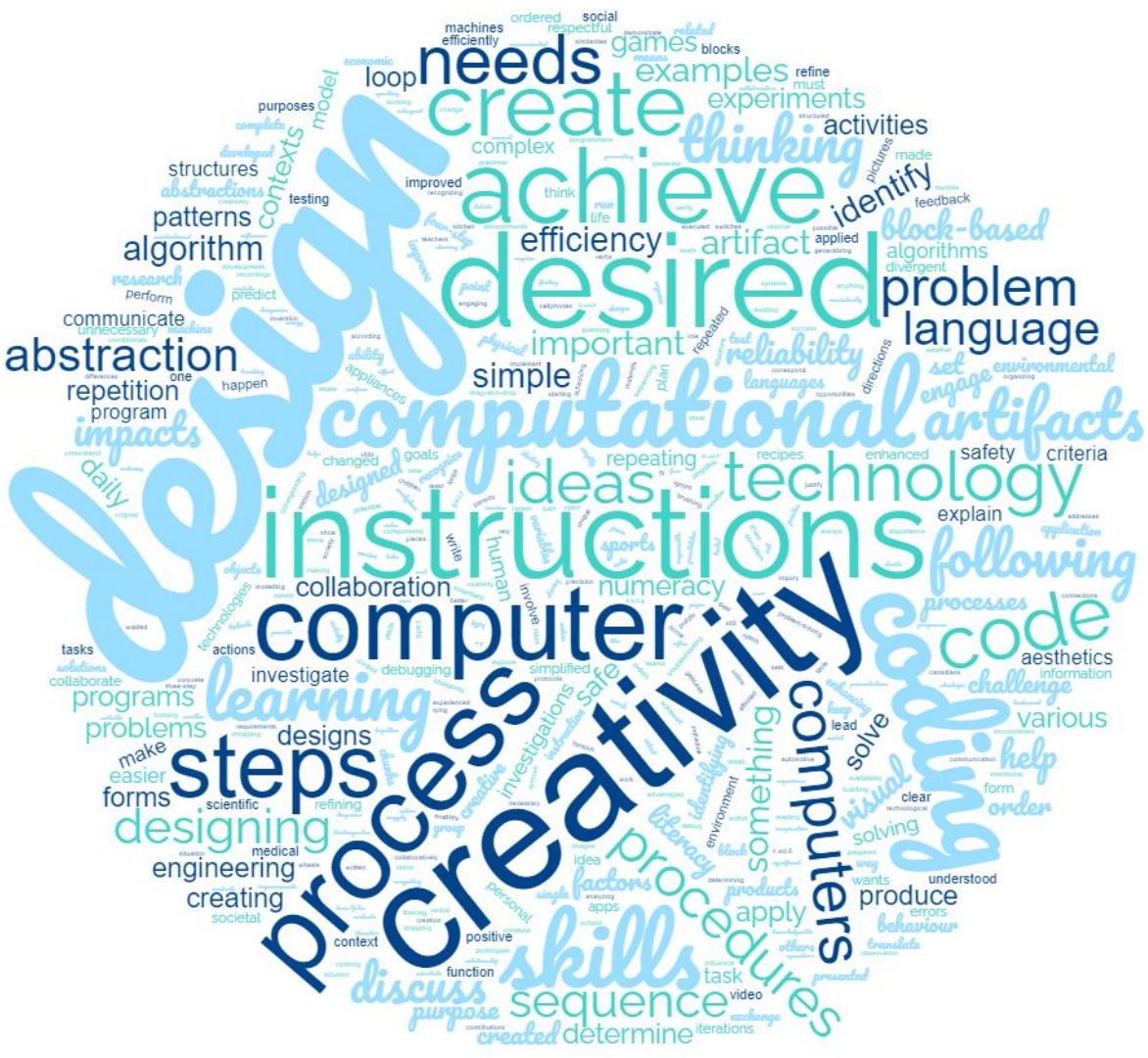
|---|---|---|
| Design can produce many artifacts, including<br>• algorithms<br>• models<br>• prototypes<br>• blueprints<br>• programs<br>• experiments<br>• objects<br><br>Design can deal with complex problems.<br><br>Availability of materials and costs are considerations in design. | Design involves processes that can transform ideas into artifacts that meet needs. | Plan and create an artifact to meet a need.<br><br>Provide feedback to others during the design process.<br><br>Test an artifact to confirm that it meets intended needs.<br><br>Collaborate to design an algorithm to solve a problem.<br><br>.Examine availability and cost of materials during design. |

**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

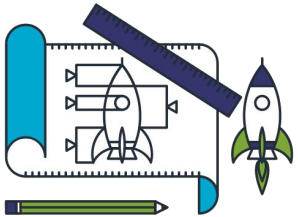
Construct Point
of View Based
on User Needs

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?

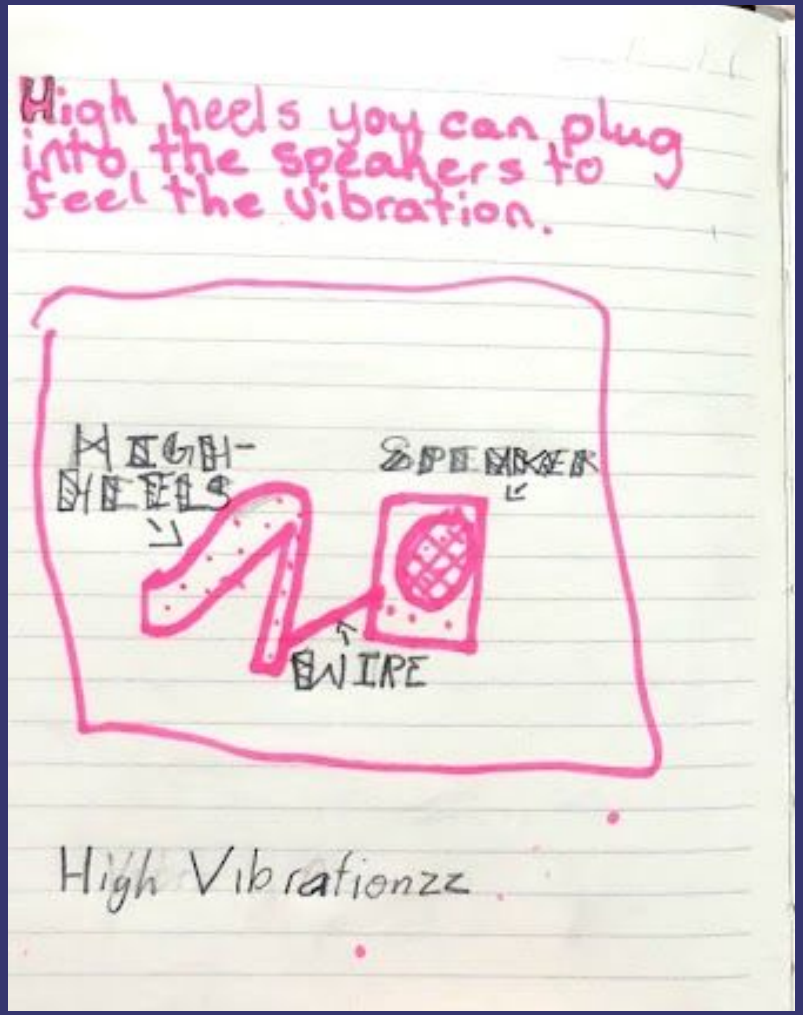
Tip: It's not that she is deaf.

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?

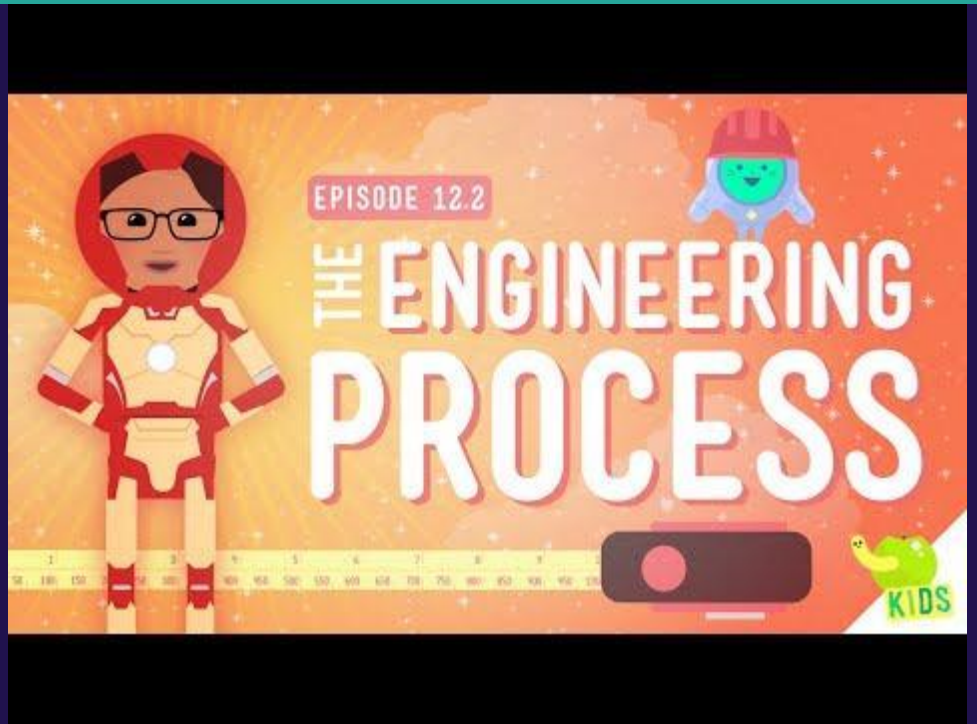
She sings in her stocking feet so she can feel the vibrations.

- 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

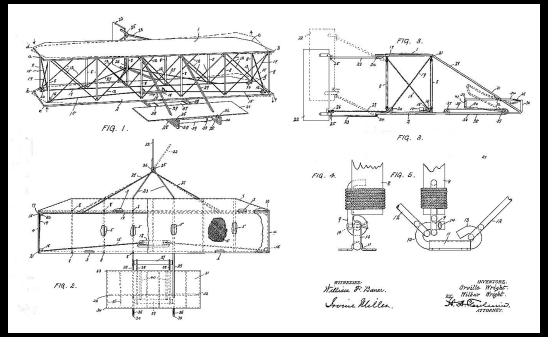
There are NO bad ideas!

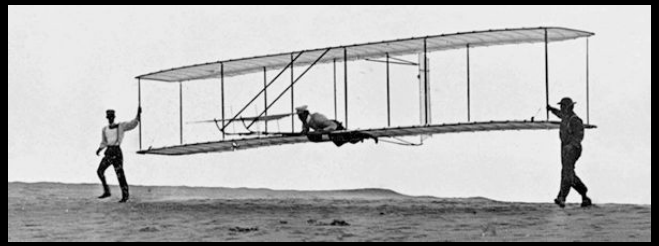
Think about your audience's needs!

Quantity over Quality!

Ideas! Ideas! Ideas!

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





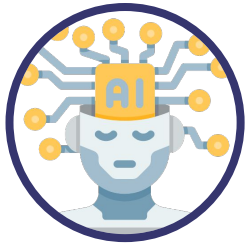
Empathize → Define → Ideate → Prototype → **Test**

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

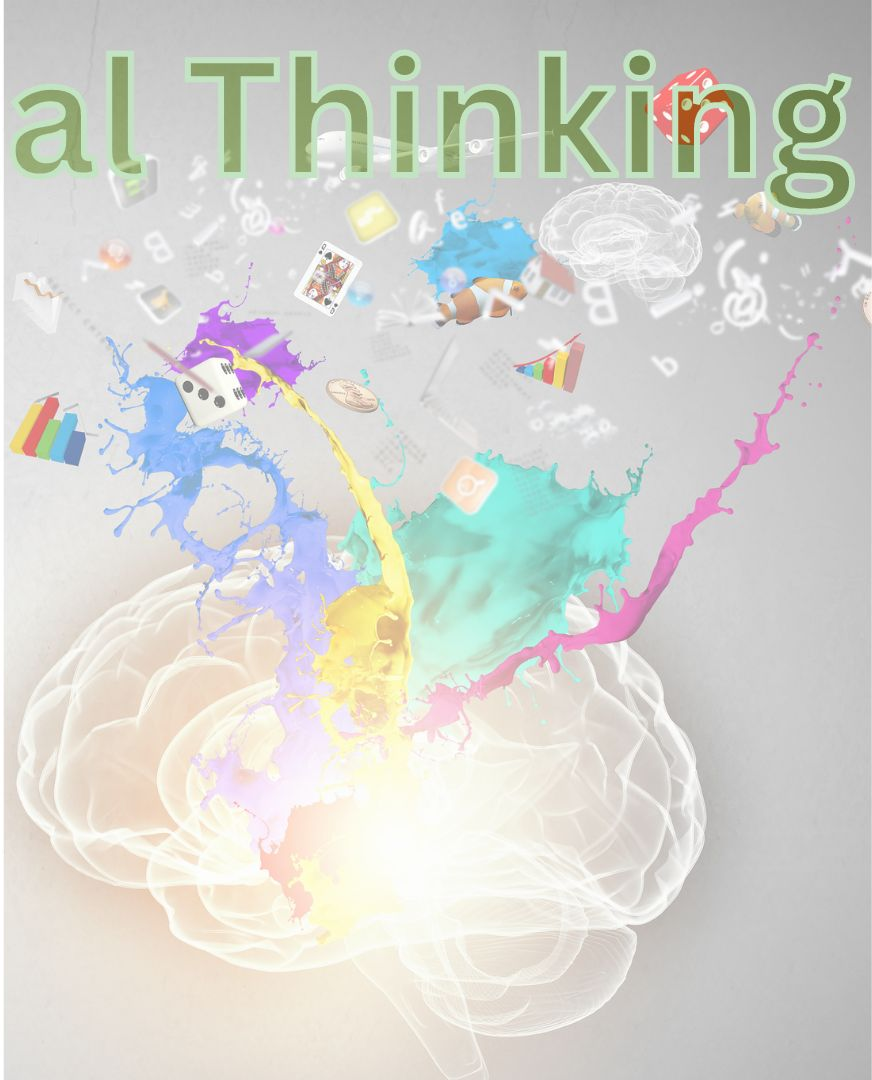
## Decomposition




## Pattern Recognition

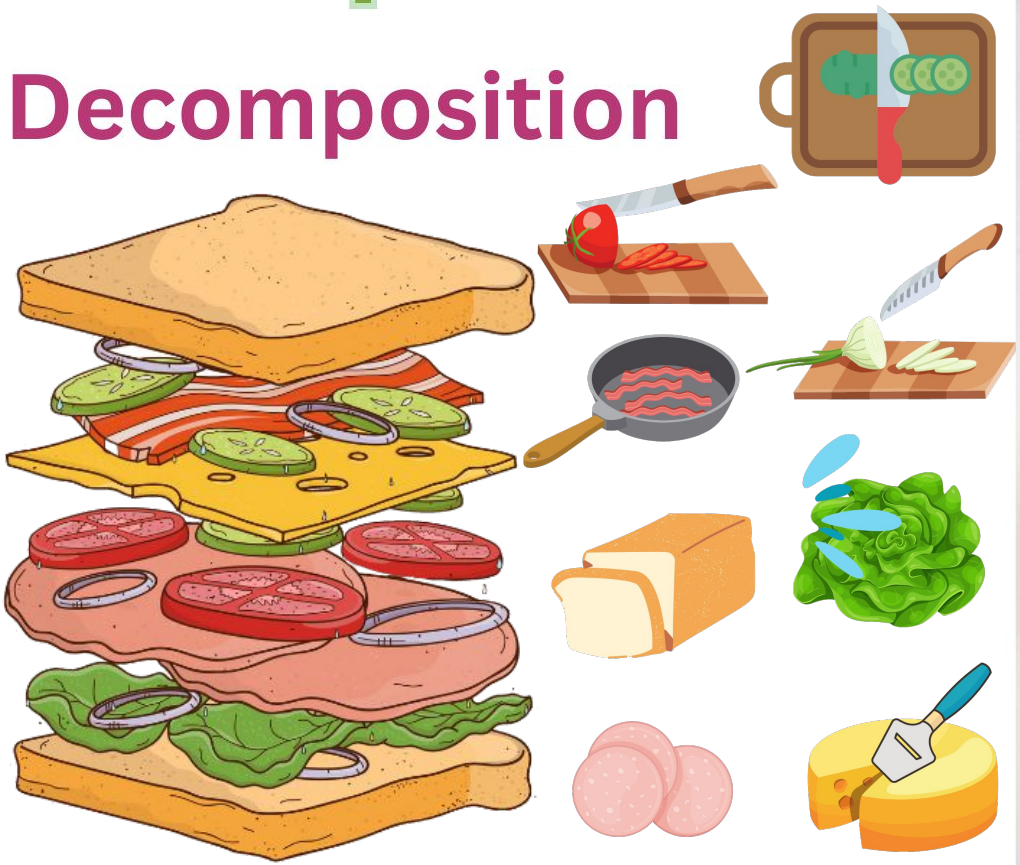
## Pattern Abstraction

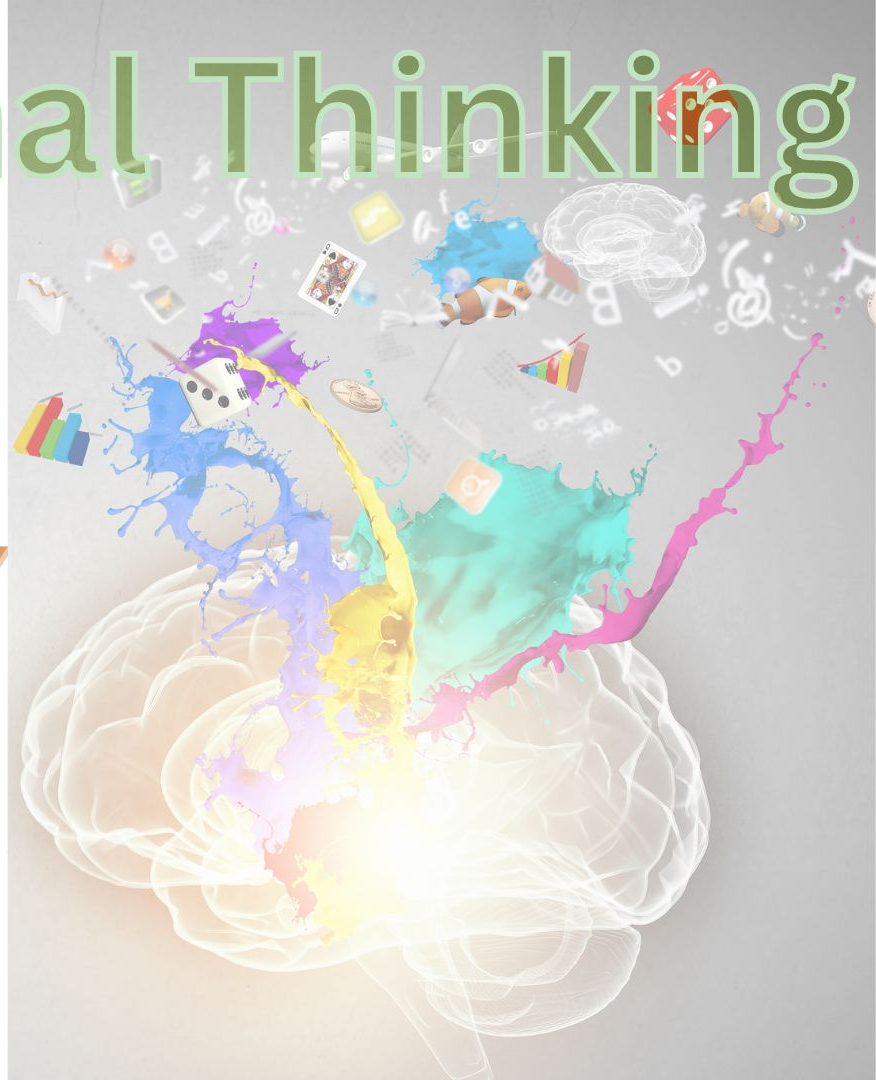
## Algorithm Design



# Computational Thinking

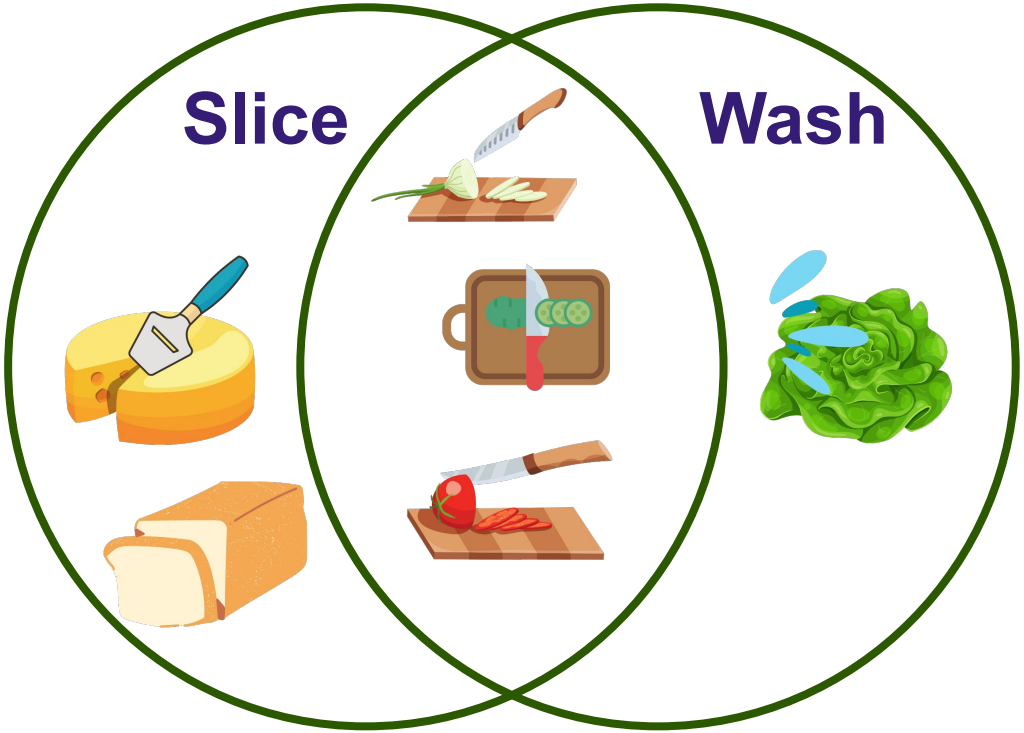
## Decomposition

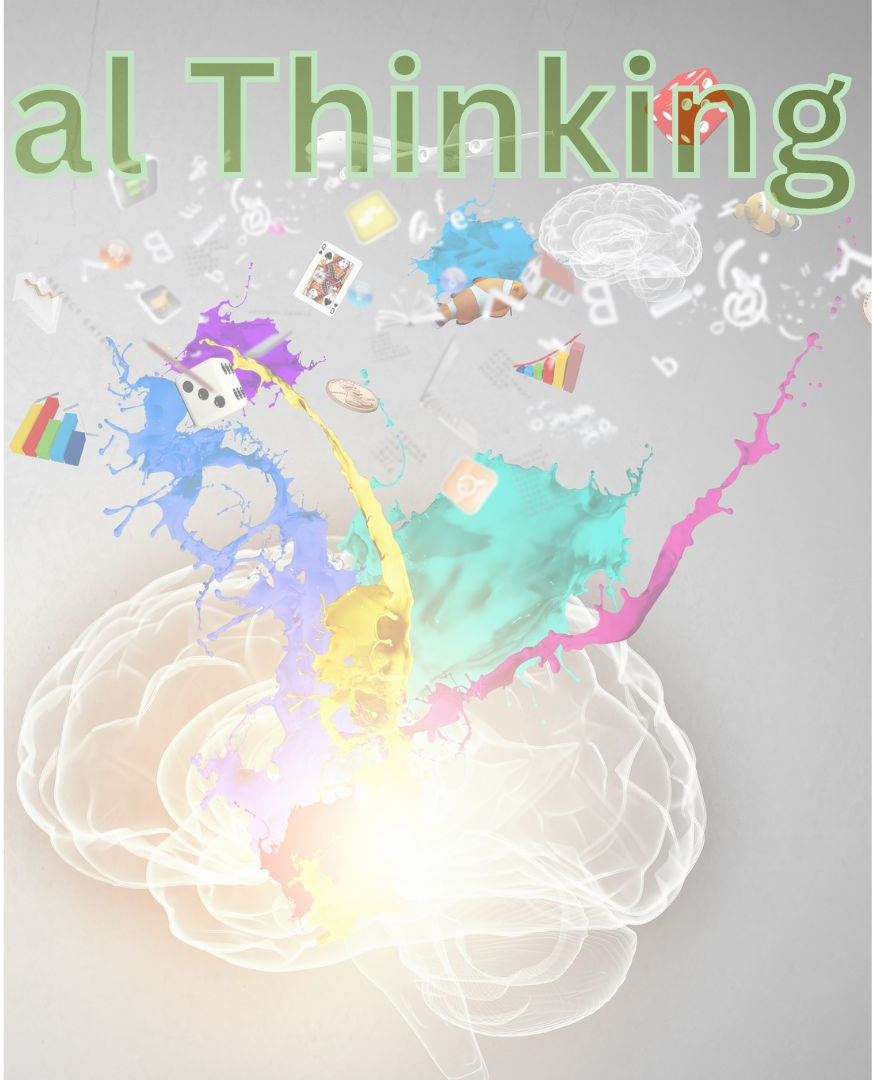




# Computational Thinking

## Pattern Recognition



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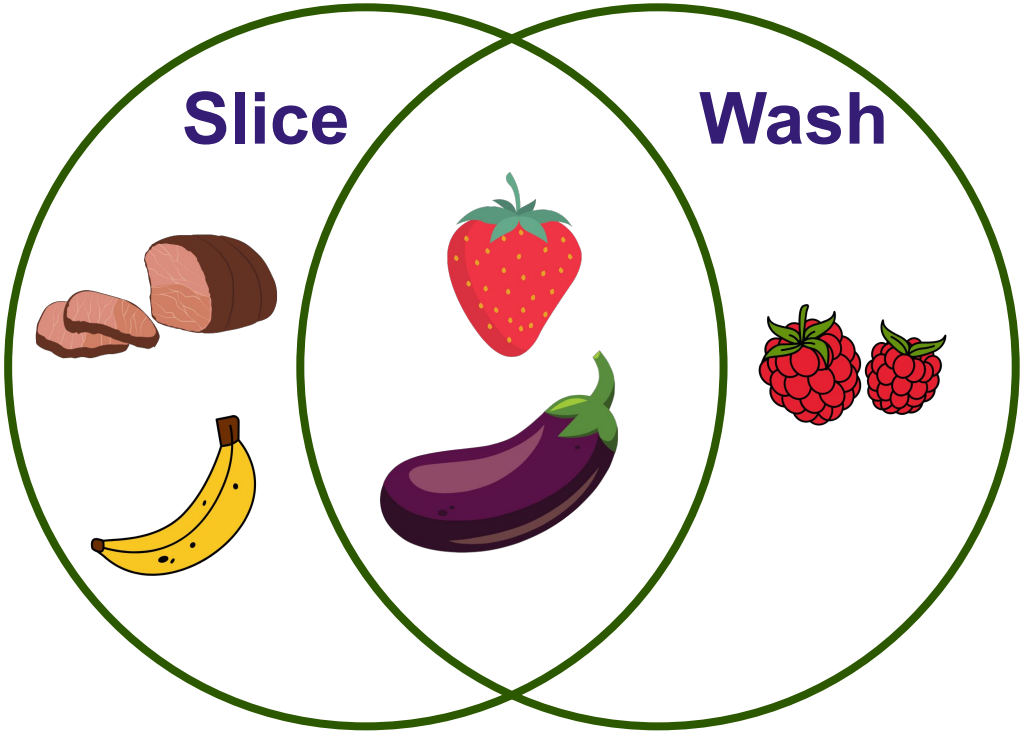


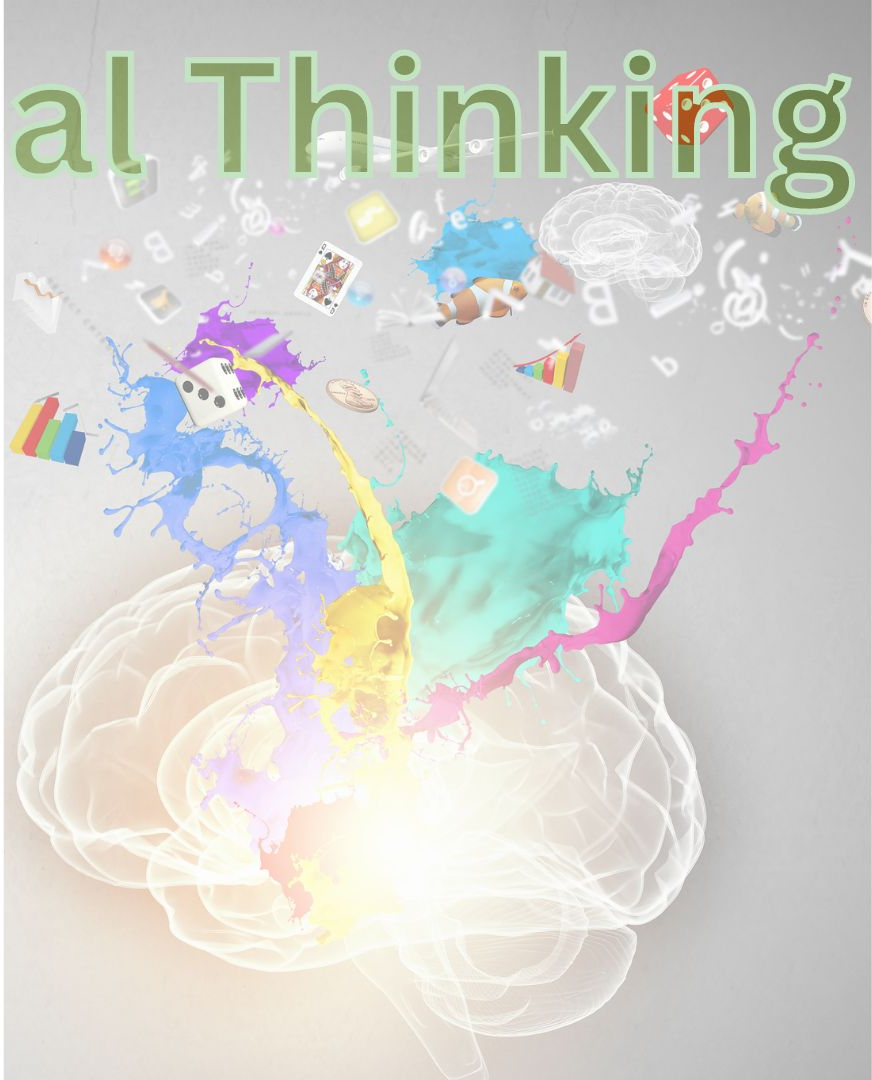

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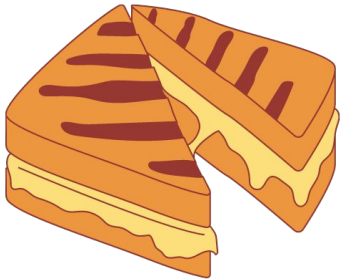
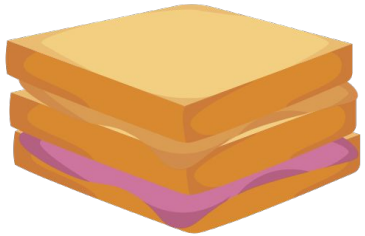
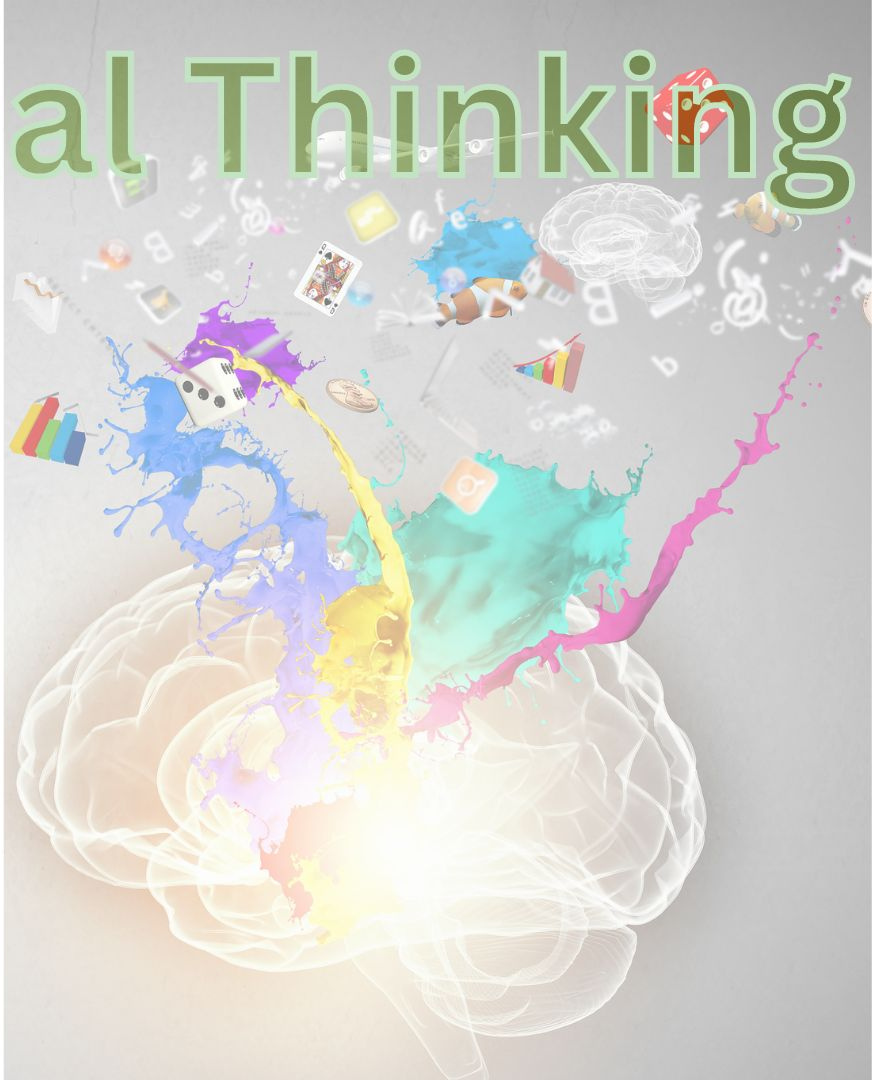


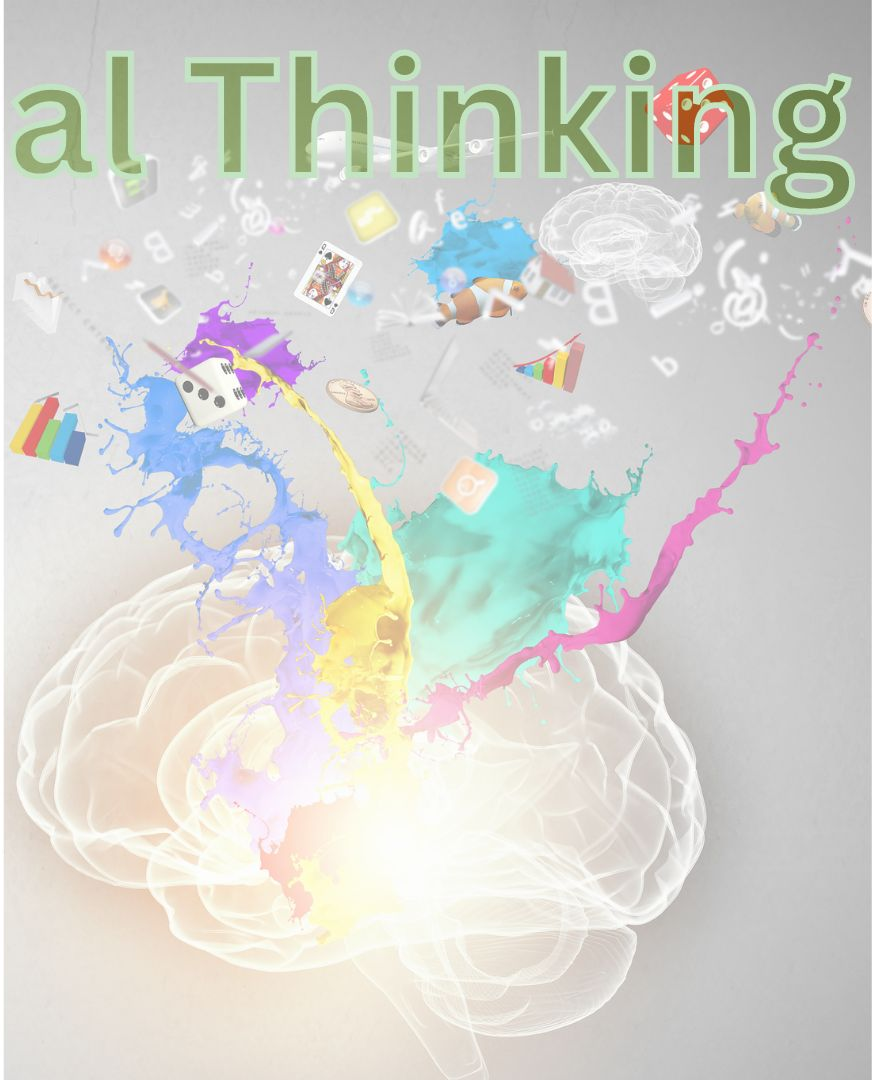


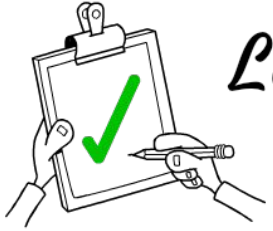


# Computational Thinking

## 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





# 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.

## 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

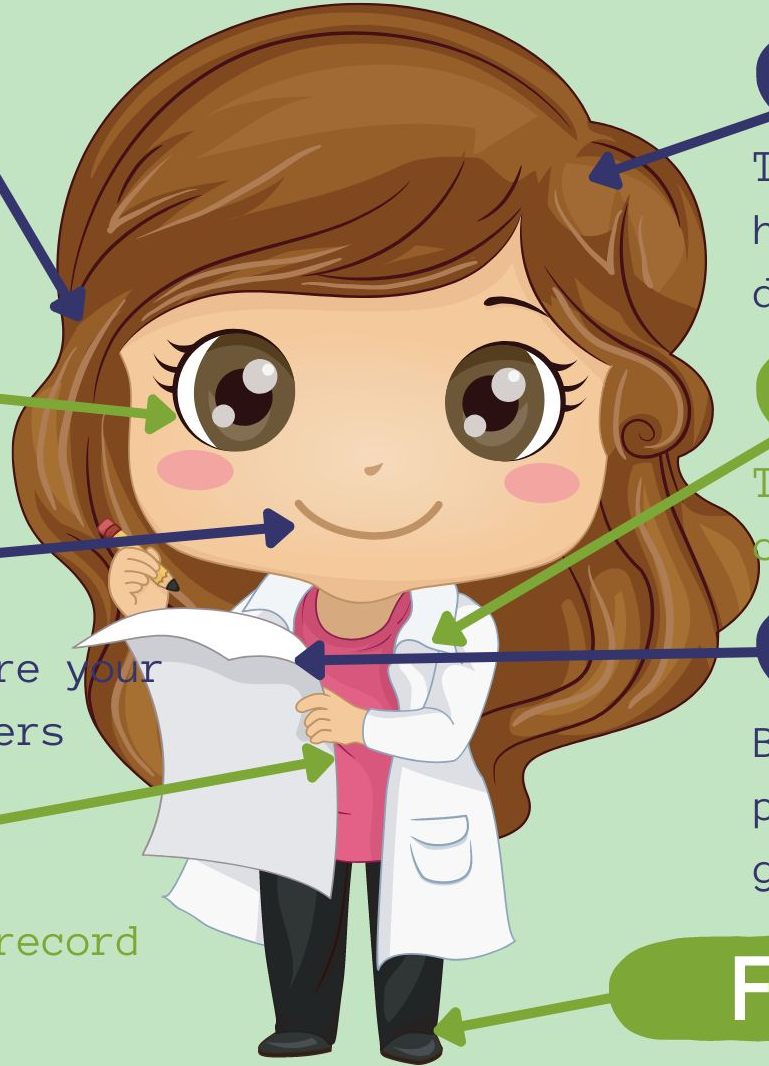
To be brave and take chances!

## Tools

Beakers, Chromebooks, pencils, magnifying glasses & more

## Feet

To move safely



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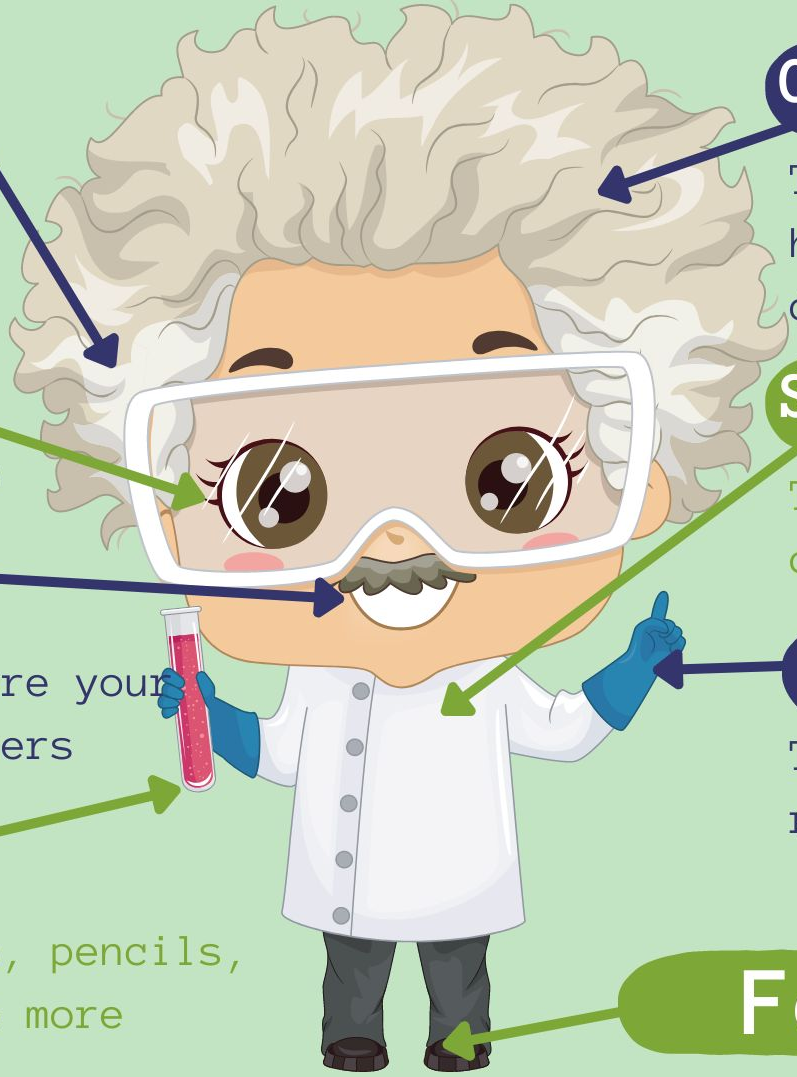

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# Attack of the Kidbots

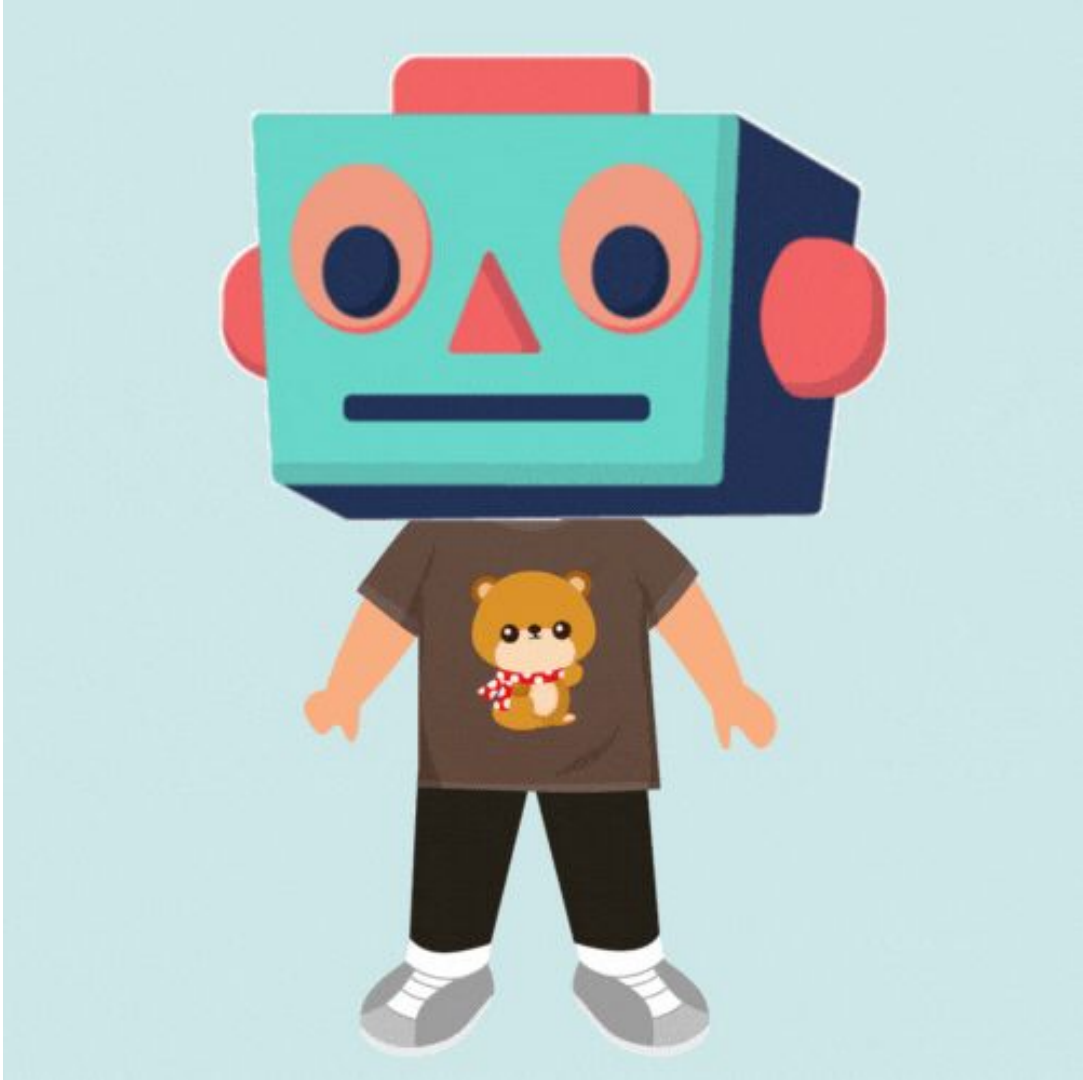
Classroom routines

Learning instructions

Other subject areas

Outside of school

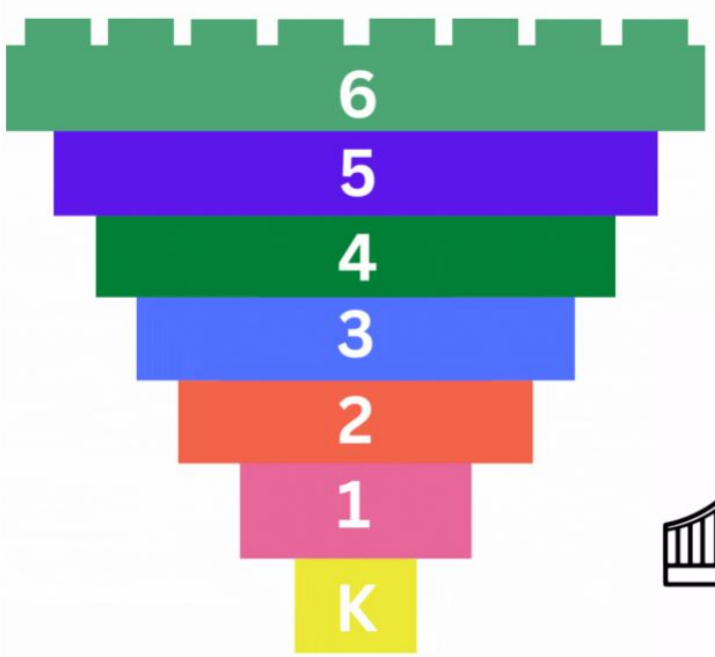
- Community
- Family
- The world
- In nature



# Coding Knowledge

Grade 2

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



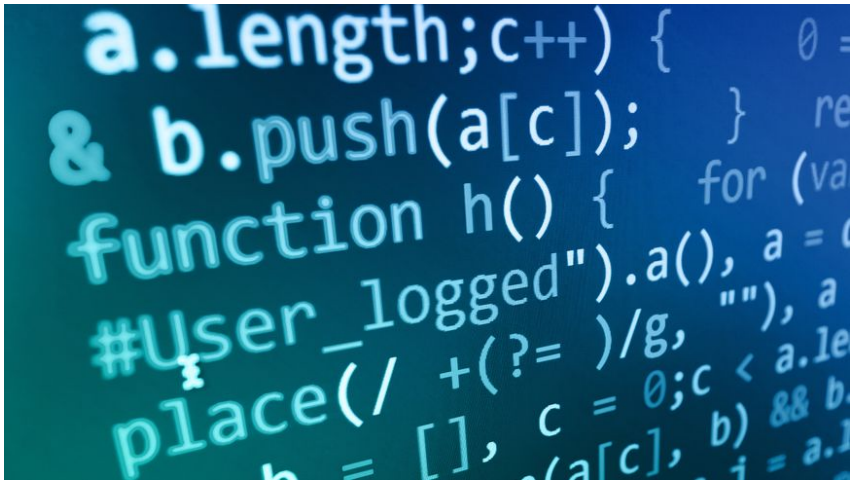

Bridging Gaps

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
3
4
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6
CARD
7
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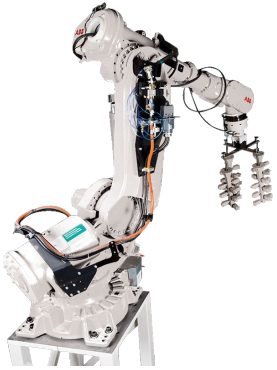
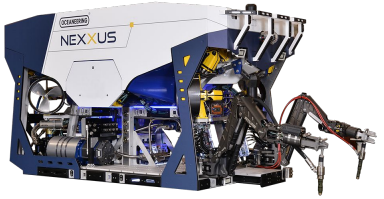
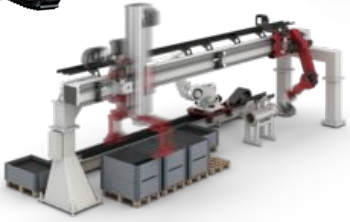
#

# ROBOTS!!!



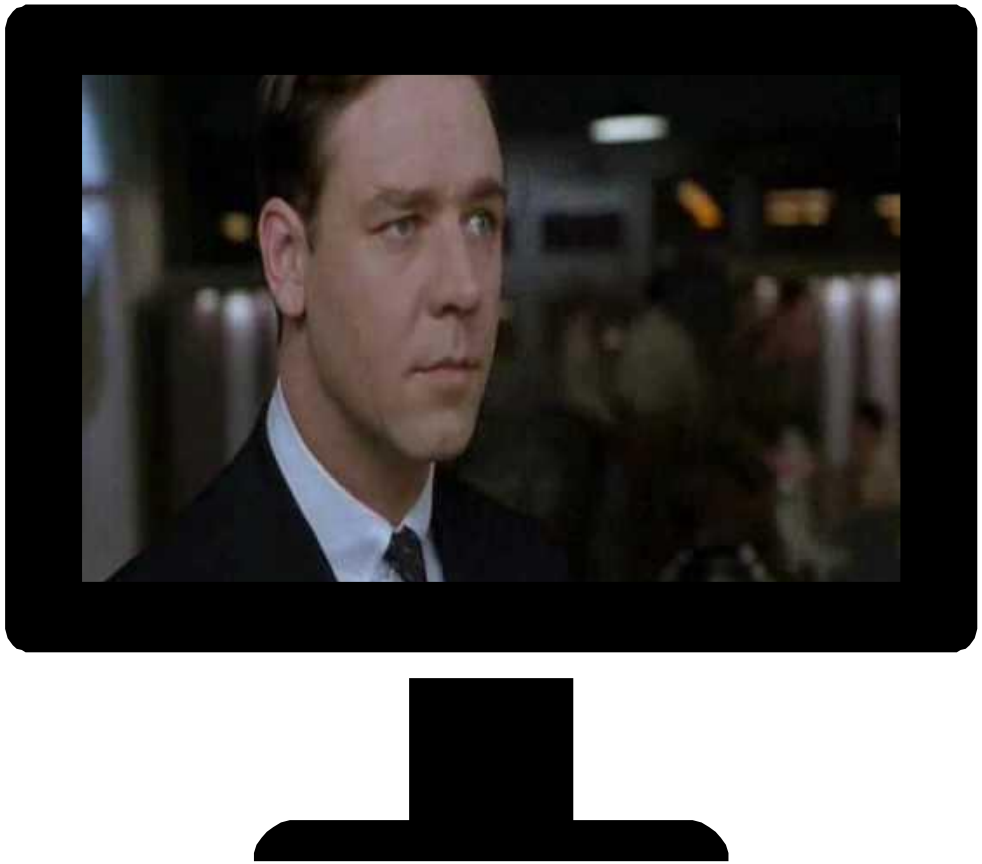




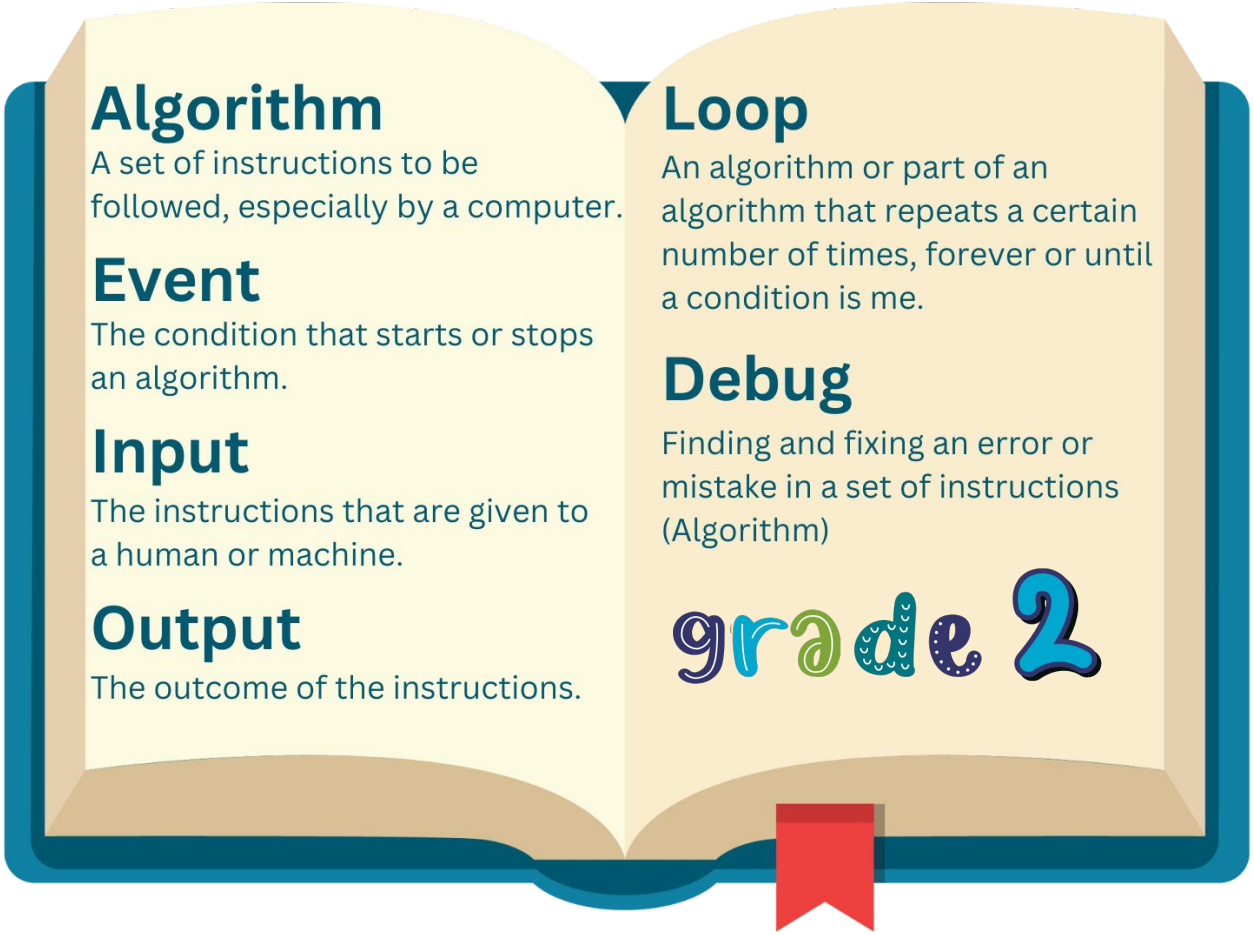


# Coding

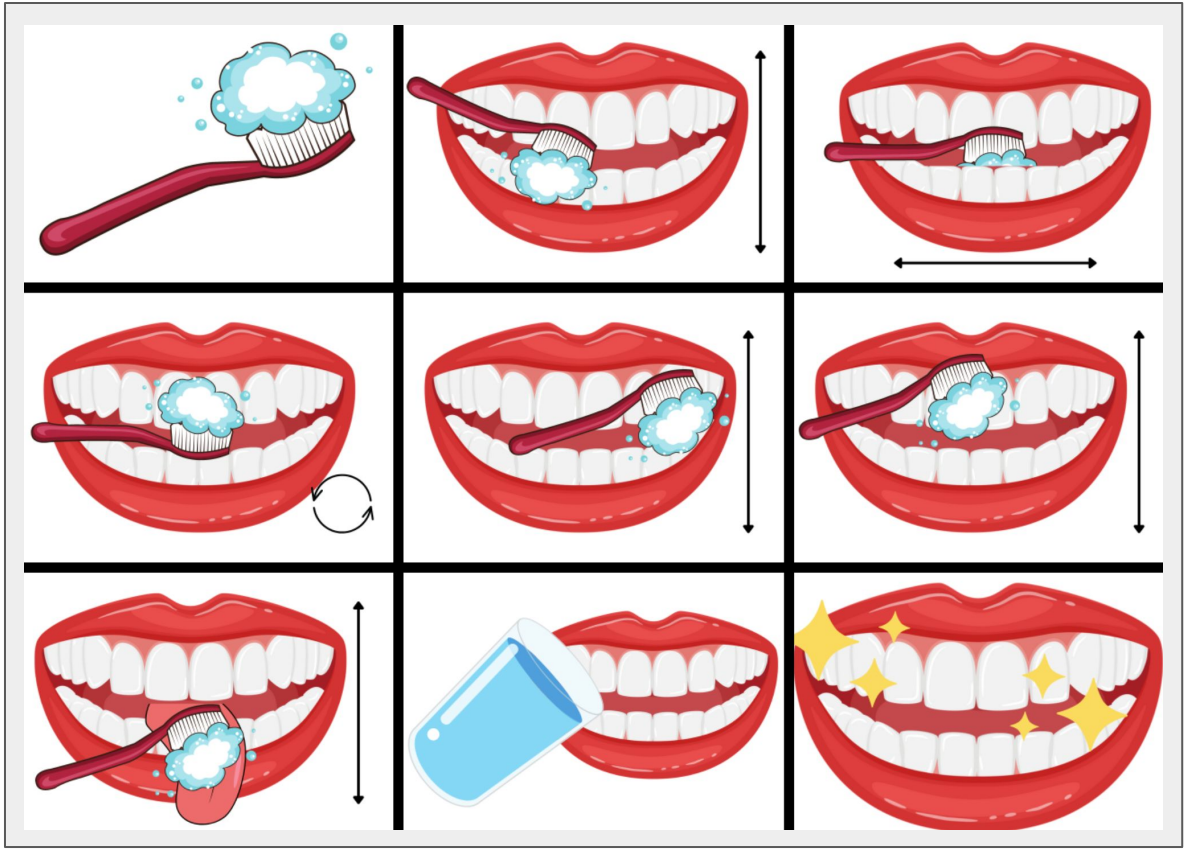
What we think it is…



# Computer Science Vocabulary



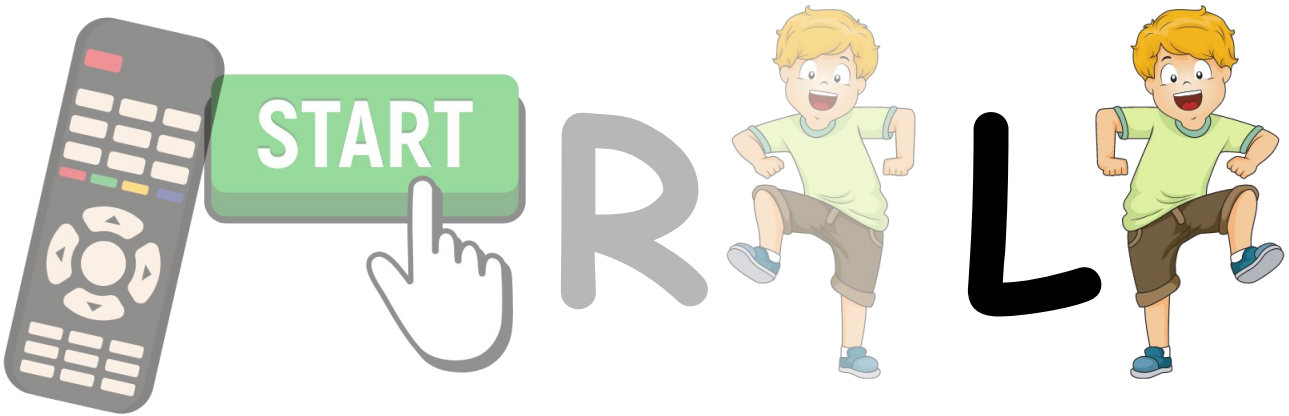
# What Coding Really is



# EVENT

# INPUT / OUTPUT

# ALGORITHM



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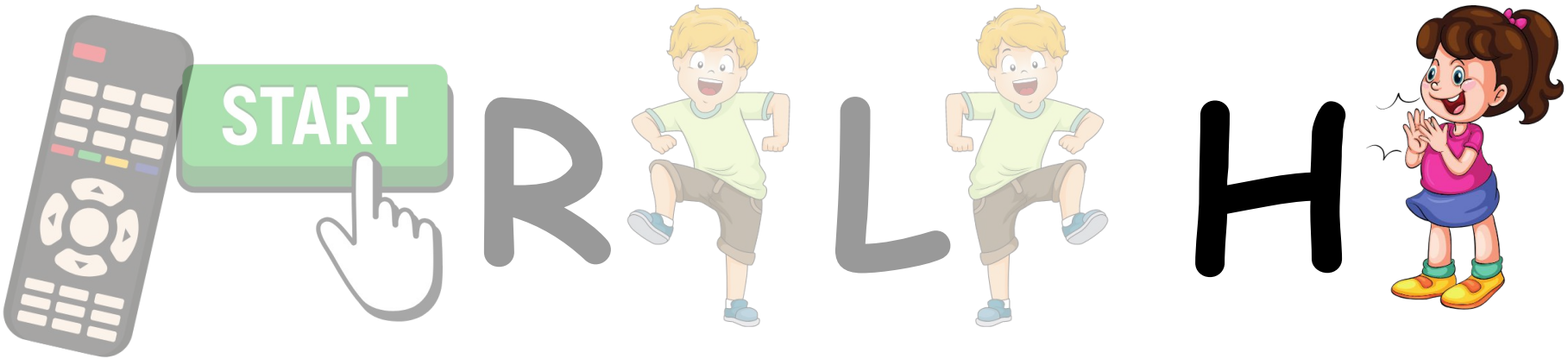

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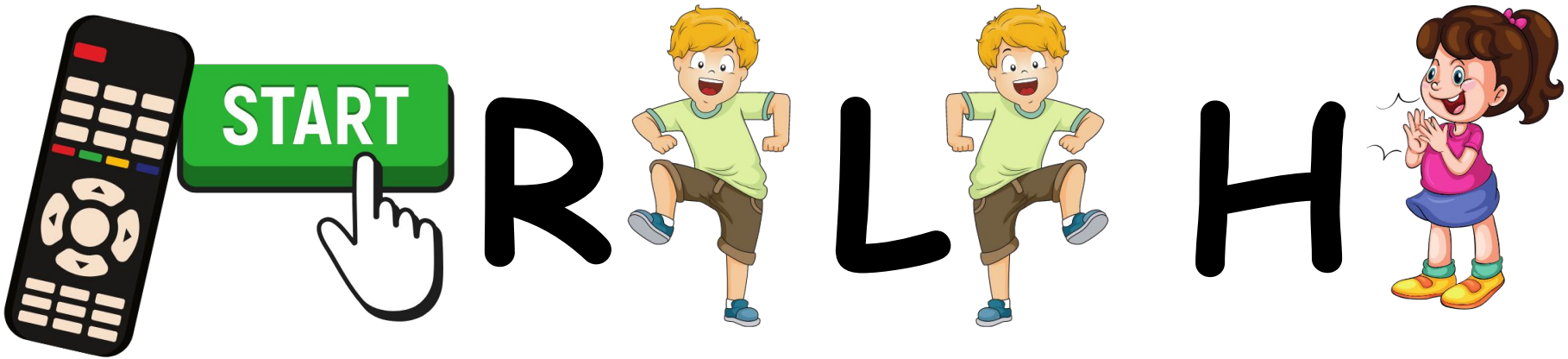
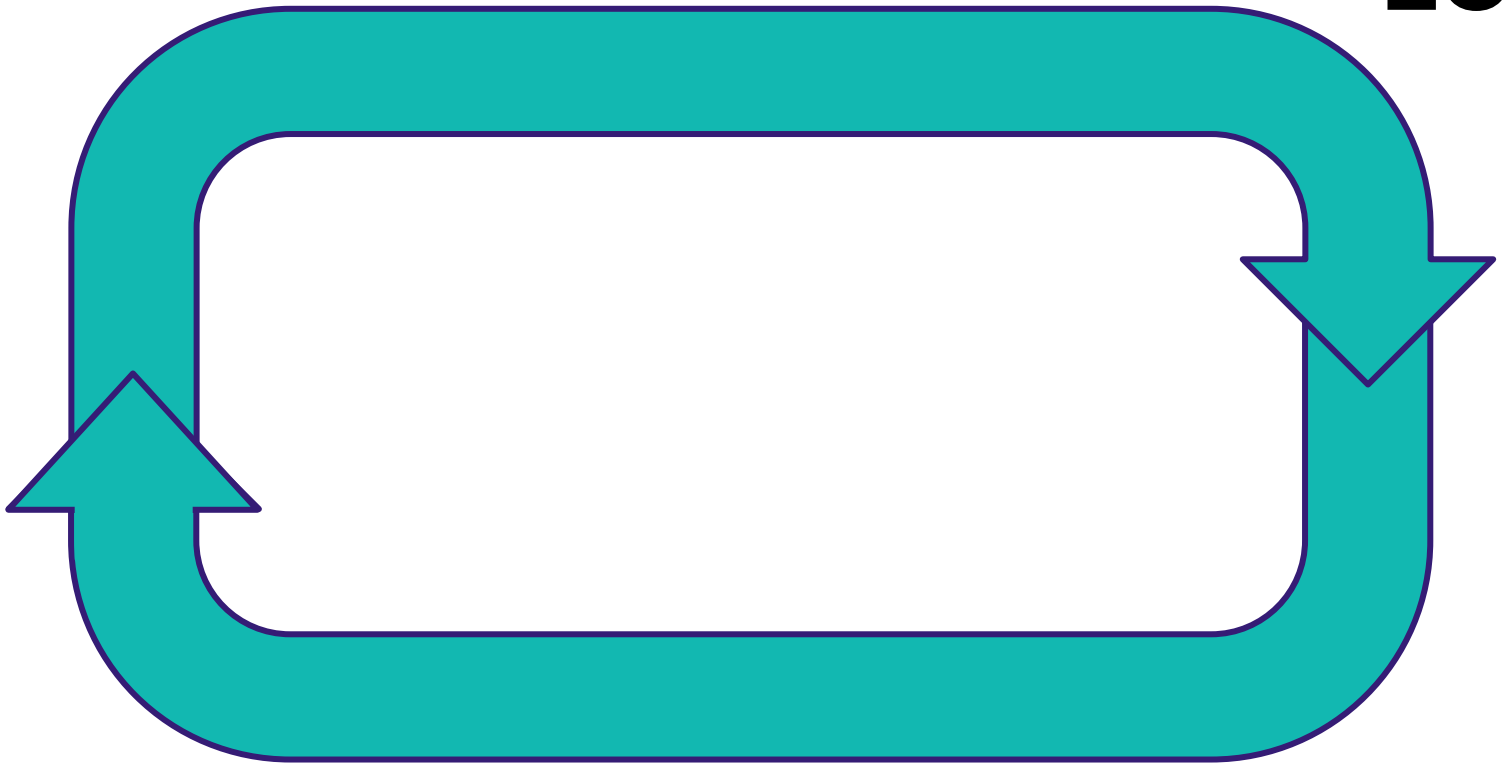



R H


L H

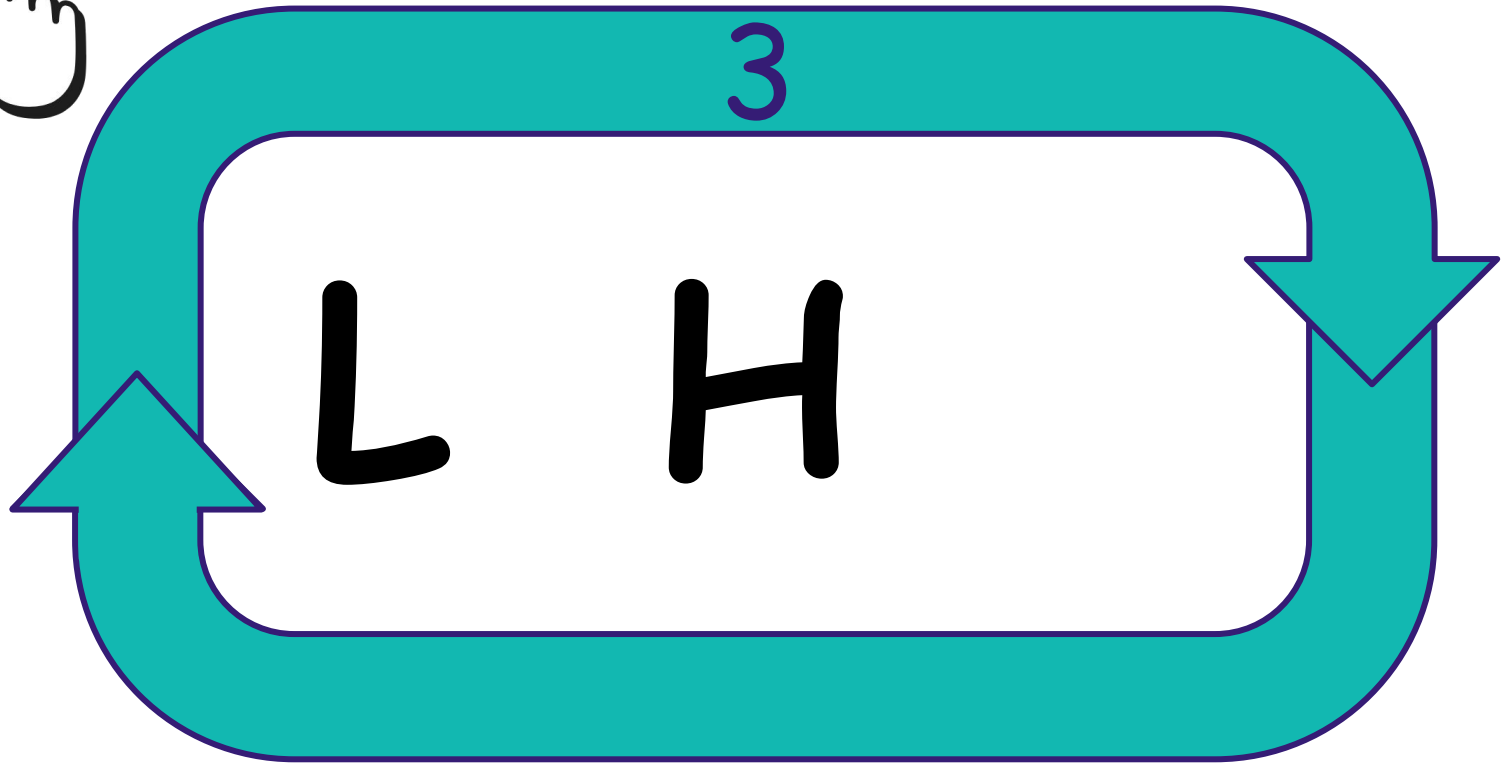

L H R

# LOOP



START

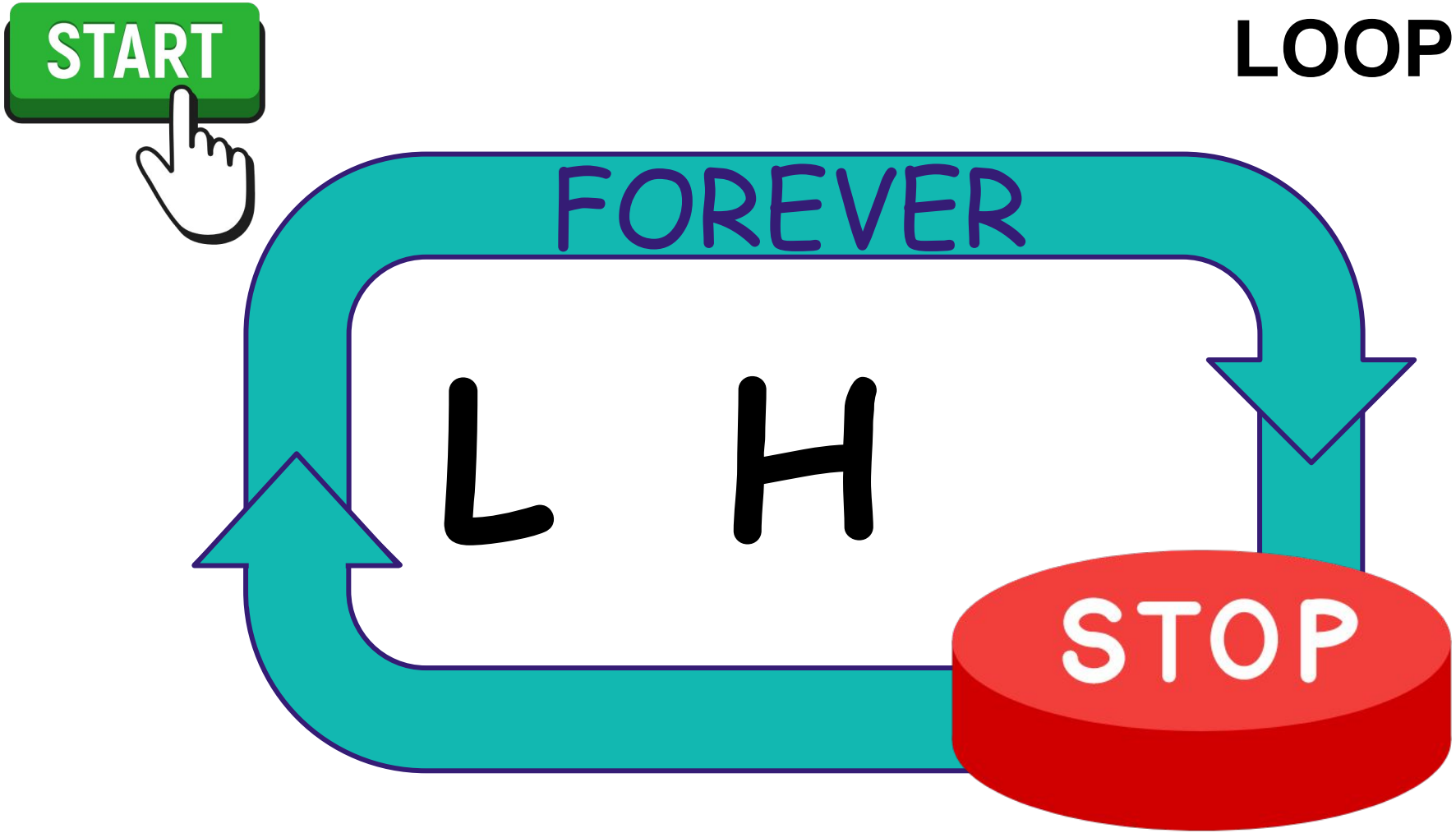
# LOOP



START

# LOOP

# LOOP



START

LOOP

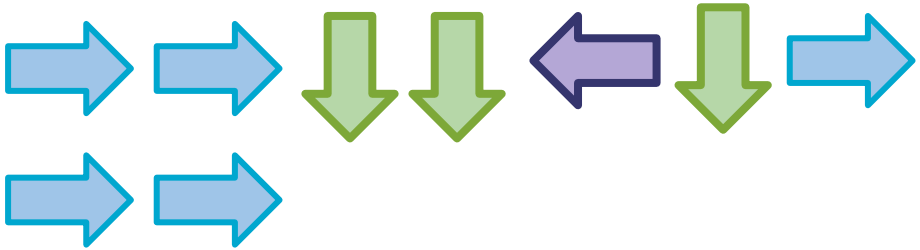
START

LOOP

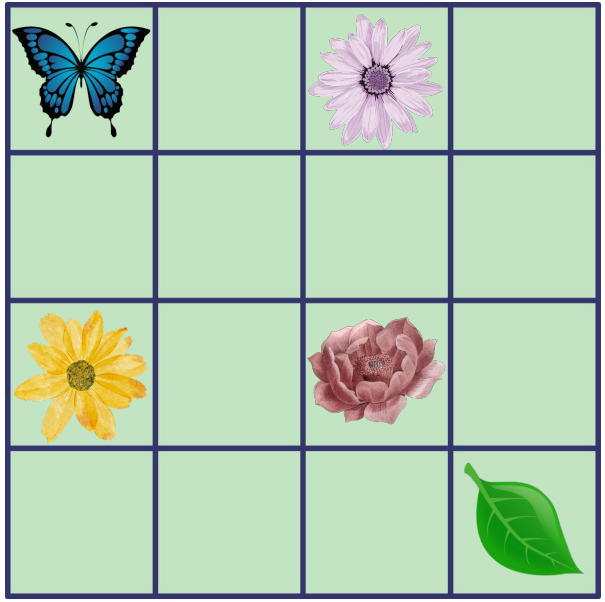
FOREVER

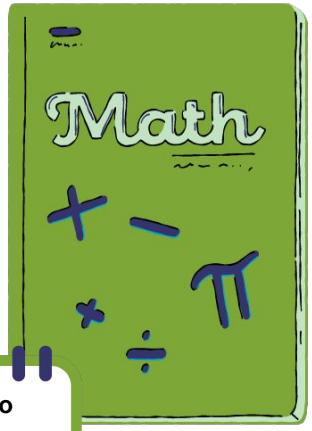
START

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

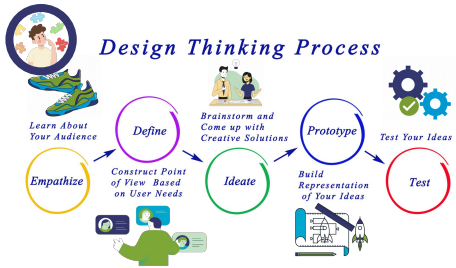
2, 4, 6, 8,
10, 11, 13,
15, 17, 19

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

Design processes include
- understanding the problem
- forming ideas (ideating)
- planning
- creating
- analyzing
- testing
- troubleshooting




Feedback helps to ensure all needs are considered during the design process.

An algorithm is a sequence of instructions.

Artifacts are objects or products made by humans, machines, or computers through the process of design.

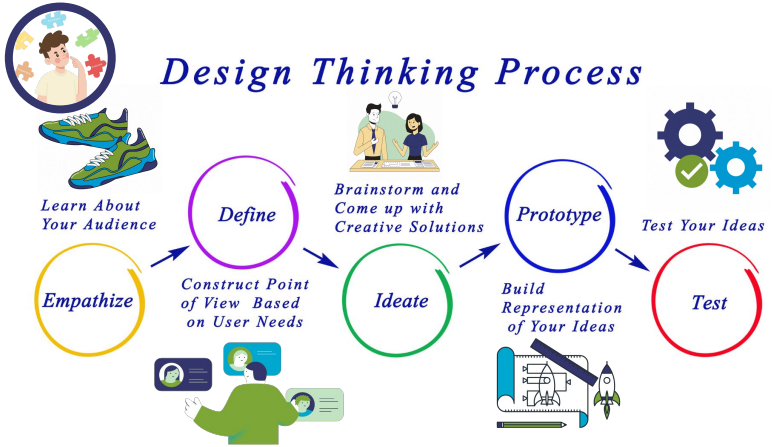
Design can produce many artifacts, including
- algorithms
- models
- prototypes
- blueprints
- programs
- experiments
- objects

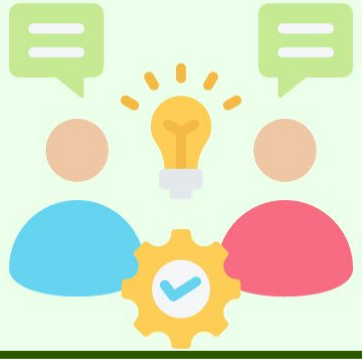
Design can deal with complex problems.

Availability of materials and costs are considerations in design.

# UNDERSTANDING

Design involves processes that can transform ideas into artifacts that meet needs.



# SKILLS & PROCEDURES

Plan and create an artifact to meet a need.

SKILLS & PROCEDURES

Examine availability and cost of materials during design.

SKILLS & PROCEDURES

Test an artifact to confirm that it meets intended needs.

SKILLS & PROCEDURES

Provide feedback to others during the design process.

SKILLS & PROCEDURES

Collaborate to design an algorithm to solve a problem.

SKILLS & PROCEDURES

Plan and create an artifact to meet a need.

SKILLS & PROCEDURES

Examine availability and cost of materials during design.

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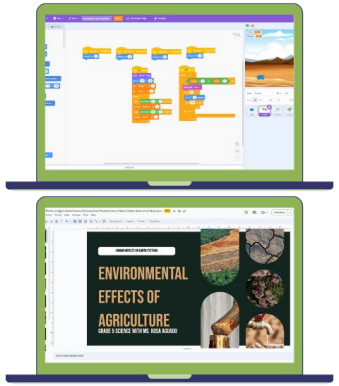
Test an artifact to confirm that it meets intended needs.

SKILLS & PROCEDURES

Provide feedback to others during the design process.

SKILLS & PROCEDURES




Create a model of a water ecosystem including animals and plants that live there.

# DESIGN THINKING BRAINSTORM LOG

understand your users needs

EMPATHIZE:

DEFINE:

IDEATE:

Develop a bunch of awesome ideas! Nothing is too crazy!

PROTOTYPE:

TEST:

return to your users for feedback

Plan and create an artifact to meet a need.

SKILLS & PROCEDURES

Test an artifact to confirm that it meets intended needs.

SKILLS & PROCEDURES

**ANY project!**
**ANY subject!**


Examine availability and cost of materials during design.

SKILLS & PROCEDURES

Provide feedback to others during the design process.

SKILLS & PROCEDURES

**Earth Systems:**

**Create a plan to implement a conservation practice in a local community.**

# REDUCE YOUR CARBON FOOTPRINT

## SMALL ACTIONS, BIG IMPACT!

**Energy-Efficient Lifestyle:**

- Unplug electronics when not in use.
- Adjust your thermostat to conserve energy.
- Opt for energy-saving appliances and LED lights.
- Use natural light and open windows for ventilation.

**Sustainable Transportation:**

- Walk or bike for short distances.
- Combine multiple errands into one trip.
- Opt for fuel-efficient vehicles or electric cars.
- Choose public transportation, carpooling, or biking.

**Smart Energy Consumption:**

- Switch to renewable energy providers.
- Use energy-efficient insulation in your home.
- Minimize air conditioning and heating usage.
- Harness solar energy with rooftop solar panels.

**Reduce, Reuse, Recycle:**

- Cut down on single-use plastics.
- Recycle paper, plastic, glass, and aluminum.
- Compost food waste and use it for gardening.
- Embrace reusable bags, bottles, and containers.

**Water Conservation:**

- Collect rainwater for watering gardens.
- Fix leaks and dripping faucets promptly.
- Water plants efficiently, avoiding excessive irrigation.
- Take shorter showers and install water-saving devices.

**Conscious Consumerism:**

- Choose eco-friendly and sustainable products.
- Prioritize quality over quantity when purchasing items.
- Repair and repurpose items instead of discarding them.
- Support companies with transparent and ethical practices.

**Sustainable Food Choices:**

- Support sustainable farming practices.
- Opt for locally sourced, organic produce.
- Reduce meat consumption and try plant-based meals.
- Minimize food waste through mindful shopping and meal planning.

# DESIGN THINKING BRAINSTORM LOG

understand your users needs

EMPATHIZE:

DEFINE:

IDEATE:

Develop a bunch of awesome ideas! Nothing is too crazy!

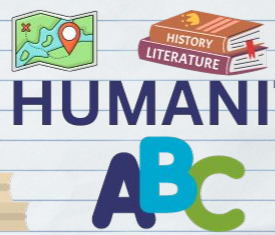
PROTOTYPE:

return to your users for feedback

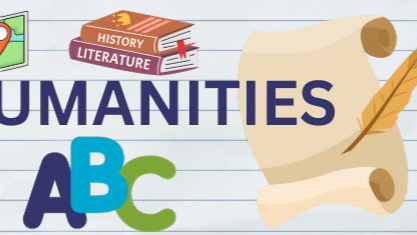
TEST:


## Plan & Design a piece of art for

- ★ classmate
- ★ school staff member
- ★ family member
- ★ character from a story or novel

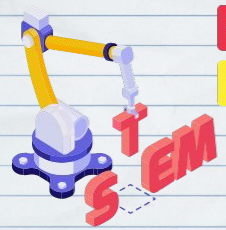



## HUMANITIES



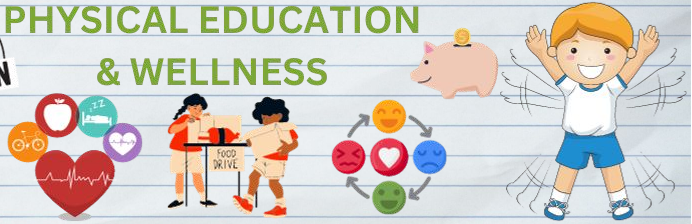
## Plan & Create a piece of writing for:

- ★ A call to action
- ★ A proposal
- ★ Another person
- ★ Persuading

## STEM


## PHYSICAL EDUCATION & WELLNESS



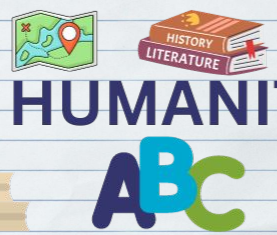
## Plan & Create:

- ★ 3D model to share with younger students
- ★ slide presentation to show parents
- ★ computer program for classmates
- ★ poster presentation for parent council

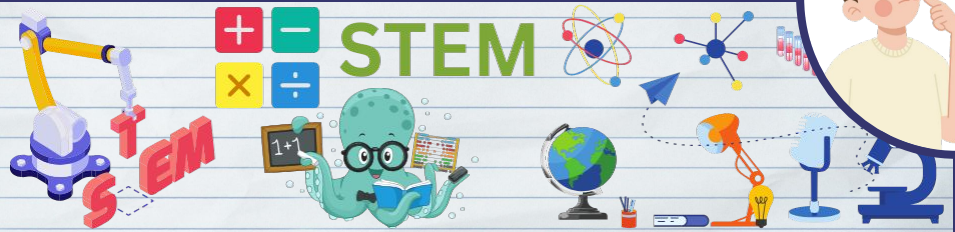
## Plan & Create:

- ★ a warm up for another class
- ★ a fundraiser for a cause
- ★ a meal plan for a family

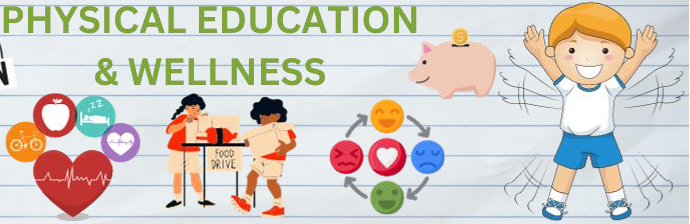

Interview or survey the audience/customer to find out what they like and don't like.




Research the cause and do interviews to find out the important information.

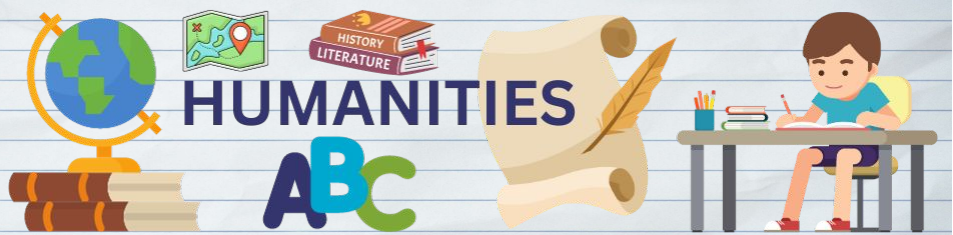




Think about the things you found interesting when you were in a younger grade.

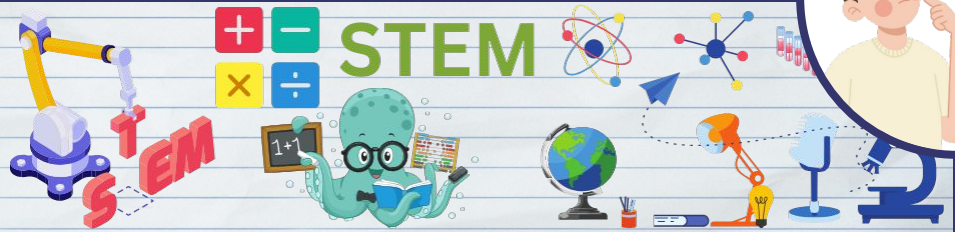




Use the provided information to figure out what kinds of meals everyone in the family will love.


Take the information you got from your audience and use that to decide what kind of art you will make.



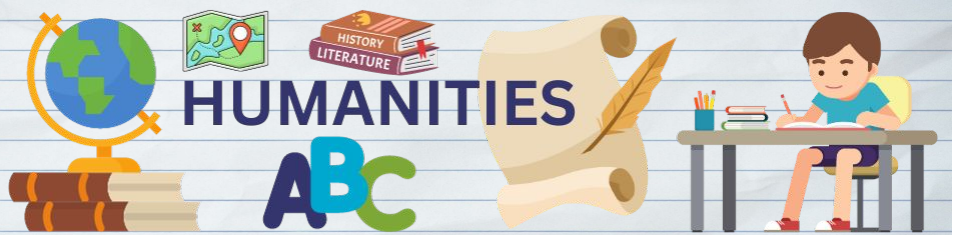

Decide what information needs to be included in your writing to meet your purpose.

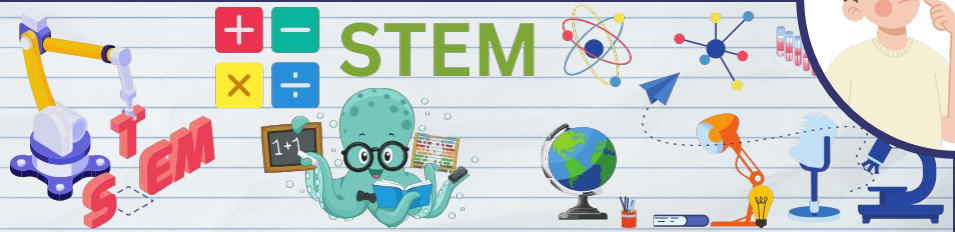

Decide what kind of project you are going to make based on what you know about younger students.


Determine generally what kinds of foods to include and avoid in the meal plan.


Brainstorm ideas for what to include in your artwork. Come up with a plan for your design.



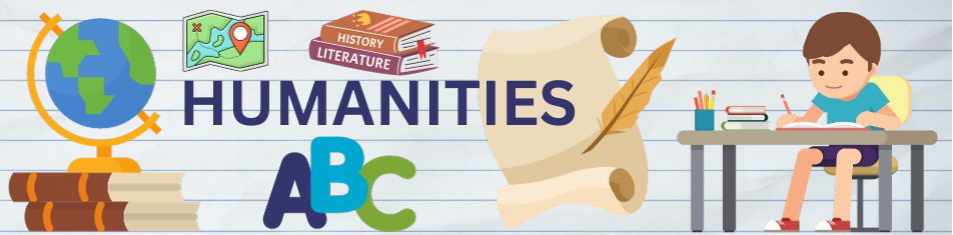

Plan your writing including all of the important points and supporting details.

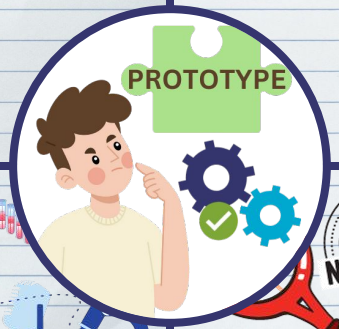

Generate ideas for how to make your project appealing to younger students and show the information you need to show.

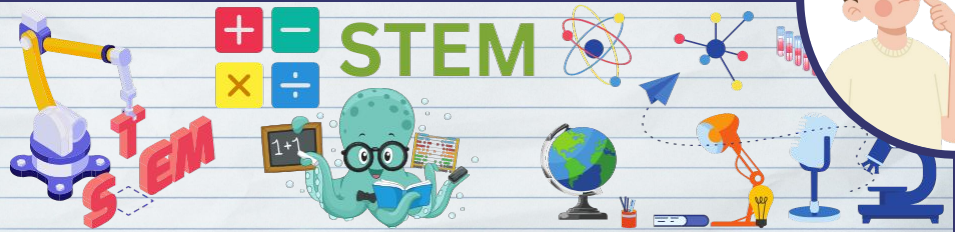

Find lots of meal options and ideas that include the family's favourite foods and none they don't like.


Create the artwork!




Do a rough draft of the writing.

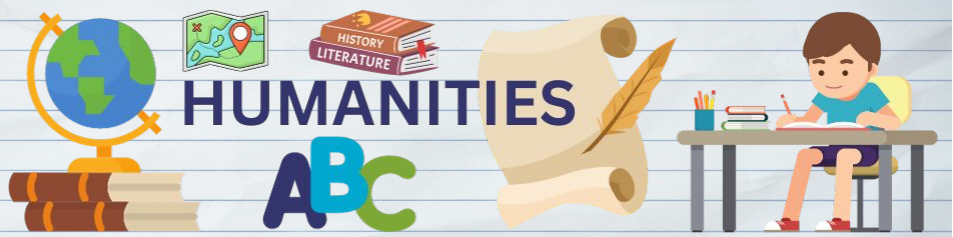


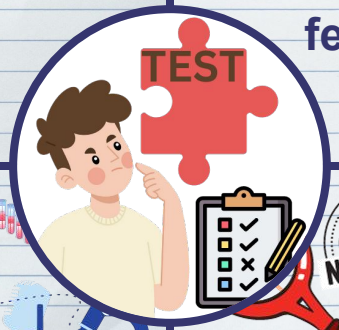

Build your project!

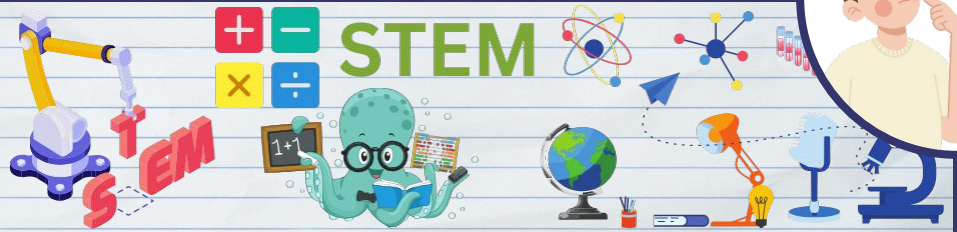

Create a 7 day meal plan with 3 meals per day and 2 snacks.


Ask your audience for feedback on your artwork.

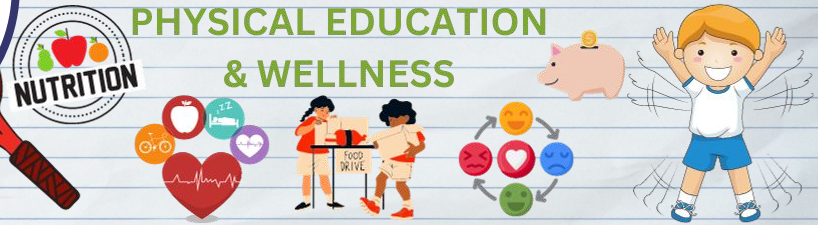



Ask your audience or a classmate to read your writing and give you feedback.



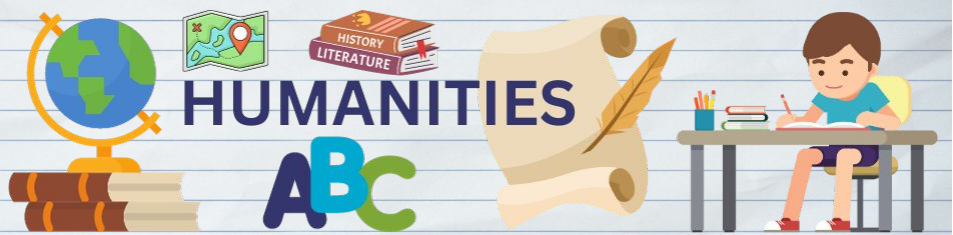




Ask a classmate for feedback on your project. Do they think the younger kids will like it? Did you miss any information?




Have a classmate look at your meal plan and provide you feedback.

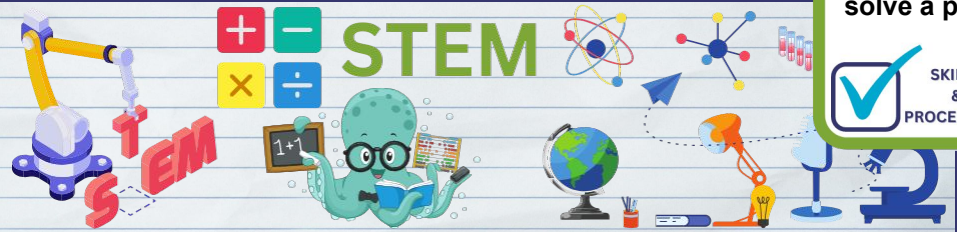

Can you write a set of instructions for how to complete the artwork you made?




Can you come up with instructions that another student could follow to write on the same topic or a different one?

Collaborate to design an algorithm to solve a problem.

SKILLS & PROCEDURES



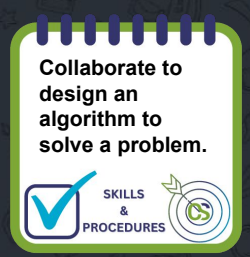

Can you write a set of instructions for how to build your project so another student could do it?

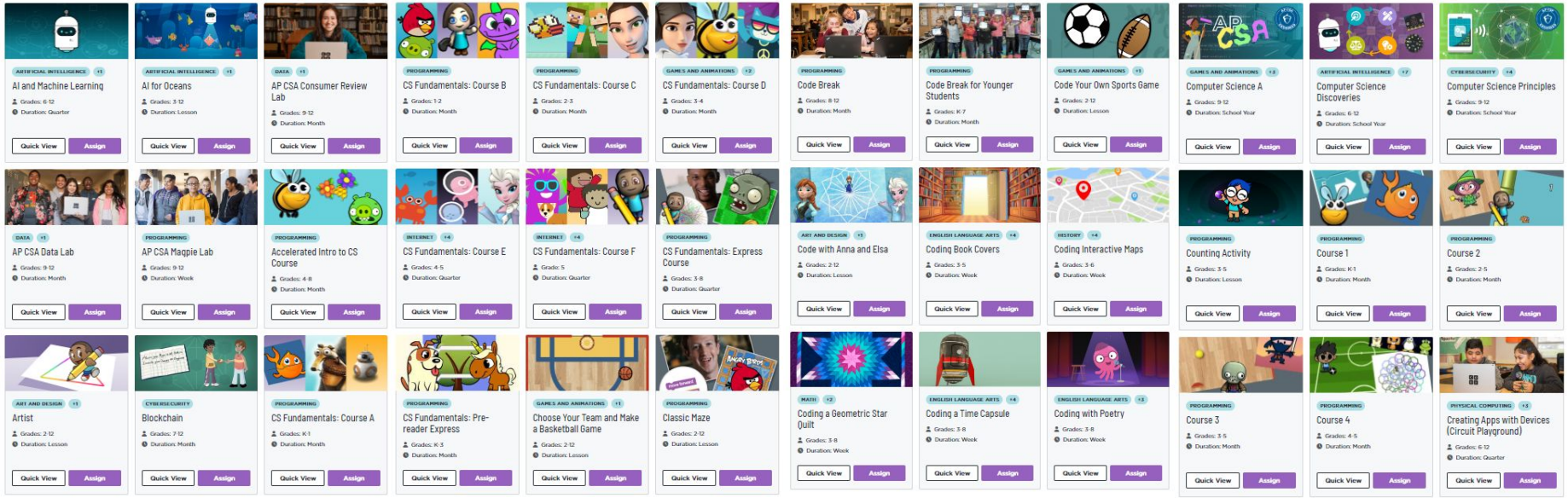

Can you come up with a set of instructions for how to create a meal plan for a family for a week?

CODE.ORG

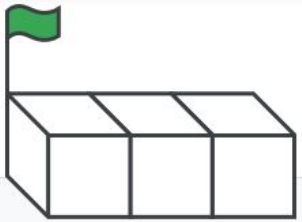
# Curriculum Catalog

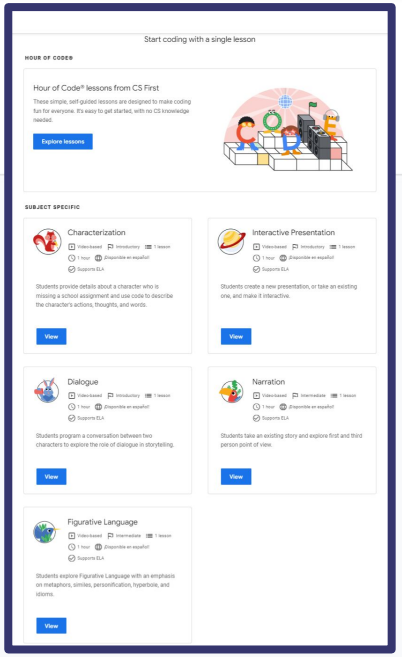
Find the perfect fit for your learning environment: Code.org courses, tutorials, and more designed for all ages and experience levels.



# Google CS First






## Get started with CS First

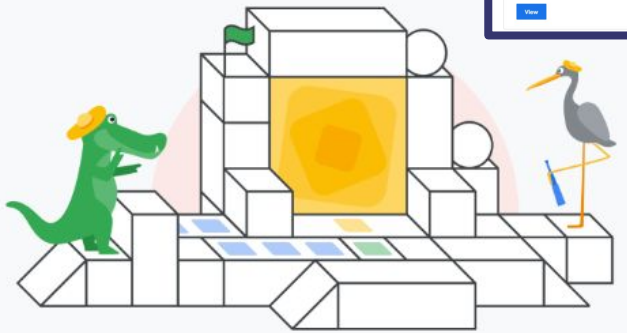
Coding instructions like hints, highlights, and text-to-speech live inside *Scratch for CS First*

### 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.

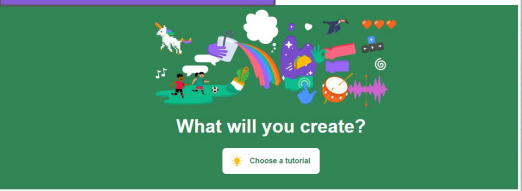
View

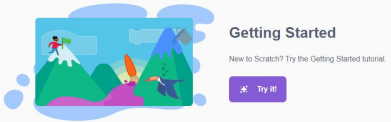


SCRATCH

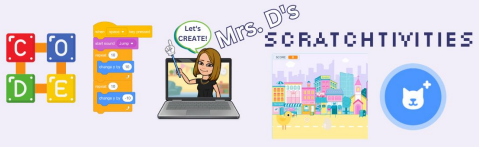
scratch.mit.edu

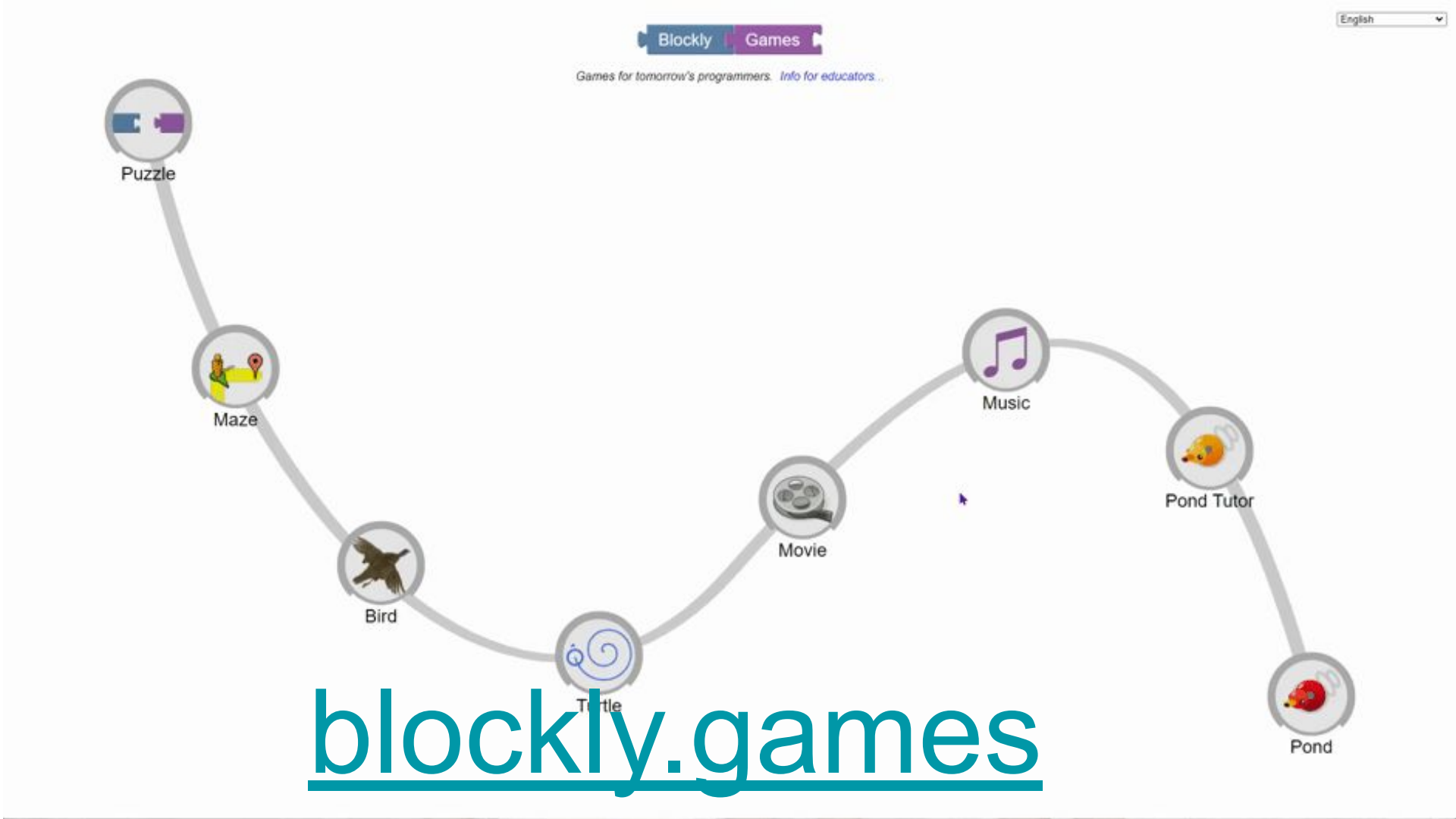
IDEAS




etwithmrsd.com





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

# Toys!!!

## Your ATA Library

The Alberta Teachers' Association

### Kits in Your ATA Library

- Makerkits A-D
- Makerkits E-G
- Makerkits H-L
- Makerkits M-O
- Makerkits P-S
- Makerkits T-Z



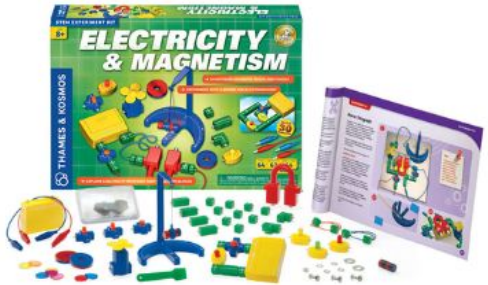










# Toys!!!


## Sphero Minis

## micro:bits