Making Connections

Energy

Computer Science

grade 5

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 can design be used to help achieve desired outcomes or purposes?**
Learning Outcome	**Students apply design processes when creating artifacts that can be used by a human or machine to address a need.**

Knowledge	Understanding	Skills & Procedures
A computational artifact is anything created by a human using a computer, such as • computer programs and code images • audio video • presentations • web pages Design can be used to create algorithms and translate them into code. Code is any language that can be understood by and run on a computer. There are many ways to code, including using visual block-based languages. Visual block-based languages are a form of code in which prepared chunks of instructions are in drag-and-drop blocks that fit together like puzzle pieces to design a program. A computer cannot think for itself and must rely on code for all that it does. A loop is a repetition of instructions used in an algorithm.	Design can be used by humans or machines to meet needs.	Engage in the design process to create computational artifacts. Relate a block of code to an outcome or a behaviour. Explain what will happen when single or multiple blocks of code are executed. Translate a given algorithm to code using a visual block-based language. Design an algorithm that includes a loop and translate it into code.

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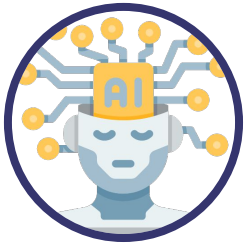
Knowledge	Understanding	Skills & Procedures
Design process can be influenced by various factors, including • safety • functionality • usability • reliability • efficiency • aesthetics Functionality is the quality of being useful to do the job for which something was designed. Usability is the degree of ease with which something can be used to achieve an outcome. Design processes that support the development of multiple iterations include • enhancing • refining Design can be improved through collaboration.	Computational thinking is a problem-solving process that uses creativity.	Discuss examples of designs that have been enhanced or refined to better meet needs. Evaluate an artifact based on various factors. Design an artifact to meet a need. Propose enhancements and refinements to an artifact in collaboration with others. Develop multiple iterations of an artifact.

Computational Thinking

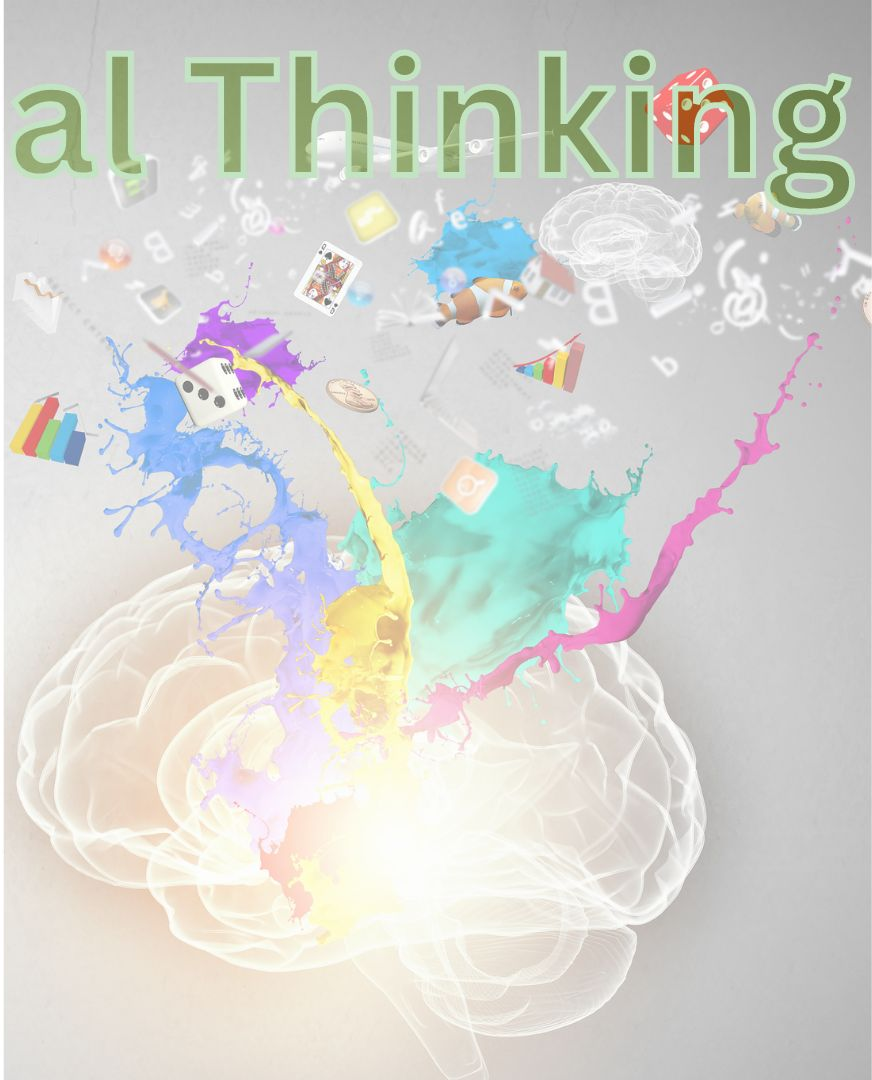


Decomposition

Pattern Recognition

Pattern Abstraction

Algorithm Design



Design Thinking Process

Learn About
Your Audience

Empathize

Define

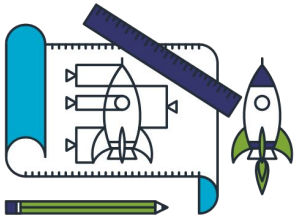
Construct Point
of View Based
on User Needs

Brainstorm and
Come up with
Creative Solutions

Ideate

Prototype

Build
Representation
of Your Ideas



Test Your Ideas

Test

Creativity

Finding different ways to reach the same outcome.

Problem solving to overcome obstacles to achieve a desired outcome.

Organizing Idea	Energy: Understandings of the physical world are deepened by investigating matter and energy.
Guiding Question	How are forces similar and different in water and air?
Learning Outcome	Students investigate and compare how forces affect living things and objects in water and air.

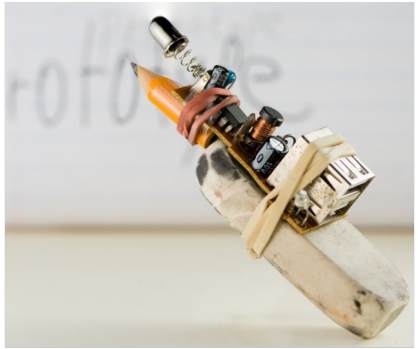
Gr. 4 CS KNOWLEDGE

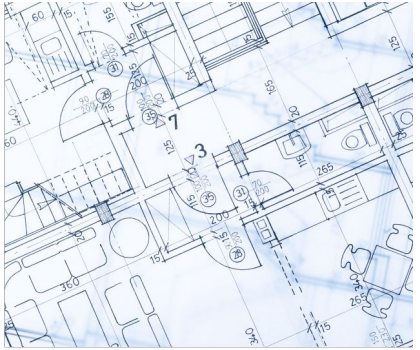
Design can produce many artifacts, including

- algorithms
- models
- prototypes
- blueprints
- programs
- experiments
- objects

Design an artifact to meet a need.

SKILLS & PROCEDURES





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Gr. 5 CS KNOWLEDGE

A computational artifact is anything created by a human using a computer, such as

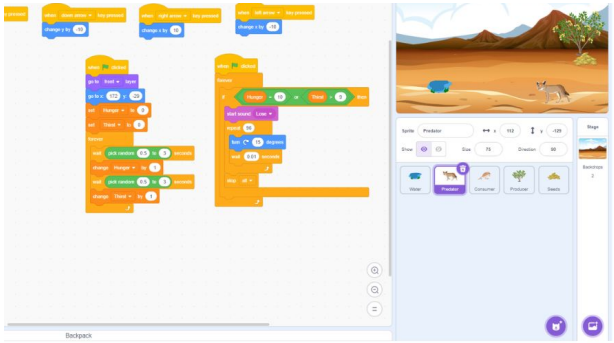
- computer programs and code images
- audio video
- presentations
- web pages

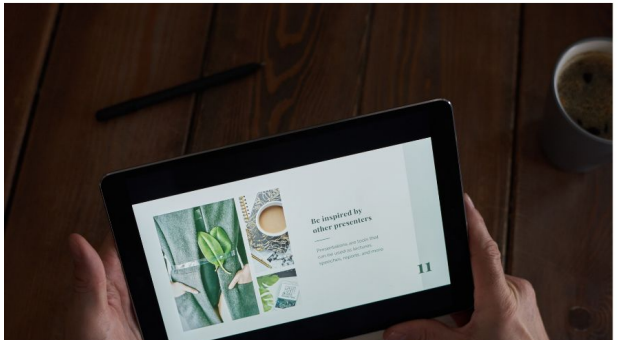
Engage in the design process to create computational artifacts.

SKILLS & PROCEDURES

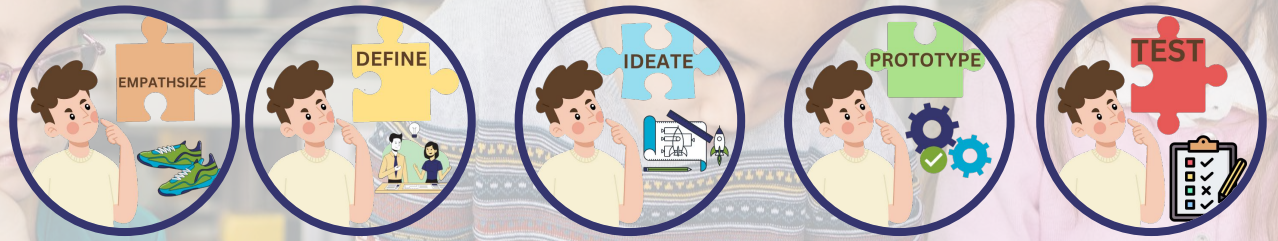
Design an artifact to meet a need.

SKILLS & PROCEDURES





Organizing Idea	**Earth Systems: Understandings of the living world, Earth, and space are deepened by investigating natural systems and their interactions.**
Guiding Question	**How does Earth sustain life?**
Learning Outcome	**Students investigate the systems of Earth and reflect on how their interconnections sustain life.**



UNDERSTANDING

Design can better meet needs through the development of multiple iterations.

Evaluate an artifact based on various factors.

SKILLS & PROCEDURES

Design an artifact to meet a need.

SKILLS & PROCEDURES

Propose enhancements and refinements to an artifact in collaboration with others.

SKILLS & PROCEDURES

Develop multiple iterations of an artifact.

SKILLS & PROCEDURES

Organizing Idea	**Energy: Understandings of the physical world are deepened by investigating matter and energy.**
Guiding Question	**How are forces similar and different in water and air?**
Learning Outcome	**Students investigate and compare how forces affect living things and objects in water and air.**

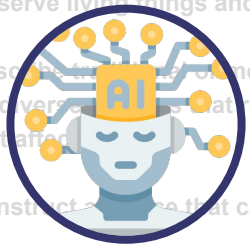
Skills & Procedures

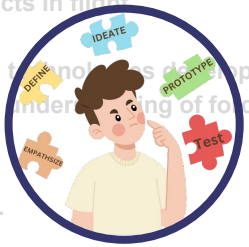
Diagram opposing forces that act on living things or objects in flight.

Explain the effects of thrust and drag on the flight of living things and objects.

Explain the effects of lift and weight on the flight of living things and objects.

Observe living things and objects in flight.





Practise safe and appropriate use of tools, equipment, and materials while constructing a device.

Design an artifact to meet a need.

SKILLS & PROCEDURES

Engage in the design process to create computational artifacts.

SKILLS & PROCEDURES

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Observe living things and objects in flight.

Describe traditional or modern technologies developed by diverse cultures that reflect understanding of forces that affect flight.

Construct a device that can fly.

Practise safe and appropriate use of tools, equipment, and materials while constructing a device.

Name _____ Date _____

STEM Challenge
Paper Airplane Precision

Objective

To design a paper airplane that flies the farthest and most accurately.

Materials

- Markers or colored pencils
- Letter-sized paper (8.5 x 11 inches)
- Ruler
- Tape

Instructions

- Create three different paper airplane designs using the given materials.
- Measure a designated starting point and set up targets at different distances.
- Fly each paper airplane three times, aiming for different targets, and record the distances.
- After each flight, analyze the design and make adjustments to improve performance.

Challenge Questions

er airplane design flew the farthest, and why do you think it better?

rs influenced the accuracy of the paper airplanes?

u modify the design to enhance performance during the ?

plain the aerodynamic principles behind the most successful ane?

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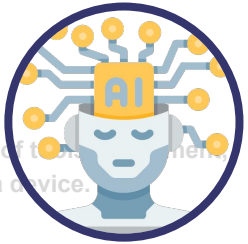

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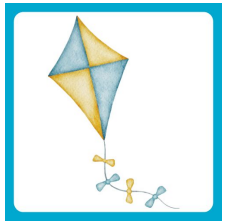
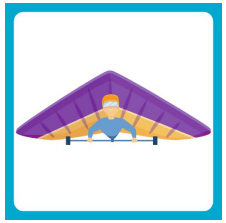
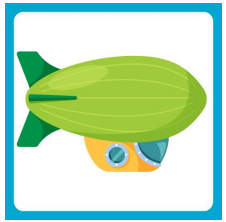
SKILLS & PROCEDURES







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Guiding Question	How are forces similar and different in water and air?
Learning Outcome	Students investigate and compare how forces affect living things and objects in water and air.

Skills & Procedures

Relate buoyant force and weight to the tendency to float or sink in water.

Conduct controlled experiments to determine if various objects and materials float in different fluids.

Construct a device that can float.

Practise safe and appropriate use of tools, equipment, and materials while constructing a device.

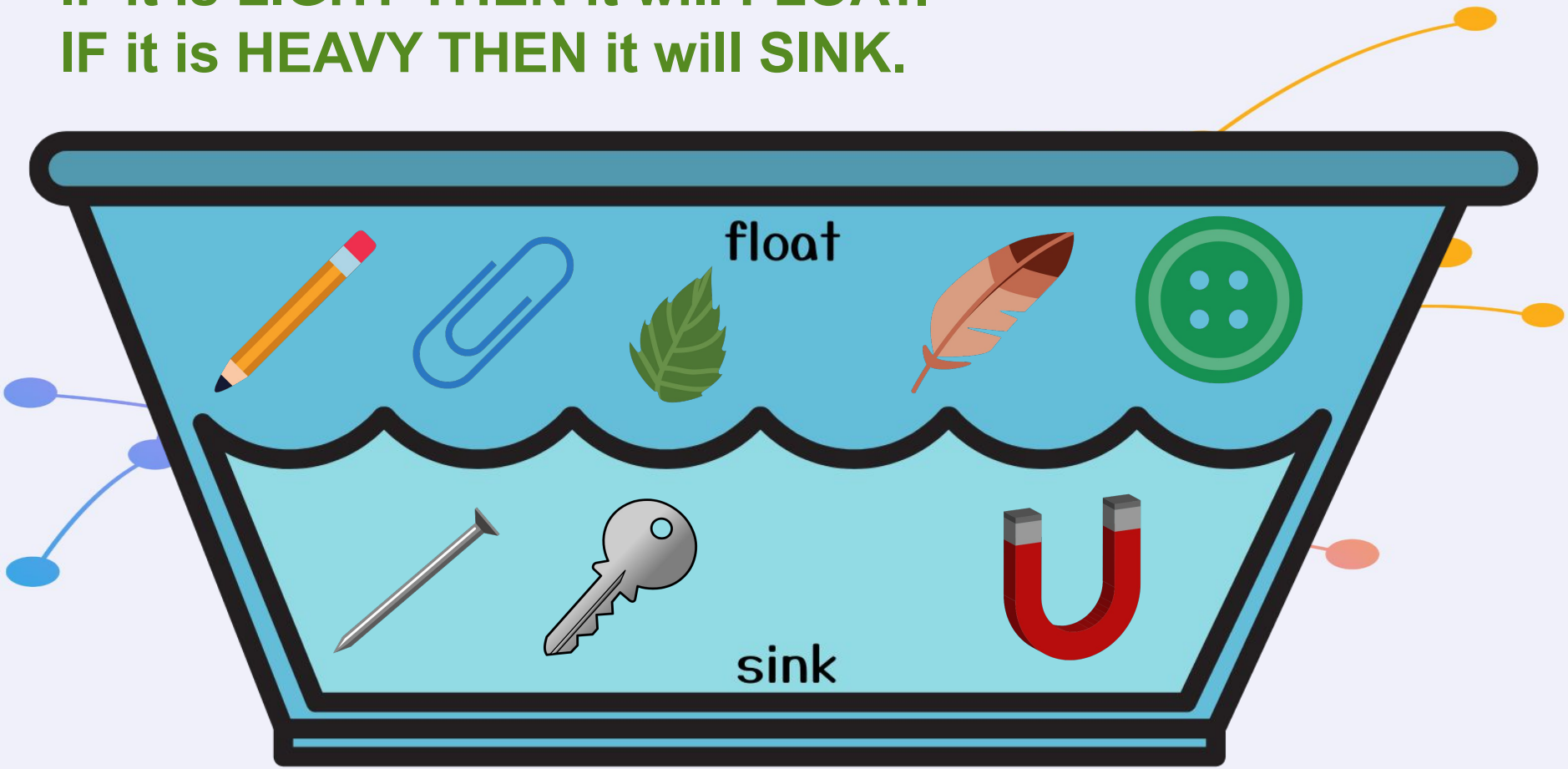
What properties contribute to an object's buoyancy?

What do buoyant objects have in common? What can be different?

What properties don't contribute to an object's buoyancy?

Can you write an algorithm for how to determine if an object will float or sink?

IF it is LIGHT THEN it will FLOAT.
IF it is HEAVY THEN it will SINK.



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Boat Design Challenge

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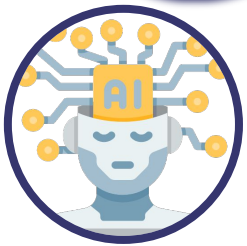


Organizing Idea	Earth Systems: Understandings of the living world, Earth, and space are deepened by investigating natural systems and their interactions. Energy: Understandings of the physical world are deepened by investigating matter and energy.
Guiding Question	How are energy resources understood?
Learning Outcome	Students investigate and analyze various energy resources.

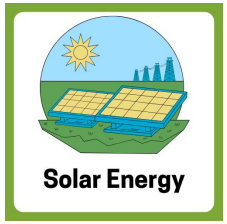
Skills & Procedures

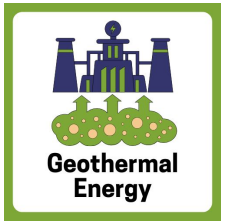
Compare renewable energy resources with non-renewable energy resources.

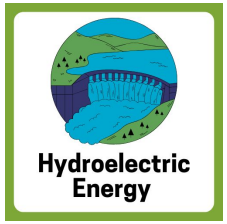
Discuss advantages and disadvantages of using renewable and non- renewable energy resources.

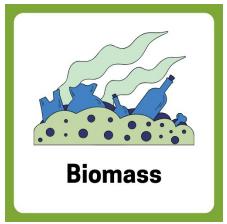
Examine how various provinces and territories throughout Canada fulfill energy needs.

RENEWABLE









NON-RENEWABLE