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Curriculum Planning & Assessment Resource

Science

Grade 4 - Computer Science

Alberta Regional Professional Development Consortia

Dedicated to the provision of professional learning opportunities at the local, regional and provincial levels

Curriculum Planning & Assessment Resource

Science

Grade 4: Computer Science

About This Document

This Curriculum Planning & Assessment Resource is intended to be a collection of sample activities, assessments, and resources that teachers may wish to use as they develop their unit plans. This document is not intended to be a sequential list of activities. Rather, the intent is that teachers choose from this resource what is appropriate for their context, and sequence it their planning.

The sample activities, assessments and resources included in this document have undergone an initial review to determine appropriateness and alignment to the curriculum. However, it is expected that teachers use their professional judgment in selecting activities, assessments and resources that are appropriate for their context.

While every attempt has been made to provide credit and receive permissions, some errors or omissions may have occurred. Please contact info@arpdc.ab.ca to report any error or omissions.

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Important Links

New Learn Alberta Progressions

- Competency Progressions
- Numeracy Progressions
- Literacy Progressions

Recorded Video:

- How to Read these Curriculum Planning & Assessment Resources
- Wait, What? I'm Teaching Computer Science? Part 1 - Janet Bell
- Wait, What? I'm Teaching Computer Science? Part 2 - Janet Bell
- K-3 Computer Science - Angela Dearing
- Exploring Grade 4 Computer Science
- CS Connections to Science Videos - Angela Dearing
  - CS Connections to Earth Systems
  - CS Connections to Living Systems
  - CS Connections to Matter
  - CS Connections to Energy
  - CS Connections to Space

Planners and Concept Maps

- Science Planner
- Assessment Planner
- K-6 Action Verbs (EN)
  - Verbes des habiletés et procédures en sciences de M à 3
- Concept Maps for [Organizing Idea]
  - Cartes conceptuelles [Idée organisatrice]

Curriculum Progressions

- Science Skills and Procedures Progression K-3
- K-6 Science Concept Progressions
  - Progressions des concepts

Numbered Outcomes Document

Scientific Methods

Unpacking Scientific Methods - A General Overview for Grades 1-6 with Nicole Lamoureux

Prior Grade CPAR Documents

Acknowledgements

Thank you to all the teachers, curriculum specialists, and technical expertise from Alberta school divisions and ARPDC who collaborated to develop, review, and revise these planning and assessment documents to support curriculum implementation.

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

4CS1 Students examine and apply design processes to meet needs.

Summative Assessment(s) - Transfer *(In Progress)*

Summative assessments can include the following.

- *Understanding/making sense of a novel context from the real world using one or more concepts (eg. "Is this an example of diversity?). Example*
- *Understanding/making sense of a novel context using one or more understandings (eg.Students watch a video or complete a case study and explain what they viewed/interpreted through the lens of the understanding)..*

  Example
- *Being able to describe why (developing predictions or hypotheses) something is unfolding, or what might happen next using learned concepts and understandings.*
- *Apply learning (create products; undertake projects; taking action such as creating a campaign) in a novel context or taking action using the understanding(s). Example*
- *Construct arguments by taking a position on a novel issue and defending it with known understandings.*

Summative Assessments: **Surface, Deep and Transfer Assessment**

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3CS1.1	3CS1.2	Resources (Toys!)	Literature Connections

KUSPs 4CS1.1

Prerequisite Knowledge

Students know

- What it means to demonstrate respect
- What it means to be safe

Misconceptions

- Coding is complicated.
- You must be able to read before you can learn to code.
- Coding can only be done on a computer

I Know Statements

- I know design processes include
    - understanding the problem
    - forming ideas (ideating)
    - planning
    - creating
    - analyzing
    - testing
    - troubleshooting
- I know feedback helps to ensure all needs are considered during the design process.
- I know an algorithm is a sequence of instructions.
- I know artifacts are objects or products made by humans, machines, or computers through the process of design.
- I know design can produce many artifacts, including
    - algorithms
    - models
    - prototypes
    - blueprints
    - programs
    - experiments
    - objects
- I know design can deal with complex problems.
- I know availability of materials and costs are considerations in design.

I Understand Statements

- I understand design involves processes that can transform ideas into artifacts that meet needs.

Student Language | Essential Vocabulary & Concepts

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

Artifact - Artifacts are objects or products made by humans, machines, or computers through the process of design.
Algorithm - An algorithm is a sequence of instructions.

I Can Statements | Skills

- I can plan and create an artifact to meet a need.
- I can provide feedback to others during the design process.
- I can test an artifact to confirm that it meets intended needs.
- I can collaborate to design an algorithm to solve a problem.
- I can examine availability and cost of materials during design.

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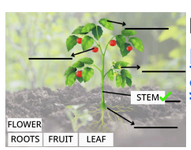
3CS1.1	3CS1.2	Resources (Toys!)	Literature Connections

Learning Outcome	4CS1.1 Students investigate creativity and its relationship to computational thinking.			
Knowledge	**Understanding**	**Skills & Procedures**	**Sample Activities & Resources** **What is Surface, Deep and Transfer**	**Assessments (formative)**
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.	Design involves processes that can transform ideas into artifacts that meet needs.	Plan and create an artifact to meet a need. Provide feedback to others during the design process. Test an artifact to confirm that it meets intended needs. Collaborate to design an algorithm to solve a problem. Examine availability and cost of materials during design.	**Sample Surface Level Activities** Marble Run Design Challenge **Tower Challenge** There are many tower building STEM challenges you can do with your class. One idea: Put students in groups and give each group a bag with an assortment of "building" materials in it. Include items such as straws, popsicle sticks, pipe cleaners, tooth picks, paper clips, masking tape, etc. Adding in decorative items can add to the fun/challenge as well. The variety of the materials doesn't matter but **make sure to include 8 ½" x 11 plain paper.** Tell students their assignment is to use the provided materials to create a tower that will support a can of soup or similar amount of weight. Give students a time limit of 15 minutes to build their towers. Allow them to use the can of soup for testing as they work. Note that the easiest way to complete the task is to make a simple tube with a piece of paper and some tape or paper clips. You may have students come to this conclusion on their own or you may need to guide them toward it. Students will get frustrated trying to achieve their goals with the stuff in the bag, often ignoring the paper altogether. This provides an opportunity to talk about abstraction and how sometimes the simplest solution is the best. This would be a good time to introduce the design thinking process to students as well. Scratch Activities Connected to other Science organizing ideas.  **Plant Life Cycle Scratch Project** Project Template Scratch Cards  **Recycling Game Scratch Project** Project Template Scratch Cards	**Sample Surface Level Assessments**

			 **Hazard Symbols Scratch Project** Project Template Scratch Cards **Sample Deep Level Activities** Have students create computational artifacts with one of these easy to use free coding sites. Ask them to demonstrate an outcome from another science topic or whole other subject or create a project with a purpose. **Scratch.mit.edu** **MakeCode Arcade** Develop your programming skills by quickly creating and modding retro arcade games with Blocks and JavaScript in the MakeCode editor. Has self-guided lessons and projects. **CS First** Hands-on lessons with instructional videos. Code.org offers a full coding curriculum for elementary. Courses D & E are appropriate for grade 4 students: CS Fundamentals: Course D CS Fundamentals: Course E CS Fundamentals Express Course	

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3CS1.1	3CS1.2	Resources (Toys!)	Literature Connections

Classroom Technology

There are so many coding related toys available it can be hard to decide what is right for your classroom. Below is a list of toys our committee members have had experience with and can recommend.

Coding toys aren't necessary for covering your computer science curriculum but they provide a fun and interactive way for students to achieve those outcomes. You can combine a few robots with some Chromebook/tablet and unplugged activities to create CS centres for Science.

		Description	Resources	ATA Library Link (if available)	Purchase Options*
	**Codey Rocky**	Codey Rocky seamlessly blends hardware and software for playful programming and creation. Utilizing mBlock software, supporting both block-based and Python programming, Codey Rocky introduces children to avant-garde technology. With built-in AI and IoT capabilities, it provides a competitive edge in the era of artificial intelligence.	Codey Rocky Course from MBlock MakeBlock Lesson Plans	Codey Rocky	Robotix Education
	**Sphero Mini**	Sphero Mini, a pint-sized robot the size of a ping pong ball, delivers loads of fun through its app-enabled features. Drive it with various modes using the Sphero Mini app or even by using your face with the Face Drive feature. Engage in addicting games, where the ball becomes a controller for space shooting, racing, or brick destruction. Regular app updates bring new experiences, and for those feeling extra clever, the Sphero Edu app allows programming in JavaScript.	Lessons from Sphero.com Lessons from Learn71.ca Sphero Edu Educator Guide	Sphero Mini Class Set	Robotix Education
	**MakeyMakey**	Makey Makey is an electronic invention tool enabling students to connect everyday objects to computer programs. With a circuit board, alligator clips, and a USB cable, it uses closed-loop electrical signals to send keyboard or mouse click signals to a computer. This versatility allows Makey Makey to interface with any computer program or webpage, as they all accept keyboard and mouse click input.	MAKEY MAKEY 101 - FOR ABSOLUTE BEGINNERS Makey Makey Workshop Materials Lesson Plans from Kooabura.com	MakeyMakey Class Set (25) MakeyMakey Class Set (12)	Robotix Education
	**micro:bit**	The micro:bit is a beginner-friendly, pocket-sized computer that simplifies learning electronics and coding. Easily programmable via computer or its user-friendly app for Android and iOS, it offers coding options like a drag-and-drop Blocks editor, JavaScript, and Python.It includes built-in sensors, LEDs, and buttons for various experiments. Key features include an accelerometer and compass for motion and orientation detection, a 5×5 LED matrix for displaying text or designs, and two programmable buttons for inputs or program control. Additionally, it has a speaker and microphone for basic sound interactions, with the logo doubling as a touch-sensitive button.	Lessons from micro:bit.org Lessons on Makecode Lessons from Learn71.com Lessons from LearnQuebec Maker Lesson on code.org micro:bit Challenge: Addressing the UN Global Goals		Robotix Education

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3CS1.1	3CS1.2	Resources (Toys!)	Literature Connections

Other Resources

Additional Websites and Resources to Support *Learning*

Indigenous Related:

- The Learning Circle: Classroom Activities on First Nations in Canada - Ages 9 to 11 - **The Learning Circle** has been produced to help meet Canadian educators' growing need for elementary-level learning exercises on First Nations. It is the second in a series of four classroom guides on First Nations in Canada.

- Learning from the Land (teacher information) - Although there is much diversity between First Nations, Métis, and Inuit, a deep and abiding connection to the land is common. Dr. Leroy Littlebear says that "The land is a sacred trust from the Creator. The land is the giver of life like a mother. The ecological aspect of Indigenous knowledge is all about the land. The land is a source of identity for Aboriginal People. CASS Resource.
- Infusing Indigenous Knowledge into Curriculum (Grades 1-12) Website

General:

- Code.org
- Beebot Emulator
- Kidlo Coding Games
- All Hour of Code Activities
- ScratchJr and Scratch (Scratch can also be accessed via CS First)
- What is Computational Thinking? - cartoon video explanation of CT, accessible to share with students (Jules)

Resources Developed by School Divisions/Educational Institutions

Edmonton Public Schools Science Snippets

Websites and Resources to Support *Planning*

Inclusion - Best Practices Meeting the Needs of All Learners in Science
Differentiation: Preview vocabulary and pre teach to students. Use various forms of media to present vocabulary including simplified explanations, visuals in the form of diagrams to label and connect concepts.

Gizmos New Learn Alberta(Teacher Login Required)
Programmable Rover

Request a Gizmos account: alberta@explorelearning.com

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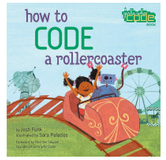
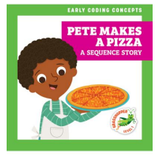
3CS1.1	3CS1.2	Resources (Toys!)	Literature Connections

Literature Connections

Title & Author	Format (Picture Book, Novel, Non-fiction, other)	Publisher & ISBN	Book & Numbered Outcome Link
How to Code a Sandcastle by Josh Funk From the computer science nonprofit Girls Who Code comes this lively and funny story introducing kids to computer coding concepts.All summer, Pearl has been trying to build the perfect sandcastle, but out-of-control Frisbees and mischievous puppies keep getting in the way!	Picture Book	Viking/Penguin ISBN - 10, 0425291987	 YouTube Read Aloud
How to Code a Rollercoaster by Josh Funk Pearl and Pascal take their coding adventures to the amusement park in this follow-up picture book from our Girls Who Code program!Pearl and her trusty rust-proof robot, Pascal, are enjoying a day out at the amusement park. Spinning teacups, ice cream, and of course: rollercoasters!	Picture Book	Viking/Penguin ISBN - 978-0425292037	 YouTube Read Aloud
Pete Makes a Pizza by Elizabeth Everett Follow along as Pete follows a recipe to make a pizza, experiencing firsthand the coding concept of sequencing. Fun, vibrant illustrations and carefully leveled text engage young readers in a supportive educational fiction reading experience about fundamental coding concepts. A Let's Review! question further explains the programming concept and asks readers how it applies to both daily life and computers. Pete Makes a Pizza: A Sequence Story also features reading tips for teachers and caregivers, a picture glossary, and a table of contents. Grasshopper Books offers simple, fun fiction for emerging readers. Pete Makes a Pizza: A Sequence Story is part of Jump!'s Early Coding Concepts series.	Picture Book	Jump! Inc ISBN - 979-8885241823	 Epic Books
Gus's Routine by Elizabeth Everett Follow along as Gus repeats the same steps in his daily routine as he takes care of his dog, experiencing firsthand the coding concept of looping. One day, his routine changes, introducing the concept of branching. Fun, vibrant illustrations and carefully leveled text engage young readers in a supportive educational fiction reading experience about fundamental coding concepts. A Let's Review! question further explains the programming concept and asks readers how it applies to both daily life and computers. Gus's Routine: A Looping Story also features reading tips for teachers and caregivers, a picture glossary, and a table of contents. Grasshopper Books offers simple, fun fiction for emerging readers. Gus's Routine: A Looping Story is part of Jump!'s Early Coding Concepts series.	Picture Book	Jump! Inc ISBN - 979-8885241762	 Epic Books
Min Builds a Train Track: An If-Then Story by Elizabeth Everett Follow along as Min builds a toy train track, makes if-then statements about where it will go next, and experiences firsthand the coding concept of conditionals. Fun, vibrant illustrations and carefully leveled text engage young readers in a supportive educational fiction reading experience about fundamental coding concepts. A Letís Review question further explains the programming concept and asks readers how it applies to both daily life and computers. Min Builds a Train Track: An If-Then Story also features reading tips for teachers and caregivers, a picture glossary, and a table of contents. Grasshopper Books offers simple, fun fiction for emerging readers. Min Builds a Train Track: An If-Then Story is part of Jump!ís Early Coding Concepts series.	Picture Book	Jump! Inc ISBN - 9798885241809	 Epic Books

Sara Cleans Her Room: A Sorting Story by Elizabeth Everett Follow along as Sara organizes the toys in her room, experiencing firsthand the coding concept of sorting. Fun, vibrant illustrations and carefully leveled text engage young readers in a supportive educational fiction reading experience about fundamental coding concepts. A Let's Review! question further explains the programming concept and asks readers how it applies to both daily life and computers. Sara Cleans Her Room: A Sorting Story also features reading tips for teachers and caregivers, a picture glossary, and a table of contents. Grasshopper Books offers simple, fun fiction for emerging readers. Sara Cleans Her Room: A Sorting Story is part of Jump!'s Early Coding Concepts series.	Picture Book	Jump! Inc ISBN - 979-8885241854	 Epic Books
Ara the Dream Innovator by Komal Singh Ara is a young girl who loves to dream BIG. Many of her amazing ideas come to her in her dreams. So Ara builds a Dream Decoder to capture them. But other kids have big dreams too. What about them? With help from her entrepreneur-mentors and her droid DeeDee (who dreams of--beep! beep!--BIG ice creams), Ara embarks on a quest to make her Dream Decoder FTW - For The World! First stop: a Hackathon to find a diverse team of fellow thinkers and tinkerers. Then--fingers crossed--they'll earn a spot at an Accelerator where, with tweaks and testing, they can make the Dream Decoder work for all kids.	Picture Book	Page Two ISBN-10 - 1989603599 ISBN-13 - 978-1989603598	 YouTube Read Aloud Activities
Ara the Star Engineer by Komal Singh Ara is a young girl who loves BIG numbers. She wants to count all the stars in the sky… but how? This is an upbeat adventure of Ara and her sidekick droid, DeeDee ("Beep!"). They use smarts and grit to solve a BIG problem and discover an amazing algorithm! A quest that takes them through a whirlwind of intriguing locations at Innovation Plex -- Data Centre, Ideas Lab, Coding Pods, and X-Space. Along the way, they encounter real-life women tech trailblazers of diverse backgrounds, including a Tenacious Troubleshooter, an Intrepid Innovator, a Code Commander, and a Prolific Problem Solver. They tinker-and-tailor, build-and-fail, launch-and-iterate, and in the end discover an amazing algorithm of success -- coding, courage, creativity, and collaboration ("Beeeeep!").	Picture Book	Page Two ASIN - B07JG3YTB4	 YouTube Read Aloud Activities
If I Were a Wizard by Paul Hamilton In a quiet corner of a distant forest, a young mouse dares to dream of what might be. While her fellow classmates aspire to become football players, architects and doctors, Hazel begins an adventure of a lifetime. With the power of magic, Hazel journeys through her day, helping friends and family, solving problems and making the world a better place.	Picture Book	Paul Hamilton ISBN-10 : 0646978969 ISBN-13 : 978-0646978963	 YouTube Read Aloud