



IGNITE MY FUTURE

LESSON TITLE

Digital DIY

Guiding Question: How can technology improve our lives?

SUBJECTS

English Language Arts
Computer Science

COMPUTATIONAL THINKING PRACTICE

Recognizing and Defining
Computational Problems

COMPUTATIONAL THINKING STRATEGY

Develop Algorithms

MATERIALS

[Digital DIY](#) student
capture sheet

[Design Thinking](#) teacher
prompt (you will need to
make copies and use scissors
or a paper cutter to divide
the definitions)

[Design Thinking](#) student
capture sheet

Paper

Pencils/pens

Ignite Curiosity

- Why are online tutorials so popular?
- Can you teach other people how to do something you love to do?
- Do online courses help students learn as well as in-person courses?
- Can sharing our talents improve the lives of others?

In this lesson, students will use the computational thinking strategy of developing algorithms to teach a skill to others. In **THINK**, students reflect on their skills and analyze different approaches for teaching. In **SOLVE**, students will use the Design Thinking Process to prototype their tutorial. In **CREATE**, students create a flowchart algorithm to help plan and execute their tutorial. In **CONNECT**, students discover how technology can provide resources like experts, knowledge, and classes to people who couldn't otherwise access them. Students explore how to leverage different applications to teach someone something new. Students will also identify how many professionals, such as teachers, bloggers, and data science consultants, use algorithms to share information.

Students will be able to:

- **Understand** how the computational thinking strategy of developing algorithms helps us teach people and computers new things,
- **Evaluate** a tutorial using the Design Thinking Process, and
- **Create** an algorithm flowchart that provides step-by-step instructions on how to learn a skill.



Students reflect on their skills and analyze different approaches for teaching a skill to others.

- 1 Ask** students to reflect on the following problem: how can we make education and training more accessible to people around the world?
- 2 Engage** students in a class discussion with the following questions:
 - What's a skill or talent that you have? Has someone told you that you're really good at something? *This could be something like making three-point shots in basketball, applying eyeliner, or asking good questions.*
 - Do you watch any how-to videos or tutorials? If so, do you attempt the skill outlined in the tutorial?
 - Have you ever tried to teach someone how to do something? What worked and what didn't?
 - There is a new trend in education called massive open online courses (MOOCs). These courses make lots of knowledge accessible over the internet for free or a very small fee. While many people participate in these courses, very few people complete them. Why do you think that is? What strategies can you use to keep people engaged in your tutorial?
- 3 Watch the [Exact Instruction Challenge](#) to understand that specific step-by-step procedures are critical for successful results.** Provide students with 5 to 10 minutes to complete the first section of the [Digital DIY](#) student capture sheet. Explain that the capture sheet asks students to teach someone how to perform their skill or talent in only 10 steps.
- 4 When students have finished** writing their 10 steps, have them exchange their sheets with a partner. One student will attempt to perform the skill or talent based on the written instructions while the other student takes notes and observes. When the task is completed, have students return the [Digital DIY](#) student capture sheets to their owners. Instruct students to repeat this exercise two more times with different partners.
- 5 When students are finished**, regroup as a class. Explain that algorithms are rules and commands that humans give to computers to tell them what to do. Common examples of algorithms in our daily life include things like recipes, directions, and instruction manuals. Divide students into groups and have them round-robin other examples of algorithms in everyday life.
- 6 Summarize** by informing students that they will be utilizing the computational thinking strategy of developing algorithms to make education and training more accessible to people around the world.



Students use the Design Thinking Process to prototype their tutorial.

- 1 Explain** that the 10-step tutorials and instructions that students have created are a type of algorithm. When computer programmers develop algorithms, they must think through all the possible scenarios that might arise. For instance, when you are playing a video game, you have many choices. You can make a character move left or right, jump or run, and the like. The computer programmer has to give the computer a series of instructions that accounts for all these potential possibilities. In a similar way, educators and tutorial creators have to think through all the different ways that their instructions might be perceived.
- 2 Ask** students to review their notes from observing their classmates completing their rudimentary algorithm. What did they observe? Did some things happen that surprised you? What things happened that your algorithm didn't account for?
- 3 Explain** that students will now edit their algorithms using the **Design Thinking Process**. The **Design Thinking Process** is a way of testing and refining a product that is based on how people think and behave.
- 4 Divide** students into groups of five. Provide each student in every group with one definition from the [Design Thinking](#) teacher prompt. Inform students that they are to teach the other students in their group about their stage of the **Design Thinking Process**. When each student has provided his or her definition, ask students to work as a group to organize the definitions in the correct order. When students have finished, tell them that there is no correct order of steps. The steps can occur in any order and two steps might even happen at the same time.
- 5 Instruct** students that they will now work individually to edit their algorithm using the [Design Thinking Process](#) student capture sheet. They should use the notes they collected on the [Digital DIY](#) student capture sheet to complete this task. Provide students with 15 to 20 minutes to complete their capture sheets, offering assistance as needed.
- 6 When students have finished**, call on a few students to have them provide examples of how they changed their algorithm by using the **Design Thinking Process**.



Students create a flowchart algorithm to help plan and execute their tutorial.

- 1 Tell** students to make any last-minute edits to their algorithm that they would like to make in order to make it as detailed as possible.
- 2 Pass out paper and markers.** Instruct students to modify their algorithm by taking it from a step-by-step instructional format to a flowchart. Provide students with 15 to 20 minutes to create their flowcharts.
- 3 When students have completed their flowcharts,** engage the class with the following critical thinking questions:
 - How can you ensure that learners will remain engaged with your tutorial from beginning to end? Could you incorporate elements of a game, such as points, competition, or play?
 - What is the best format for your tutorial? Would it work best as a video, podcast, or presentation? Why?
 - How can digital learning and online tutorials help provide greater access to education?



Select one of the strategies listed below to help students answer these questions:

- **How do this problem and solution connect to me?**
- **How do this problem and solution connect to real-world careers?**
- **How do this problem and solution connect to our world?**

- 1 Write** the three questions on PowerPoint or flip chart slides and invite students to share out responses.
- 2 Display** pieces of chart paper around the room, each with one question written on it. Ask students to write down their ideas related to the questions on each sheet.
- 3 Assign** one of the questions to three different student groups to brainstorm or research, and then share out responses.
- 4 Invite** students to write down responses to each question on a sticky note, and collect them to create an affinity diagram of ideas.

How does this connect to students?

Students likely use algorithms several times a day to solve problems without realizing they are using this process. Breaking down large tasks into steps or manageable chunks of information allows us to better understand what actions we need to take.

Once we break down a problem into manageable data, we can easily resolve the problem through an algorithm design. This is where “if” statements, variables, and loops are helpful. These strategies are not only useful to humans, but also important elements of coding that helps computers think.

How does this connect to careers?

Teachers prepare students for careers and successful lives by teaching various lessons and skills.

Bloggers are authors who write web articles on a variety of subjects. Bloggers are typically familiar with diverse social media platforms and have basic web design skills.

Data Science Consultants use algorithms to create programs and share information. Data science consultants analyze different uses of technology and solve problems for businesses and organizations.

How does this connect to our world?

Many organizations use computer coding. People who are able to write computer code are essential in any field that uses computers to perform or produce the work that they do. Algorithms help create the set of rules that need to be followed.

While coding is important in keeping technology running in the organization, the ability to identify and solve problems adds value to the computer’s ability to provide the resources needed. Algorithms help in developing the solutions that are automated.

Curriculum Connections



“For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and **people like you.**”
 –The United Nations

“The Sustainable Development Goals are the blueprint for a better future. And together we can reach them. By following the Good Life Goals, we can all help make tomorrow better than today. Let’s do this! #GoodLifeGoals”



LEARN AND TEACH
 Actions

4

1 **Keep learning throughout life**

2 **Teach kids kindness**

3 **Help girls and boys stay in school**

4 **Support teachers and keep schools open**

5 **Defend everyone’s right to an education**



Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SUSTAINABLE DEVELOPMENT GOALS

Source:

[The Good Life Goals by Futerra Sustainability Communications Ltd and 10-Year Framework of Programmes on Sustainable Lifestyles and Education Programme](#) is licenced under CC BY-ND 4.0.

Find more easy-to-implement resources to integrate computational thinking practices into your classroom by visiting ignitefutureinschool.ca

Global Competencies

CMEC (Council of Ministers of Education, Canada) Pan-Canadian Global Competencies Descriptions

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
Collaboration	Collaboration involves the interplay of the cognitive (including thinking and reasoning), interpersonal, and intrapersonal competencies necessary to participate effectively and ethically in teams. Ever-increasing versatility and depth of skill are applied across diverse situations, roles, groups, and perspectives in order to co-construct knowledge, meaning, and content, and learn from, and with, others in physical and virtual environments.	<p>Students participate in teams by establishing positive and respectful relationships, developing trust and acting co-operatively and with integrity.</p> <p>Students learn from and contribute to the learning of others by co-constructing knowledge, meaning, and content.</p> <p>Students assume various roles on the team, respect a diversity of perspectives, and address disagreements and manage conflict in a sensitive and constructive manner.</p> <p>Students network with a variety of communities/groups and use an array of technology appropriately to work with others.</p>
Communication	Communication involves receiving and expressing meaning (e.g., reading and writing, viewing and creating, listening and speaking) in different contexts and with different audiences and purposes. Effective communication increasingly involves understanding both local and global perspectives, societal and cultural contexts, and adapting and changing using a variety of media appropriately, responsibly, safely, and with regard to one's digital footprint.	<p>Students communicate effectively in different contexts in oral and written form in French and/or English through a variety of media.</p> <p>Students communicate using the appropriate digital tools and create a positive digital footprint.</p> <p>Students ask effective questions to acquire knowledge, listen to understand all points of view, voice their own opinions, and advocate for ideas.</p> <p>Students gain knowledge about a variety of languages and understand the cultural importance of language.</p>

Global Competencies cont.

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
<p>Global Citizenship and Sustainability</p>	<p>Global citizenship and sustainability involve reflecting on diverse worldviews and perspectives and understanding and addressing ecological, social, and economic issues that are crucial to living in a contemporary, connected, interdependent, and sustainable world. It also includes the acquisition of knowledge, motivation, dispositions, and skills required for an ethos of engaged citizenship, with an appreciation for the diversity of people, perspectives, and the ability to envision and work toward a better and more sustainable future for all.</p>	<p>Students understand the ecological, economic, and social forces, their interconnectedness, and how they affect individuals, societies, and countries.</p> <p>Students take actions and responsible decisions that support quality of life for all, now and in the future.</p> <p>Students recognize discrimination and promote principles of equity, human rights, and democratic participation.</p> <p>Students understand Indigenous traditions and knowledge and its place in Canada, learn from and with diverse people, develop cross-cultural understanding, and understand the forces that affect individuals, societies, and nations.</p> <p>Students engage in local, national, and global initiatives to make a positive difference.</p> <p>Students contribute to society and to the culture of local, national, global, and virtual communities in a responsible, inclusive, accountable, sustainable, and ethical manner.</p> <p>Students as citizens participate in networks in a safe and socially responsible manner.</p>

Global Competencies cont.

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
Critical Thinking and Problem Solving	Critical thinking and problem solving involve addressing complex issues and problems by acquiring, processing, analysing, and interpreting information to make informed judgments and decisions. The capacity to engage in cognitive processes to understand and resolve problems includes the willingness to achieve one's potential as a constructive and reflective citizen. Learning is deepened when situated in meaningful, real-world, authentic experiences.	<p>Students will solve meaningful, real-life, complex problems by taking concrete steps to address issues and design and manage projects.</p> <p>Students will engage in an inquiry process to solve problems as well as acquire, process, interpret, synthesize, and critically analyse information to make informed decisions (i.e., critical and digital literacy).</p> <p>Students will see patterns, make connections, and transfer what they have learned from one situation to another, including in real world applications.</p> <p>Students will construct, relate, and apply knowledge to all domains of life such as school, home, work, friends, and community.</p> <p>Students will analyze the functions and interconnections of social, economic, and ecological systems.</p>
Innovation, Creativity and Entrepreneurship	Innovation, creativity, and entrepreneurship involve the ability to turn ideas into action to meet the needs of a community. The capacity to enhance concepts, ideas, or products to contribute new-to- the-world solutions to complex economic, social, and environmental problems involves leadership, taking risks, independent/unconventional thinking and experimenting with new strategies, techniques, or perspectives, through inquiry research. Entrepreneurial mindsets and skills involve a focus on building and scaling an idea sustainably.	<p>Students formulate and express insightful questions and opinions to generate novel ideas.</p> <p>Students contribute solutions to complex economic, social, and environmental problems or to meet a need in a community in a number of ways including; enhancing concepts, ideas, or products through a creative process, taking risks in their thinking and creating, making discoveries through inquiry research, and by hypothesizing and experimenting with new strategies or techniques.</p> <p>Students demonstrate leadership, initiative, imagination, creativity, spontaneity, and ingenuity in a range of creative processes and motivate others with an ethical entrepreneurial spirit.</p>

Global Competencies cont.

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
<p>Learning to learn and to be self-directed and self-aware</p>	<p>Learning to learn and to be self-directed and self-aware, means: becoming aware and demonstrating agency in one's process of learning, including the development of dispositions that support motivation, perseverance, resilience, and self-regulation. Belief in one's ability to learn (growth mindset), combined with strategies for planning, monitoring and reflecting on one's past, present, and future goals, potential actions and strategies, and results. Self-reflection and thinking about thinking (metacognition) promote lifelong learning, adaptive capacity, well-being, and transfer of learning in an ever-changing world.</p>	<p>Students learn the process of learning (metacognition) (e.g., independence, goal-setting, motivation) and believe in their ability to learn and grow (growth mindset).</p> <p>Students self-regulate in order to become lifelong learners and reflect on their thinking, experience, values, and critical feedback to enhance their learning. They also monitor the progress of their own learning.</p> <p>Students develop their identity in the Canadian context (e.g., origin and diversity) and consider their connection to the environment. They cultivate emotional intelligence to understand themselves and others. They take the past into account to understand the present and approach the future.</p> <p>Students develop personal, educational, and career goals and persevere to overcome challenges to reach these goals. They adapt to change and show resilience to adversity.</p> <p>Students manage various aspects of their lives: physical, emotional (relationships, self-awareness), spiritual, and mental well-being.</p>

Digital DIY

Identify a skill or talent at which you excel:

Now, write down how to perform that skill or talent in 10 easy-to-follow steps:

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Hand your paper to a classmate and see if he or she can perform the skill!

While your partner is reading and performing, record notes in the space below. When your partner is finished, have him or her return this sheet. Then, repeat this activity two more times with different partners.

Trial #1 Notes:

Trial #2 Notes:

Trial #3 Notes:

The Design Thinking Process Teacher Prompt

Cut and distribute these definitions to student groups.

Empathize

This step means really understanding the problem you are trying to solve. In this stage, you will engage with users of the product or process to understand their experience. In this stage, you have to identify any assumptions (such as prior knowledge or skills) that might be hindering your product and gain insight into the interests and needs of the end user.

Define

In this step, you look through the data you have collected in order to develop a clear understanding of the problem or problems facing your users. The key to this step is designing what is known as a problem statement. The problem statement should not be focused around your own wish or need. Rather, it should focus on the needs of the end user. For instance, instead of identifying your problem statement as “my tutorial has to be funny so that it gets more views,” it should focus on the learner by reading “students learn best when they are engaged with the material.”

Ideate

When you understand your users and their needs, it becomes possible to think outside the box and create new solutions. You might brainstorm, play, act, or use other techniques to encourage lots of free thinking. The goal of this step is to generate many ideas. It doesn’t matter if they are good or bad. You just need to be creative!

Prototype

A prototype is a rough draft or trial version of the product. In this stage, you share a preliminary version of your product with a small group. You might incorporate some ideas and remove them if they don’t work. When you finish this stage, you should have a pretty good idea of how a user would interact with your finished product.

Test

In this stage, the product is shared with a wide group of users. As new people interact with the product, you learn more about what works and what doesn’t. You use data from the testing phase to make the product better.

The Design Thinking Process Student Capture Sheet

With your algorithm in hand, complete the following stages of the **Design Thinking Process**. Perform the tasks in the right-hand column and record your thoughts in the space provided.

Empathize *Think like the user*

Identify five reasons why a user might want to use a tutorial about your skill:

- 1
- 2
- 3
- 4
- 5

Thoughts:

Define *Get a clear understanding of the problem*

Answer this: What problem is your tutorial trying to solve? Make sure the problem is phrased from the perspective of the user.

Thoughts:

Ideate *Think outside the box to create a solution*

Brainstorm and free-write five ideas about how to solve the problem you wrote above:

- 1
- 2
- 3
- 4
- 5

Thoughts:

Prototype *Make a rough draft*

Rewrite your algorithm using the steps of the Design Thinking Process you've completed. Share your revised algorithm with a partner and see how it goes. What did you learn?

Thoughts:

Test *Try it out with users*

Share your revised algorithm with three more people. What changes do you need to make?

Thoughts: