



IGNITE MY FUTURE

SUBJECTS

Engineering
Math

COMPUTATIONAL THINKING PRACTICE

Developing and
Using Abstractions

COMPUTATIONAL THINKING STRATEGY

Analyze Data
Decompose

MATERIALS

Computers with Internet access

[Fidget toys student capture sheet](#)

[Build Your Own Fidget toy
student capture sheet](#)

Graph paper

Pencils

Whiteboard or chalkboard

Focusing toys: stress balls, Zen gardens, fidget rings, thinking putty, fidget foot bands, etc. (optional)

Optional extension:

Students can use 3D modeling software or applications to design and print fidget toys. Necessary materials include computers with Internet access and the ability to use 3D modeling software (TinkerCAD, Inkscape, etc.) and 3D printers.

LESSON TITLE

Find Your Focus

Guiding Question: How can technology improve our lives?

Ignite Curiosity

- Have you ever had a great idea for a new toy?
- Why is play important for health and wellness?
- What helps you focus when you need to study?

In this lesson, students will think like computers to decompose the real-world problem of designing a toy that helps students focus while studying. In **THINK**, students act as toy designers challenged to create a new toy that helps students focus on studying for an extended amount of time. Because there are so many different learning styles, the toy designers have decided that instead of manufacturing the toy themselves, it is better to publish an instruction guide that teaches someone how to make a generic fidget toy and modify it to suit their unique needs. Students will analyze current fidget toys available now and assess the benefits and drawbacks of different designs. They will discuss the diversity of learning styles and why a more generic toy design helps to solve a variety of problems. In **SOLVE**, students will brainstorm different toy designs and decompose the process of designing a fidget toy. In **CREATE**, students will create an instruction guide that breaks the process of building a custom fidget toy into manageable steps. Classrooms with access to 3D printing technology may choose to extend this lesson by printing a 3D artifact of a fidget toy. In **CONNECT**, students will explore how 3D modeling connects to careers, production, and the problems of tomorrow.

Students will be able to:

- **Evaluate** different toy designs,
- **Understand** the process of decomposing complicated problems into manageable sub-problems, and
- **Create** an instruction manual that teaches someone how to construct a unique fidget toy.



Students act as toy designers challenged to create a new toy that helps students focus on studying for an extended amount of time. Students will analyze fidget toys currently available and assess the benefits and drawbacks of different designs. They will discuss the diversity of learning styles and why a more generic toy design helps to solve a variety of problems.

1 Read the following scenario to students:

Imagine that you are a designer working for a toy company. Your job is to generate creative ideas for new tools and communicate these ideas to the people who build the tools. After a conversation with students from the Yukon ([click here to learn more](#)), you learn that focus tools are very popular with students who are trying to concentrate on their studies. You decide that you want to build a new focus toy that any student can use while studying in any environment. The problem is that students have a wide range of learning styles and study in lots of different environments, so it would not work to create one toy that every student could use. You decide that instead of building one toy design, you will create an instruction manual that teaches students how to customize a generic fidget toy to fit their needs and learning style. You think that new 3D modeling software and 3D printers are a great way to make this idea a reality. Can you decompose the problem of designing a fidget toy that anyone can build and use?

2 Ask students to name some different tools that might help someone focus while studying. Answers might include stress balls, putty, fidget spinners/rings, elastic bracelets, chewable bands, etc. Write the answers on a chalkboard or whiteboard.

3 If you have any focus toys in your classroom, pass them out and have students examine them. Ask students to describe the tools and identify different design characteristics. Write these characteristics on the board. They might include things like “squishy” or “soft” or “spins.”

4 Ask students why they think focus and fidget toys are so popular. What benefits do they offer? What are some drawbacks? Write these on the board. Share the following two articles with students about the benefits and drawbacks of concentration tools as well as an indigenous perspective on the matter:

- [Tool or Toy? Why Fidget toys may be hurting as many kids as they're helping](#)
- [Indigenizing the fidget spinner](#)

5 Explain that these benefits and drawbacks are helpful in determining the criteria and constraints of their focus toy design.

6 Explain that different students have different learning styles. While learning is unique to each person, many learners can be assigned into one of three categories:

- Visual learners—learn best by seeing. Helpful tools include colors, maps, and writing things out.
- Auditory learners—learn best by hearing. Helpful tools include songs and recordings.
- Kinesthetic learners—learn best through hands-on experiences. Helpful tools include acting things out, taking notes, and drawing.

7 Have students pair up with a partner to discuss which learning style they feel best fits them. Ask each student to think of three tools or techniques that help them learn.



- 8 Pass out** the [Fidget toys](#) student capture sheet. Divide students into groups of three or four. Have groups work together to identify a variety of tools that could be used to help students with different learning styles focus. Ask students to record design features of the different tools on the [Fidget toys](#) student capture sheet. Allow student groups 15 to 20 minutes to brainstorm different tools and characteristics.
- 9 Once students have completed** the [Fidget toys](#) student capture sheet, lead the class in a discussion about how some focus tools are better for certain learners than others. For instance, kinesthetic learners might benefit from a focus toy that allows them to manipulate it, like putty. Ask how different environments also change what focus tools might work best. For instance, fidget spinners can be loud and might be distracting in a library environment.
- 10 Re-read** the initial prompt to students. Ask them to summarize the problem in the prompt (designing a fidget toy that someone can make at home that works for any learner in any situation). Explain to students that this problem is complex and includes many sub-problems. When computer programmers design new software programs, they write the code for the program in chunks. That helps to break a big program out into smaller, more manageable pieces and allows the programmer to copy or replicate some of the chunks. The computational thinking strategy of decomposing helps us take large problems and break them down into manageable sub-problems. Lead students through the process of identifying the sub-problems in the prompt:
- Designing a fidget toy
 - That can be made at home
 - That helps students with different learning styles
 - And can be used in many different situations
- 11 Ask** students how they think it might be possible to design a toy that fits all these different criteria. Explain that by making a generic toy that users can modify, they can meet the criteria of the prompt. Explain to students that decomposing is a form of abstraction. When we abstract something, it means that we have removed layers of detail so that we can make one solution work in many situations.



Students brainstorm designs and decompose the process of building a fidget toy.

- 1 Ensure** that students are still in groups of three or four. Provide groups with 5 minutes to identify the criteria and constraints of the challenge.
- 2 When they have finished**, ask groups to share their answers. Criteria should include considerations such as the toy should be easy to make and use materials that are commonly available. Constraints include the fact that the toy must be appropriate for use in a variety of scenarios, so tools with noises, excessive motion or bright lights will not work. Write the criteria and constraints on the board.
- 3 Instruct** groups to review their [Fidget toys](#) student capture sheet and identify which toy on the sheet best meets the criteria and constraints of the problem. When they have selected a toy, provide students with 15 to 20 minutes to brainstorm the following:
 - How the toy solves each of the sub-problems identified in the prompt
 - Three modifications they could make to the toy to customize it for different learning styles



Students create an instruction guide that breaks the process of building a custom fidget toy into manageable steps.

- 1 Distribute** the [Build Your Own Fidget toy](#) student capture sheet.
- 2 Explain** to students that they will decompose the process of creating the fidget toy they have selected by creating an instruction guide. They will use the [Build Your Own Fidget toy](#) student capture sheet to record their instructions. Remind students that the [guide](#), like the toy, must include aspects that work well for each learning style. The instructions should be clear, easy, and accessible (using materials that are inexpensive and commonly found in the household).
- 3 Provide** groups with 30 minutes to create their instruction guides, offering help as needed.
- 4 When groups have completed** their instruction guides, ask students the following questions:
 - How did the computational thinking strategy of decomposing help you solve the challenge in the prompt?
 - Do computers help us focus or do they distract us? Why?
 - What happens when you haven't had a chance to exercise or play in a while? How does your concentration change?
 - Could you use 3D modeling software to design a fidget toy that's tailored to your learning style?

Optional Extensions:

- Classrooms with access to 3D printing technology may choose to extend this lesson by printing a 3D artifact of a fidget toy.
- This activity lends itself well to be done off-line. Students can construct their fidget toy using everyday materials available to them. For example, could they recycle materials in their home to create their fidget toy?



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

- How does using modeling and prototypes to communicate relate to me?
- How does modeling using technology connect to real-world careers?
- How does using modeling and prototypes to communicate relate 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?

Most products that students use every day began as abstract ideas. Students probably don't consider the process required to transform an idea into a product.

Every aspect of a product—its size, color, materials, and functionality—is carefully considered. Designers work with manufacturers to make prototypes and modify them until they create the best possible product. Guide students to think about the creative and practical processes behind the objects around them, from cars to chairs to smartphones. If students have ideas for creating or improving objects, they can consider careers in design and manufacturing in which they could make their ideas reality.

How does this connect to careers?

Industrial Designers develop the concepts for manufactured products, such as cars, home appliances, and tools. They combine art, business, and engineering to make products that people use every day. Industrial designers consider the function, aesthetics, production costs, and usability of products when developing new product concepts.

Software Developers are the creative minds behind computer programs, including modeling programs and other programs that help people communicate their ideas. Some develop the applications that allow people to do specific tasks on a computer or another device. Others develop the underlying systems that run the devices or that control networks.

Machinists and **Tool and Die Makers** set up and operate a variety of computer-controlled and mechanically controlled machine tools to produce precision metal parts, instruments, and tools. These workers use specialized machines to create products based on a prototype.

How does this connect to our world?

Before something new can be manufactured, it has to be described in great detail. 3D modeling and printing is a way to provide this detail.

Today, most products are produced far from where they are designed. Designers working anywhere in the world need to be able to communicate their ideas clearly and precisely so that the products that are based on them exactly match their inspiration. Technology like 3D modeling software enables this communication.

Curriculum Connections

UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS



“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”



MAKE SMART CHOICES Actions

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1 Learn about plans for progress in your country

4 Welcome innovations that make the world a better place

2 Stay smart and kind online

5 Demand the benefits from progress are shared

3 Support construction that benefits people and protects the planet



Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

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.

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
Global Citizenship and Sustainability	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>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>

Fidget toys

Identify a toy that meets the specific criteria for each of the cells in the chart below. The left side of the chart includes criteria for where the toy will be used. The top of the chart includes criteria for what type of learner should benefit from the toy. Each toy must meet both criteria.

	Works for Visual Learners	Works for Auditory Learners	Works for Kinesthetic Learners
Good for traveling			
Good for use at home			
Good for use in the library			
Good for use outside			
Good for use in the classroom			
Good for use during a quiz or test			
Good for use while in a busy area			
Good for use while walking			
Good for use while sitting still			

Build Your Own Fidget toy

Toy name:

This toy is great because:

Where you can use this toy:

Materials needed:

How to make it:

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

How to modify this toy for different learning styles:

- **Visual learners:**

- **Auditory learners:**

- **Kinesthetic learners:**