

~ Maker Kit ~  
*Explore, Imagine, Create, Share*



*An Applied Design, Skills and Technologies Kit  
for grades 6-7*



## BIG IDEAS

Design can be responsive to identified needs.

Complex tasks require the acquisition of additional skills.

Complex tasks may require multiple tools and technologies.

## Learning Standards

Curricular Competencies	Content
<p><i>Students are expected to be able to do the following:</i></p> <p><b>Applied Design</b> <i>Understanding context</i></p> <ul style="list-style-type: none"> <li>• <b>Empathize</b> with potential <b>users</b> to find issues and uncover needs and potential design opportunities</li> </ul> <p><b>Defining</b></p> <ul style="list-style-type: none"> <li>• Choose a design opportunity</li> <li>• Identify key features or potential users and their requirements</li> <li>• Identify criteria for success and any <b>constraints</b></li> </ul> <p><b>Ideating</b></p> <ul style="list-style-type: none"> <li>• Generate potential ideas and add to others' ideas</li> <li>• Screen ideas against criteria and constraints</li> <li>• Evaluate personal, social, and environmental impacts and ethical considerations</li> <li>• Choose an idea to pursue</li> </ul> <p><b>Prototyping</b></p> <ul style="list-style-type: none"> <li>• Identify and use <b>sources of information</b></li> <li>• Develop a plan that identifies key stages and resources</li> <li>• Explore and test a variety of materials for effective use</li> <li>• Construct a first version of the <b>product</b> or a prototype, as appropriate, making changes to tools, materials, and procedures as needed</li> <li>• Record <b>iterations</b> of prototyping</li> </ul>	<p><i>Students will experience a minimum of three modules of Applied Design, Skills, and Technologies 6–7 in each of Grades 6 and 7. Schools may choose from among the modules listed below or develop new modules that use the Curricular Competencies of Applied Design, Skills, and Technologies 6–7 with locally developed content. Locally developed modules can be offered in addition to, or instead of, the modules in the provincial curriculum.</i></p> <p><b>Computational Thinking</b> <i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• <b>simple algorithms</b> that reflect computational thinking</li> <li>• <b>visual representations</b> of problems and data</li> <li>• <b>evolution of programming languages</b></li> <li>• <b>visual programming</b></li> </ul> <p><b>Computers and Communications Devices</b> <i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• computer system architecture, including hardware and software, network infrastructure (local), intranet/Internet, and personal communication devices</li> <li>• strategies for identifying and troubleshooting simple hardware and software problems</li> <li>• function of input and output devices, including 3D printing and adaptive technologies for those with special needs</li> <li>• ergonomics in use of computers and computing devices</li> <li>• effective and efficient keyboarding techniques</li> </ul>

Learning Standards (continued)

Curricular Competencies	Content
<p><b>Testing</b></p> <ul style="list-style-type: none"> <li>• Test the first version of the product or the prototype</li> <li>• Gather peer and/or user and/or expert feedback and inspiration</li> <li>• Make changes, troubleshoot, and test again</li> </ul> <p><b>Making</b></p> <ul style="list-style-type: none"> <li>• Identify and use appropriate tools, <b>technologies</b>, and materials for production</li> <li>• Make a plan for production that includes key stages, and carry it out, making changes as needed</li> <li>• Use materials in ways that minimize waste</li> </ul> <p><b>Sharing</b></p> <ul style="list-style-type: none"> <li>• Decide on how and with whom to <b>share</b> their product</li> <li>• Demonstrate their product and describe their process, using appropriate terminology and providing reasons for their selected solution and modifications</li> <li>• Evaluate their product against their criteria and explain how it contributes to the individual, family, community, and/or environment</li> <li>• Reflect on their design thinking and processes, and evaluate their ability to work effectively both as individuals and collaboratively in a group, including their ability to share and maintain an efficient co-operative work space</li> <li>• Identify new design issues</li> </ul> <p><b>Applied Skills</b></p> <ul style="list-style-type: none"> <li>• Demonstrate an awareness of precautionary and emergency safety procedures in both physical and digital environments</li> <li>• Identify and evaluate the skills and skill levels needed, individually or as a group, in relation to a specific task, and develop them as needed</li> </ul>	<p><b>Digital Literacy</b></p> <p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• <b>Internet safety</b></li> <li>• digital self-image, citizenship, relationships, and communication</li> <li>• legal and ethical considerations, including creative credit and copyright, and cyberbullying</li> <li>• methods for <b>personal media management</b></li> <li>• search techniques, how search results are selected and ranked, and <b>criteria</b> for evaluating search results</li> <li>• strategies to identify <b>personal learning networks</b></li> </ul> <p><b>Drafting</b></p> <p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• technical drawing, including sketching techniques and manual <b>drafting techniques</b></li> <li>• elements of plans and drawings</li> <li>• simple computer-aided <b>drafting programs</b></li> </ul> <p><b>Entrepreneurship and Marketing</b></p> <p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• role of entrepreneurship in designing and making products and services</li> <li>• <b>market niche</b></li> <li>• branding of products, services, institutions, or places</li> <li>• pricing product/service, including decision to seek profit or break even</li> <li>• role of basic financial record-keeping and budgeting</li> </ul>

Learning Standards (continued)

Curricular Competencies	Content
<p><b>Applied Technologies</b></p> <ul style="list-style-type: none"> <li>• Select, and as needed learn about, appropriate tools and technologies to extend their capability to complete a task</li> <li>• Identify the personal, social, and environmental impacts, including unintended negative consequences, of the choices they make about technology use</li> <li>• Identify how the land, natural resources, and culture influence the development and use of tools and technologies</li> </ul>	<p><b>Food Studies</b></p> <p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• basic food handling and simple preparation <b>techniques and equipment</b></li> <li>• factors in ingredient use, including balanced eating/nutrition, function, and <b>dietary restrictions</b></li> <li>• factors that influence food choices, including cost, availability, and family and cultural influences</li> </ul> <p><b>Media Arts</b></p> <p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• <b>digital and non-digital</b> media, and their distinguishing characteristics and uses</li> <li>• <b>techniques</b> for using images, sounds, and text to communicate information, settings, ideas, and story structure</li> <li>• media technologies and techniques to capture, edit, and manipulate images, sounds, and text for specific purposes</li> <li>• influences of digital media for the purpose of communication and self-expression</li> </ul> <p><b>Metalwork</b></p> <p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• characteristics and uses of metals</li> <li>• metalworking <b>techniques and processes</b> using <b>hand tools</b></li> <li>• metals as a non-renewable resource</li> </ul> <p><b>Power Technology</b></p> <p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> <li>• power is the rate at which energy is transformed</li> <li>• <b>forms of energy</b></li> <li>• energy is <b>conserved</b></li> <li>• devices that <b>transform energy</b></li> </ul>

Learning Standards (continued)

Curricular Competencies

Content

**Robotics**

*Students are expected to know the following:*

- a robot is a machine capable of carrying out a complex series of actions automatically
- uses of robotics
- main components of robots: **sensors, control systems, and effectors**
- various **ways** that objects can move
- programming and logic for robotics components
- various **platforms** for robotics

**Textiles**

*Students are expected to know the following:*

- range of **uses** of textiles
- variety of textile **materials**
- **hand construction techniques** for producing and/or repairing textile items
- consumer concerns that influence textile choices, including availability, cost, function (e.g., waterproof), and textile care

**Woodwork**

*Students are expected to know the following:*

- ways in which wood is used in local cultural and economic contexts
- characteristics of wood as a material
- **woodworking techniques and basic joinery using hand tools**



# COMMUNICATION CORE COMPETENCY

The Communication competency encompasses the set of abilities that students use to impart and exchange information, experiences, and ideas, to explore the world around them, and to understand and effectively engage in the use of digital media. Communication competency provides a bridge between students' learning, their personal and social identity and relationships, and the world in which they interact.

## 1. Connect and engage with others (to share and develop ideas)

### Sample "I" Statements

- I ask and respond to simple, direct questions.
- I am an active listener; I support and encourage the person speaking.
- I recognize that there are different points-of-view and I can disagree respectfully.

## 2. Acquire, interpret, and present information (includes inquiries)

### Sample "I" Statements

- I can understand and share information about a topic that is important to me.
- I present information clearly and in an organized way.
- I can present information and ideas to an audience I may not know.

## 3. Collaborate to plan, carry out, and review constructions and activities

### Sample "I" Statements

- I ask and respond to simple, direct questions.
- I am an active listener; I support and encourage the person speaking.
- I recognize that there are different points-of-view and I can disagree respectfully.

## 4. Explain/recount and reflect on experiences and accomplishments

### Sample "I" Statements

- I give, receive, and act on feedback.
- I can recount simple experiences and activities and tell something I learned.
- I can represent my learning, and tell how it connects to my experiences and efforts.

**The profiles emphasize the concept of growing and expanding.  
They are progressive and additive.**



# CRITICAL THINKING CORE COMPETENCY

Critical thinking involves making judgements based on reasoning: students consider options; analyze these using specific criteria; and draw conclusions and make judgements. Critical thinking competency encompasses a set of abilities that students use to examine their own thinking, and that of others, about information that they receive through observation, experience, and various forms of communication.

## 1. Analyze and critique

### Sample "I" Statements

- I can show if I like something or not.
- I can identify criteria that I can use to analyze evidence.
- I can analyze evidence from different perspectives.
- I can reflect on and evaluate my thinking, products, and actions.
- I can analyze my own assumptions and beliefs and consider views that do not fit with them.

## 2. Question and investigate

### Sample "I" Statements

- I can explore materials and actions.
- I can ask open-ended questions and gather information.
- I can consider more than one way to proceed in an investigation.
- I can evaluate the credibility of sources of information.
- I can tell the difference between facts and interpretations, opinions, or judgements.

## 3. Developing ideas

### Sample "I" Statements

- I can experiment with different ways of doing things.
- I can develop criteria for evaluating design options.
- I can monitor my progress and adjust my actions to make sure I achieve what I want.
- I can make choices that will help me create my intended impact on an audience or situation.

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# CREATIVE THINKING CORE COMPETENCY

Creative thinking involves the generation of new ideas and concepts that have value to the individual or others, and the development of these ideas and concepts from thought to reality.

## 1. Novelty and value

### Sample "I" Statements

- I get ideas when I play. My ideas are fun for me and make me happy.
- I can get new ideas or build on other people's ideas, to create new things within the constraints of a form, a problem, or materials.
- I generate new ideas as I pursue my interests.
- I can develop a body of creative work over time in an area I'm interested in or passionate about.

## 2. Generating ideas

### Sample "I" Statements

- I get ideas when I use my senses to explore.
- I build on others' ideas and add new ideas of my own, or combine other people's ideas in new ways to create new things or solve straightforward problems.
- I deliberately learn a lot about something (e.g. by doing research, talking to others or practising) so that I am able to generate new ideas or ideas just pop into my head.
- I have deliberate strategies for quieting my conscious mind (e.g. walking away for a while, doing something relaxing, being deliberately playful) so that I can be more creative.
- I have interests and passions that I pursue over time.

## 3. Developing ideas

### Sample "I" Statements

- I make my ideas work or I change what I am doing.
- I can usually make my ideas work within the constraints of a given form, problem, and materials if I keep playing with them.
- I build the skills I need to make my ideas work, and usually succeed, even if it takes a few tries.
- I use my experiences with various steps and attempts to direct my future work.
- I can persevere over years if necessary to develop my ideas. I expect ambiguity, failure, and setbacks, and use them to advance my thinking.

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# **SOCIAL RESPONSIBILITY CORE COMPETENCY**

Social responsibility involves the ability and disposition to consider the interdependence of people with each other and the natural environment; to contribute positively to one's family, community, society, and the environment; to resolve problems peacefully; to empathize with others and appreciate their perspectives; and to create and maintain healthy relationships.

## **1. Contributing to community and caring for the environment**

### **Sample "I" Statements**

- With some support, I can be part of a group.
- I can participate in classroom and group activities to improve the classroom, school community, or natural world.
- I contribute to group activities that make my classroom, school, community, or natural world a better place.
- I can identify how my actions and the actions of others affect my community and the natural environment and can work to make positive change.
- I can analyze complex social or environmental issues from multiple perspectives. I can take thoughtful actions to influence positive, sustainable change.

## **2. Solving problems in peaceful ways**

### **Sample "I" Statements**

- I can solve some problems myself and can identify when to ask for help.
- I can identify problems and compare potential problem-solving strategies.
- I can clarify problems, consider alternatives, and evaluate strategies.
- I can clarify problems or issues, generate multiple strategies, weigh consequences, compromise to meet the needs of others, and evaluate actions

## **3. Valuing diversity**

### **Sample "I" Statements**

- With some direction, I can demonstrate respectful and inclusive behaviour.
- I can explain when something is unfair.
- I can advocate for others.
- I take action to support diversity and defend human rights, and can identify how diversity is beneficial for my community, including online.

## **4. Building relationships**

### **Sample "I" Statements**

- With some support, I can be part of a group.
- I am kind to others, can work or play co-operatively, and can build relationships with people of my choosing.
- I can identify when others need support and provide it.
- I am aware of how others may feel and take steps to help them feel included.
- I build and sustain positive relationships with diverse people, including people from different generation.

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They are progressive and additive.**

## *A framework for Wonder*



Adapted from: Larmer, J. & Mergendoller, J. (2012). 8 essentials for project-based learning. Originally published in 2010 in *Educational Leadership*, 68(1), 34.

# *Inspiring Wonder in the Maker Space*

## **Creating Spaces that inspire Wonder**

Consider sharing:

Objects that inspire Wonder

Books that inspire Wonder

Photos that inspire Wonder: (i.e. National Geographic photos)

Websites that inspire Wonder:

<http://thekidshouldseethis.com/>

<http://wonderopolis.org/wonders>



## **Offering Different Kinds of Wonders**

Wonders you Can Test

How-to Wonders (i.e. How to make origami? How to make something with Lego? How to do magic tricks?)

Wonders from the Heart (i.e. How do I be a kind friend?)

Research Wonders: *Kid Rex* search engine; *World Book* on our Destiny site

## **Inquiry-Based Learning**

*Inquiry-based learning is a dynamic and emergent process that builds on students' natural curiosity about the world in which they live. Inquiry places ideas at the center of the learning experience. Teachers using an inquiry-based approach encourage students to ask and genuinely investigate their own questions about the world. Teachers further facilitate students' learning by providing a variety of tools, resources, and experiences that enable learners to investigate, analyze, reflect, and rigorously discuss potential solutions to their own questions about a topic the class is studying. (An excerpt from [www.naturalcuriosity.ca](http://www.naturalcuriosity.ca) )*

## **Types of Inquiry**

### **Structured inquiry**

- the teacher determines the big idea, and what the students will come to understand by the end of the inquiry
- the teacher provides the guiding questions
- the students will help create the plan and guide the inquiry with their questions, interests, ideas, analysis, reflections and understandings

### **Guided inquiry**

- the teacher determines the big idea or topic and the students and/or the teacher come up with the questions
- the students are responsible for designing and following their own procedures to test the question and then communicate their results and findings

### **Open inquiry**

- the students determine the purpose and formulate the questions
- the students design the procedures, gather the materials and communicate their findings
- the teacher facilitates, supports, asks questions and redirects the investigation

*Adapted from Michelle Hikida, mhikida@sd38.bc.ca ~ BCPTA Fall Conference, 2016*

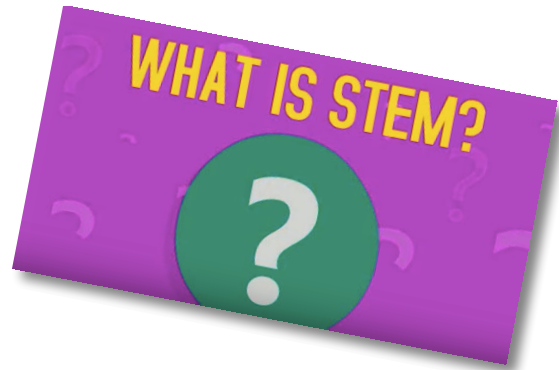
*Quick video clips inspire Wonder*



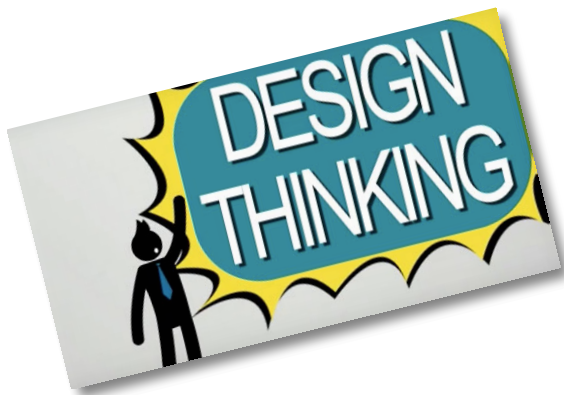
*What is a MakerSpace? (1:02)*

<https://www.youtube.com/watch?v=NLEJLOB6fDw>

*What is STEM? (1:06, stop at :34)*  
<https://www.youtube.com/watch?v=8yog1lu8HTc>



*Why STEM? (1:00) funny*  
<https://www.youtube.com/watch?v=8V8EjEzIpkg>



*What is Design Thinking? (1:50)*

<https://www.youtube.com/watch?v=a7sEoEvT8l8>

*7 Things That Happen When Students Own Their Learning (1:40)*

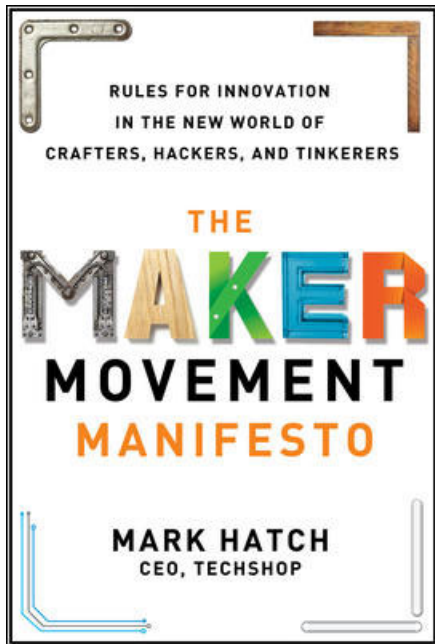
<https://www.youtube.com/watch?v=N7S9kyk-oda>



*What is Genius Hour? (1:42)*

<https://www.youtube.com/watch?v=2n7EeIMbzG0>

*Books inspire a Maker Mindset*

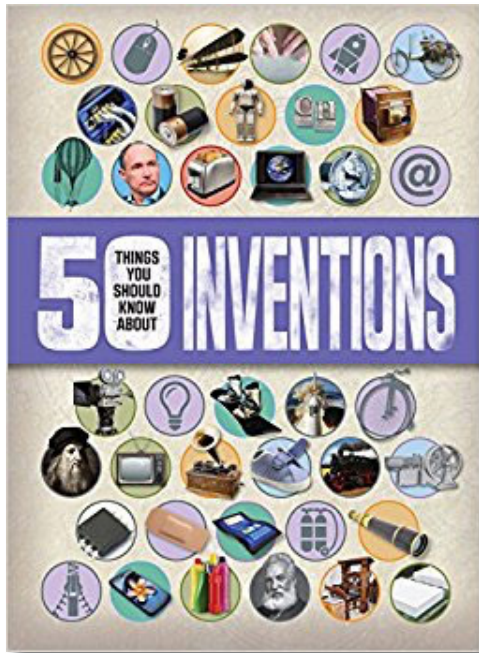


*The creative spirit lives inside every human being. We are all makers. Whether you're a banker, lawyer, teacher, tradesman, or politician, you can play an important role in the Maker society. So fire up your imagination, read The Maker Movement Manifesto--and start creating!*

*The future is now! Super smart toilets, sweet dream machines, bread buttering toasters, and flying hotels -- this fun and informative book gives curious kids the inside scoop on 125 amazing real inventions. It's sure to get gadget gurus, techies, and computer geeks thinking about the world of infinite possibilities. If there was an invention that could knock your socks off, you'd find it here!*

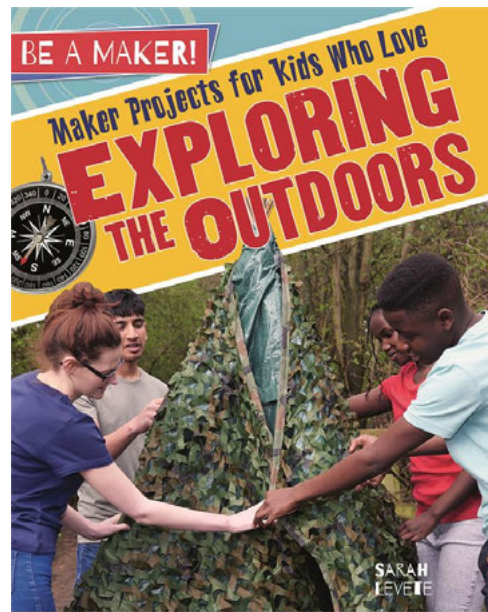


## *Books inspire a Maker Mindset*

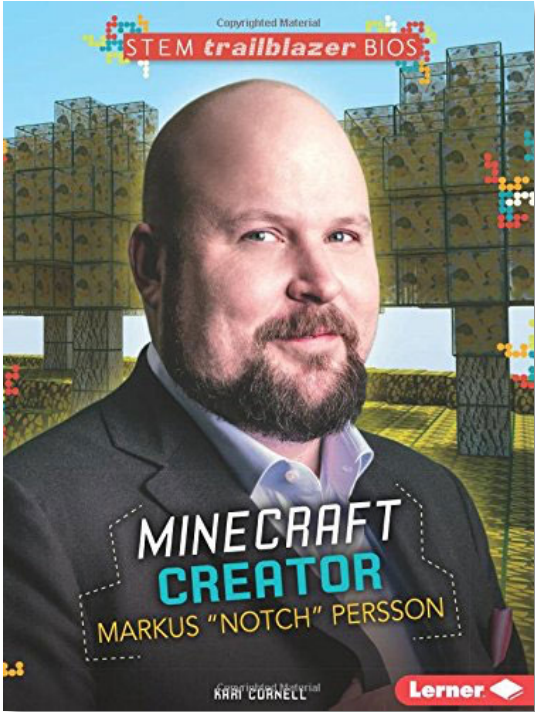


*In the ancient world, philosopher Archimedes designed new machines for farming. During the Renaissance, artist Leonardo da Vinci sketched his ideas for wondrous flying machines. Scientist James Watt provided ideas that would power the Industrial Revolution, while American inventor Thomas Edison patented more than 1000 inventions that would shape modern life, including the movie camera and the electric light bulb. Today's inventors still explore ideas for new and clever technology, producing miniature machines that we can only see under a microscope. Step inside the world of invention and see where it might take us next...*

*BE A MAKER! The great outdoors is the perfect "Maker" space for exploring possibilities for creativity, problem solving, and innovation. From designing devices to study the natural world to figuring out ways to find food or water outside, this refreshing title inspires readers to come up with Maker projects of their own in their back yards or communities. "Makers and Shakers" sidebars introduce important innovators and their creations to inspire readers to be environmentally aware and involved in the natural world.*



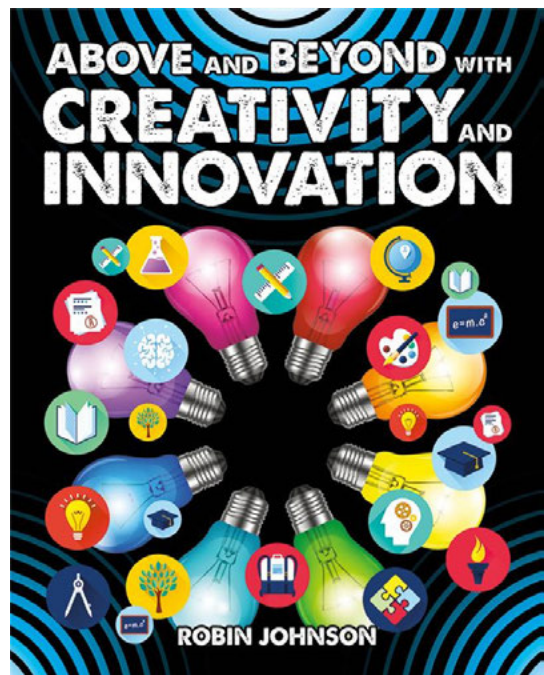
*Books inspire a Maker Mindset*



*STEM Trailblazer Bios -*

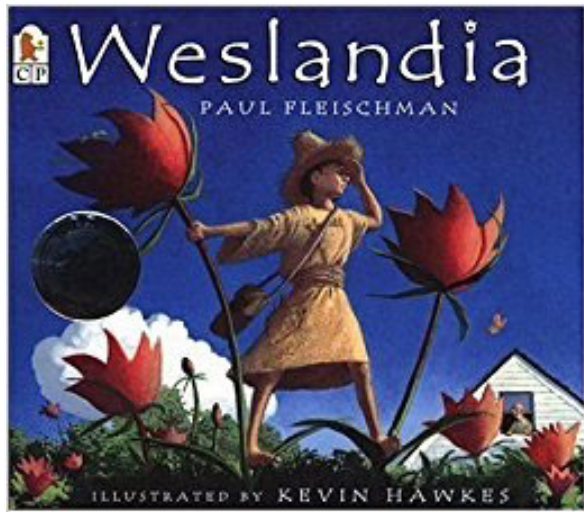
*Do you play computer games? If you do, you've probably played Minecraft. When Minecraft creator Markus Persson was young, he wasn't very interested in the games themselves. He was more interested in the programming instructions in the computer's manual. By the time Persson was eight years old, he was writing code for his own computer games.*

*Creativity and innovation are central to success in the 21st century. This dynamic title provides a comprehensive look at creative processes in a variety of settings. Readers are introduced to various brainstorming techniques and will learn different approaches to help refine and evaluate their ideas. Real-world examples, motivating challenges, and case studies broaden readers understanding of this key skill set.*



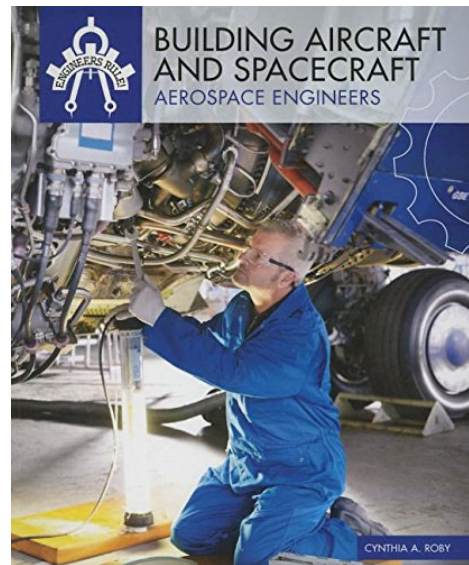


## *Books inspire a Maker Mindset*



*Enter the witty, intriguing world of Weslandia! Now that school is over, Wesley needs a summer project. He's learned that each civilization needs a staple food crop, so he decides to sow a garden and start his own - civilization, that is. He turns over a plot of earth, and plants begin to grow. They soon tower above him and bear a curious-looking fruit. As Wesley experiments, he finds that the plant will provide food, clothing, shelter, and even recreation. It isn't long before his neighbours and classmates develop more than an idle curiosity about Wesley - and exactly how he is spending his summer vacation.*

*Engaging text and vivid photographs provide a dynamic reading experience, while sidebars and a graphic organizer present additional information in an accessible way. This book is a perfect addition to STEM and career-based instruction, and it is sure to be a hit with young engineers everywhere.*



## *Young Canadian Inventors inspire a Maker Mindset*



Meet Ann (Andini) Makosinski, an 18-year-old inventor and entrepreneur from BC who is dazzling people with her ideas. Ann is especially known for her invention of the *Hollow Flashlight* and the *E-drink*. (6:29)

<https://www.youtube.com/watch?v=ErqyIm2CGp8&index=4&list=PLvntPLkd9IMcdr1kzNK60P-tnIg-XYKzz>

Vancouver teen Austin Wang's brilliant idea won him the prestigious Intel Science Fair, discovering a method to turn waste water into electricity. (6:53)

<https://www.youtube.com/watch?v=Wt4R-QrmfJY&index=1&list=PLvntPLkd9IMcdr1kzNK60P-tnIg-XYKzz>



Meet Rachel Brouwer, a 14-year-old Nova Scotia inventor who's out to change the world with her water-cleaning system. (6:49)

<https://www.youtube.com/watch?v=32ndO22BorM&index=2&list=PLvntPLkd9IMcdr1kzNK60P-tnIg-XYKzz>



*Young Canadian Inventors inspire a Maker Mindset*



Meet Frank Bouchard, co-founder of the *Wipebook*, a dry-erase notebook! (3:18)

<https://www.youtube.com/watch?v=EBia0UesYAc>

Montreal inventor Catalin Alexandru Duru has invented a hoverboard! (7:47)

<https://www.youtube.com/watch?v=AUq3mBuENiw&index=3&list=PLvntPLkd9IMcdr1kzNK60P-tnIg-XYKzz>



Alex Deans is working to improve the lives of the visually impaired with his invention, the *iAid*. (2:12)

<https://www.youtube.com/watch?v=EGPo7gnvlhE>

**Applied Design, Skills and Technologies Student Self-Assessment**

*What inspires me to come up with new ideas?*

*How did/do my ideas change over the process of designing?*



*How best do I share my curiosity?*

*How do my ideas contribute - to me, to my classmates, to the community?*

**Applied Design, Skills and Technologies Student Self-Assessment**

*What have I learned about being a design thinker?*

*How did the design process go? What worked?  
What was difficult?*



*Where to next? What will I /  
could I do differently next time?*

*A core competency I demonstrated was \_\_\_\_\_ because*

## **Applied Design, Skills and Technologies “I” Statements:**

*I identify needs and opportunities for design through exploration.*

*I generate ideas from experiences and interests.*

*I choose an idea to pursue.*

*I go through a process of trial and error to make changes, solve problems and incorporate new ideas.*

*I reflect on my ability to work effectively both as an individual and collaboratively in a group.*



## **Applied Design, Skills and Technologies Student Self-Assessment questions:**

*What inspires me to come up with new ideas?*

*What matters to me when I think about designing something?*

*How did/do my ideas change over the process of designing?*

*How do I refine my ideas?*

*How do my ideas contribute - to me, to my classmates, to the community?*

*How do I share my curiosity?*

*How best do I represent my understanding? What helps me to explain/recount and reflect on my learning?*

*What have I learned about being a Maker?*

*How did the design process go? What worked? What was difficult?*

*Where to next? What will I do differently next time?*

*A core competency I demonstrated was \_\_\_\_\_ because*

What worked?



What was difficult?



What would you do differently next time?



What worked?



What was difficult?



What would you do differently next time?



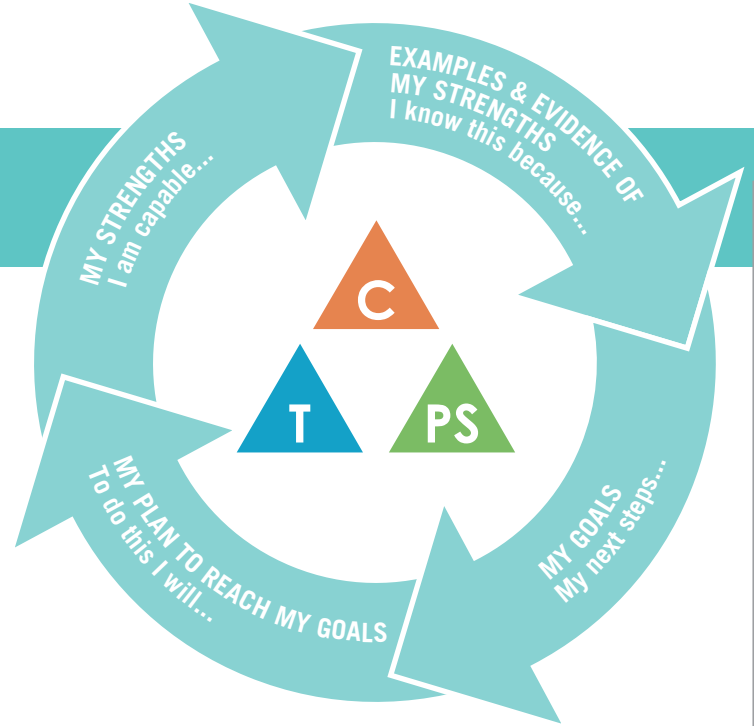


# CORE COMPETENCIES SELF-ASSESSMENT

Name: \_\_\_\_\_

Date: \_\_\_\_\_

I can reflect on my learning and describe or draw how I have demonstrated or developed my competencies.



*Self-assessment can take many forms and may focus on one, a few, or all of the core competencies.*