

~ Maker Kit ~
Explore, Imagine, Create, Share



*An Applied Design, Skills and Technologies Kit
for grades 4-5*

BIG IDEAS

Designs can be improved with prototyping and testing.

Skills are developed through practice, effort, and action.

The choice of technology and tools depends on the task.

Learning Standards

Curricular Competencies	Content
<p><i>Students are expected to be able to do the following:</i></p> <p>Applied Design <i>Understanding context</i></p> <ul style="list-style-type: none"> • Gather information about or from potential users <p>Defining</p> <ul style="list-style-type: none"> • Choose a design opportunity • Identify key features or user requirements • Identify the main objective for the design and any constraints <p>Ideating</p> <ul style="list-style-type: none"> • Generate potential ideas and add to others' ideas • Screen ideas against the objective and constraints • Choose an idea to pursue <p>Prototyping</p> <ul style="list-style-type: none"> • Outline a general plan, identifying tools and materials • Construct a first version of the product, making changes to tools, materials, and procedures as needed • Record iterations of prototyping <p>Testing</p> <ul style="list-style-type: none"> • Test the product • Gather peer feedback and inspiration • Make changes and test again, repeating until satisfied with the product 	<p><i>Students are expected to use the learning standards for Curricular Competencies from Applied Design, Skills, and Technologies 4–5 in combination with grade-level content from other areas of learning in cross-curricular activities to develop foundational mindsets and skills in design thinking and making.</i></p>

Learning Standards (continued)

Curricular Competencies	Content
<p>Making</p> <ul style="list-style-type: none"> Construct the final product, incorporating planned changes <p>Sharing</p> <ul style="list-style-type: none"> Decide on how and with whom to share their product Demonstrate their product and describe their process Determine whether their product meets the objective and contributes to the individual, family, community, and/or environment Reflect on their design thinking and processes, and their ability to work effectively both as individuals and collaboratively in a group, including their ability to share and maintain a co-operative work space Identify new design issues <p>Applied Skills</p> <ul style="list-style-type: none"> Use materials, tools, and technologies in a safe manner, and with an awareness of the safety of others, in both physical and digital environments Identify the skills required for a task and develop those skills as needed <p>Applied Technologies</p> <ul style="list-style-type: none"> Use familiar tools and technologies to extend their capabilities when completing a task Choose appropriate technologies to use for specific tasks Demonstrate a willingness to learn new technologies as needed 	



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.

**The profiles emphasize the concept of growing and expanding.
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)

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

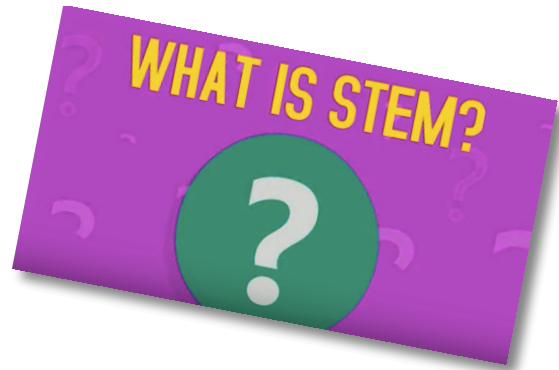
Quick video clips inspire Wonder



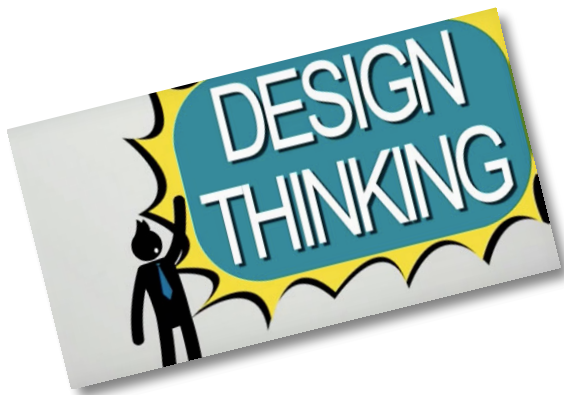
What is a MakerSpace? (1:02)

<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)

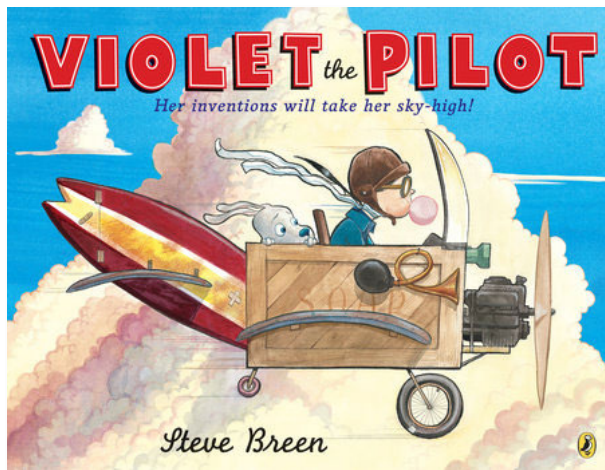
<https://www.youtube.com/watch?v=N7S9kyk-oda>



What is Genius Hour? (1:42)

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

Books inspire a Maker Mindset

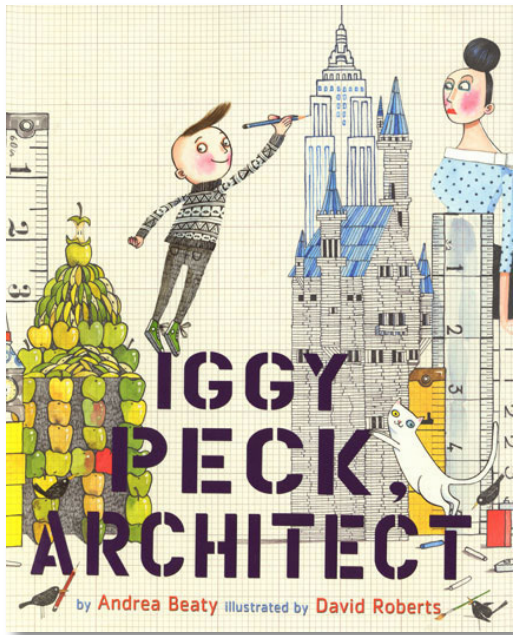


By the time she's two years old, Violet Van Winkle can engineer nearly any appliance in the house. And by eight she's building elaborate flying machines from scratch—mind-boggling contraptions such as the Tubbubler, the Bicycopter, and the Wing-a-ma-jig. The kids at school tease her, but they have no idea what she's capable of. Maybe she could earn their respect by winning the blue ribbon in the upcoming Air Show. Or maybe something even better will happen—something involving her best-ever invention, a Boy Scout troop in peril, and even the mayor himself!

An unnamed girl has a wonderful idea. She is going to make the most MAGNIFICENT thing! She knows just how it will look. She knows just how it will work. All she has to do is make it, and she makes things all the time. Easy-peasy!?! But making her magnificent thing is anything but easy, and the girl tries and fails, repeatedly. Eventually, the girl gets really, really mad. She is so mad, in fact, that she quits. But after her dog convinces her to take a walk, she comes back to her project with renewed enthusiasm and manages to get it just right.

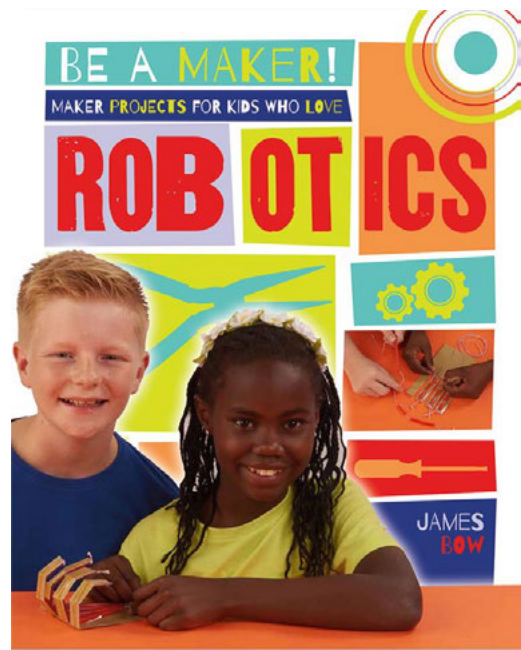


Books inspire a Maker Mindset

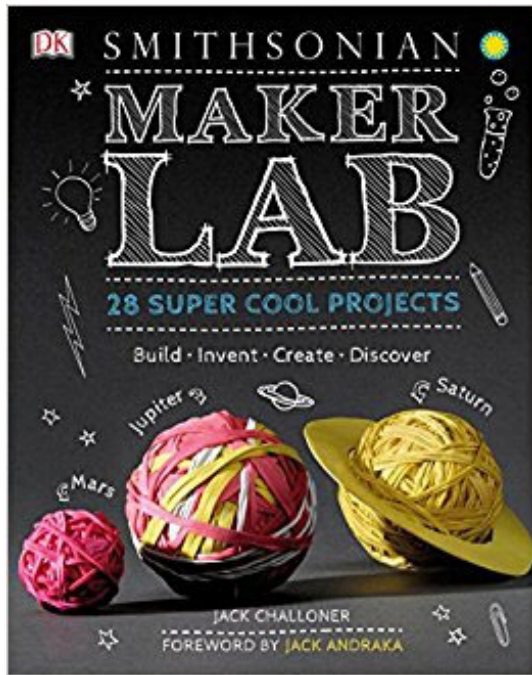


Iggy has one passion: building. His parents are proud of his fabulous creations, though they're sometimes surprised by his materials—who could forget the tower he built of dirty diapers? When his second-grade teacher declares her dislike of architecture, Iggy faces a challenge. He loves building too much to give it up! With Andrea Beaty's irresistible rhyming text and David Roberts's puckish illustrations, this book will charm creative kids everywhere.

In this exciting title, readers will learn about basic robot components and how they are used to build various robots for different purposes. Makers and Shakers sidebars introduce the worlds greatest robot designers and explain how they came to create their exciting inventions. Step-by-step Maker projects let readers put their skills to use as they build amazing robotic creations.

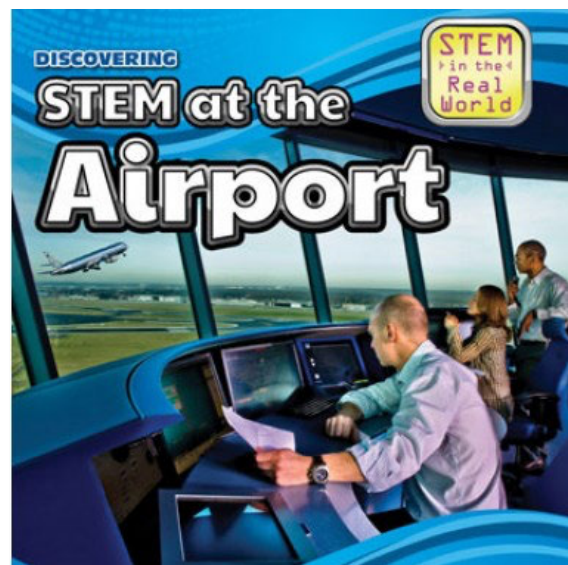


Books inspire a Maker Mindset



Each step-by-step activity is appropriate for kids ages 8–12, and ranked easy, medium, or hard, with an estimated time frame for completion. Requiring only household materials, young makers can build an exploding volcano, race balloon rocket cars, construct a solar system, make a lemon battery, and more. Photographs and facts carefully detail the "why" and "how" of each experiment using real-world examples to provide context so kids can gain a deeper understanding of the scientific principles applied.

Airports depend on science, technology, engineering, and math to run smoothly, concepts that are fundamental to elementary curricula. Without them, planes couldn't take off, passengers couldn't buy tickets, and people couldn't travel to faraway destinations. This text encourages readers to think about how the STEM subjects they learn in the classroom appear in airports and affect travellers lives. The age-appropriate text gives equal treatment to science, technology, engineering, and math, and suggests STEM careers that can be found at airports around the world. Fact boxes and colourful images support learning.



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>

The Marshmallow Challenge

Learning Target: I can collaborate with others to build the tallest free-standing structure using spaghetti sticks, tape, string and one marshmallow.

Establishing a ‘Need to Know’: Read the story *The Most Magnificent Thing* by Ashley Spires. Next, share glimpses of the Youtube video MVMS Marshmallow Challenge #1 https://www.youtube.com/watch?v=xy54jxC_Z6A

Co-constructing ideas: Building from clues
- Use the Picture Symbols we’ve sketched and invite students to come up with the shared expectations (the rules) for the marshmallow challenge. (see attached notes)...



1. Build the tallest free-standing structure.
2. The entire marshmallow must be on top.
3. Use as much or as little of the kit.
4. Break up the spaghetti, string, or tape.
5. The challenge last 18 minutes.

Launch the challenge with pre-arranged kits and groups; follow instructions in attached notes.

Post-Challenge conversation regarding the two ‘layers’ of learning: *Collaboration and Building a Structure...*

1. What worked? (What were the successes in your group?)
2. What was difficult for your group?
3. What would you do differently next time?

Closure: Share parts or all of the Youtube video: Tom Wujec, Build a tower, build a team

https://www.youtube.com/watch?feature=player_detailpage&v=H0_yKBitO8M

The Marshmallow Challenge

The Marshmallow Challenge is a remarkably fun and instructive design exercise that encourages teams to experience simple but profound lessons in collaboration, innovation and creativity.

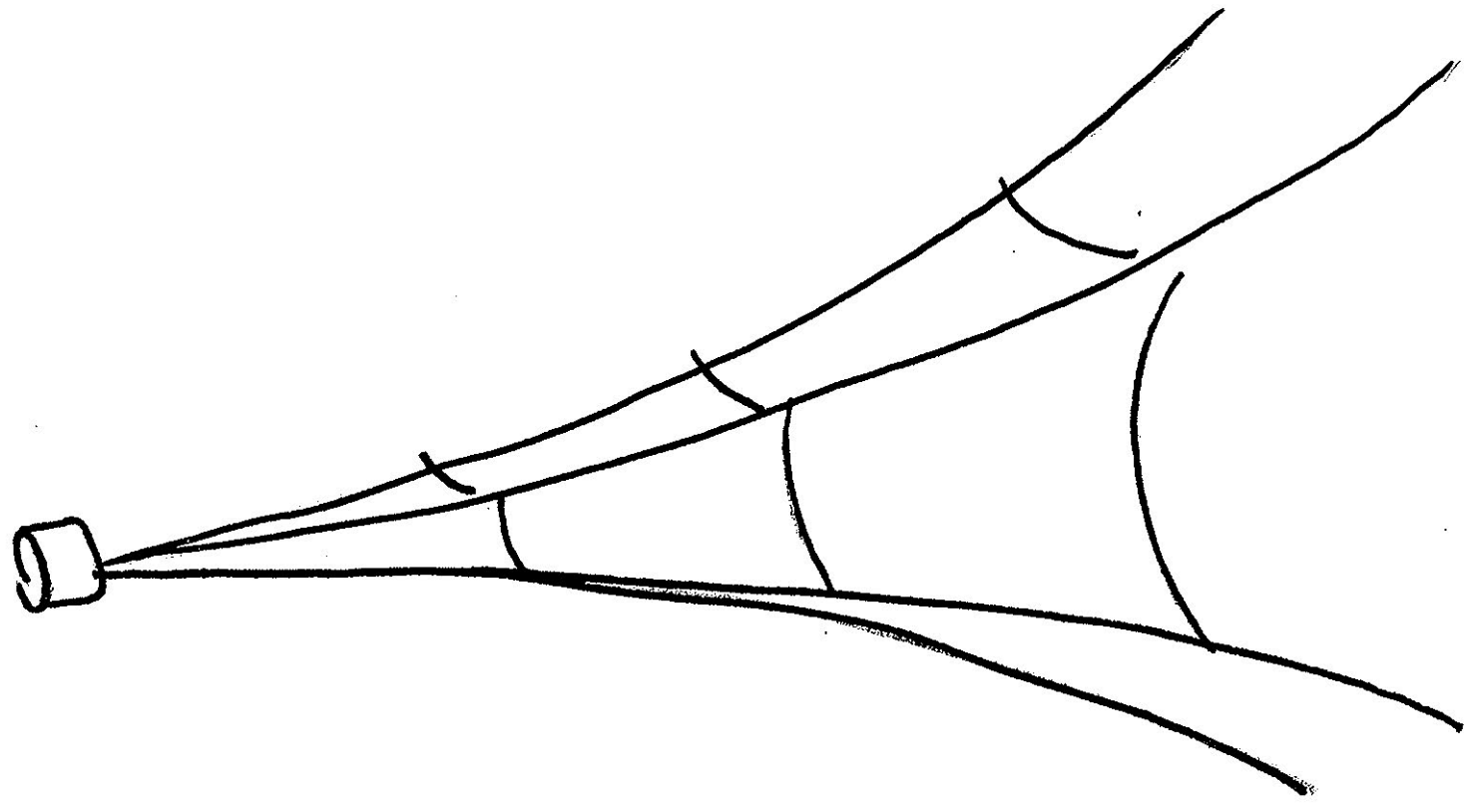
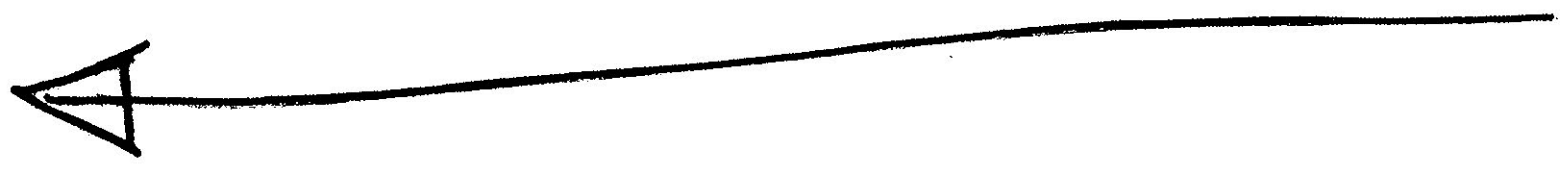
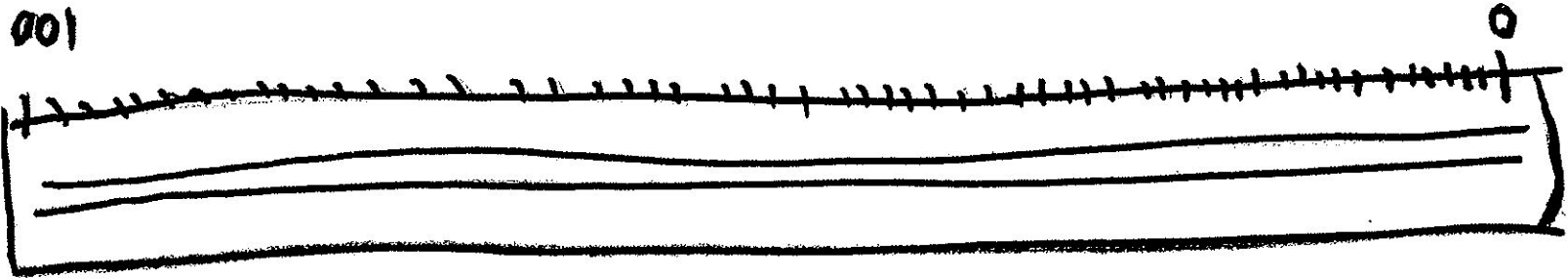
The task: in eighteen minutes, teams must build the tallest free-standing structure out of 20 sticks of spaghetti, one arms length of tape, one arms length of string, and one marshmallow. The marshmallow needs to be on top.

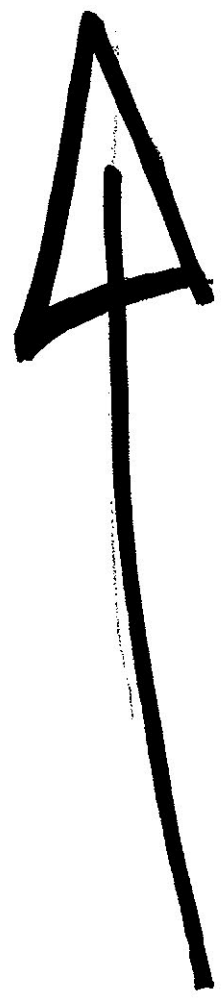
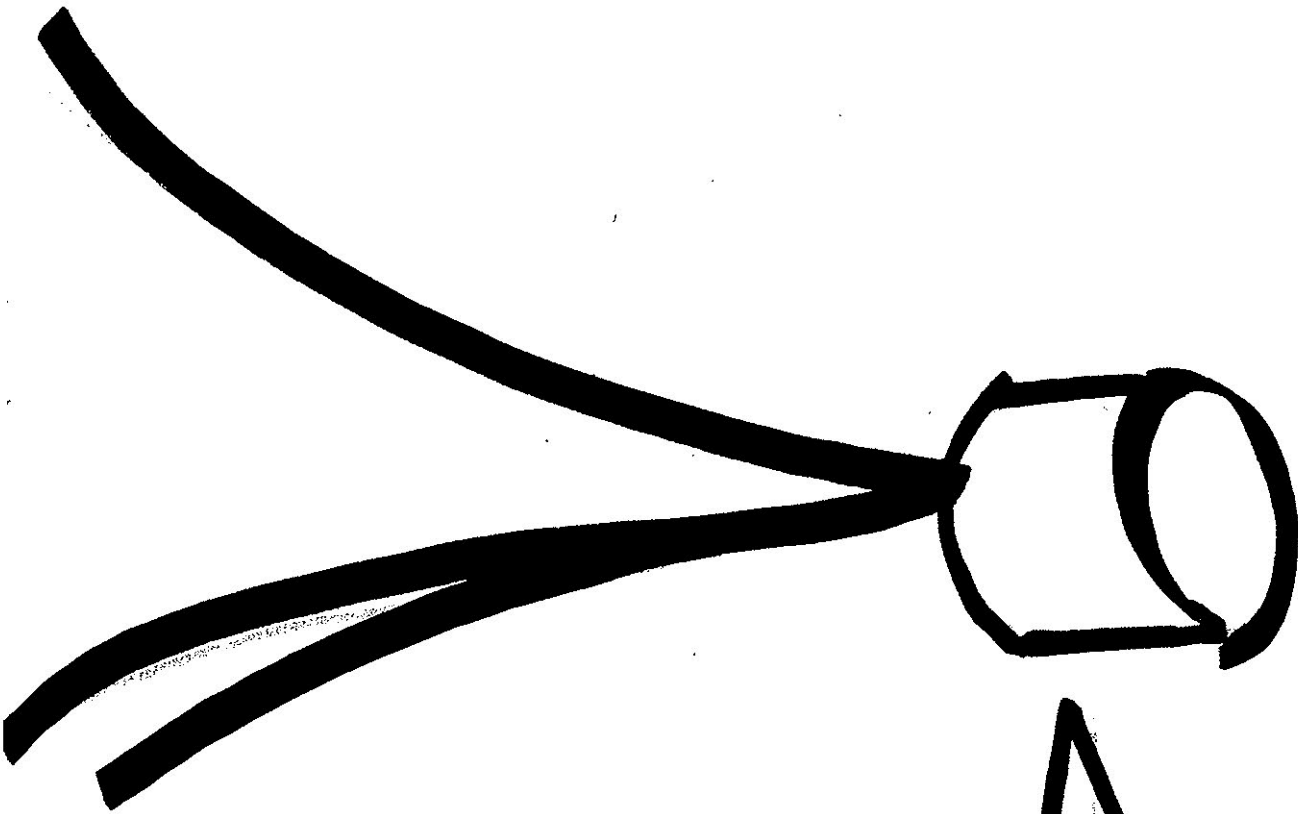
The goals and rules of the Marshmallow Challenge:

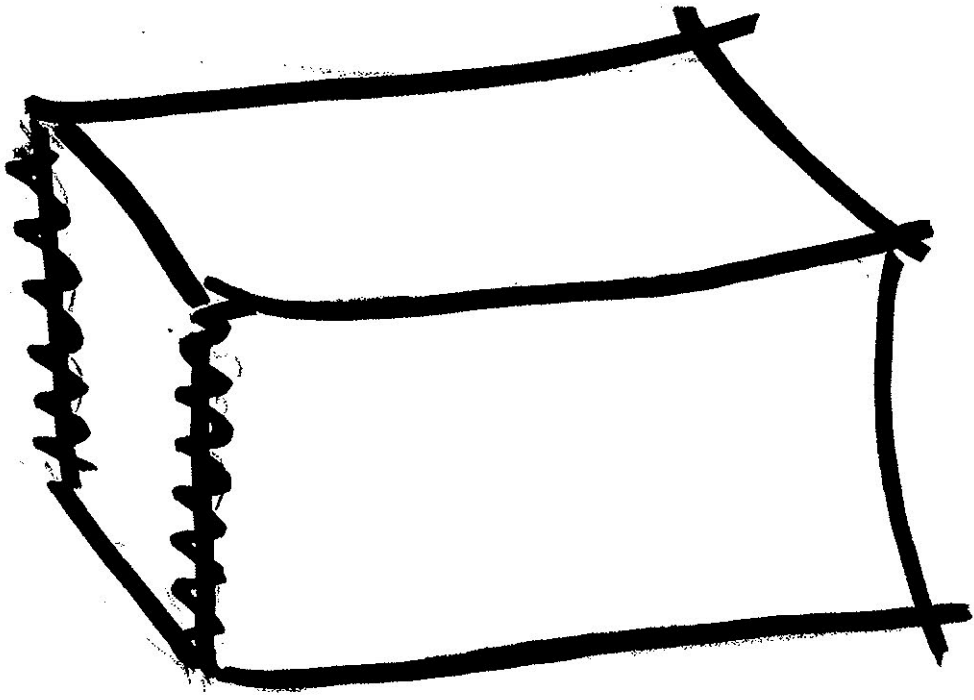
- Build the Tallest Freestanding Structure: The winning team is the one that has the tallest structure measured from the table-top surface to the top of the marshmallow. That means the structure cannot be suspended from a higher structure, like a chair, ceiling or chandelier.
- The Entire Marshmallow **MUST** be on Top: The entire marshmallow needs to be on the top of the structure. Cutting or eating part of the marshmallow disqualifies the team.
- Use as much or as little of the Kit: The team can use as many or as few of the 20 spaghetti sticks, as much or as little of the string or tape. The team cannot use the paper bag as part of their structure.
- Break up the Spaghetti, String or Tape: Teams are free to break the spaghetti, cut up the tape and string to create new structures (you can use scissors for cutting the string)
- The Challenge Lasts 18 minutes: Teams cannot hold on to the structure when the time runs out. Those touching or supporting the structure at the end of the exercise will be disqualified.



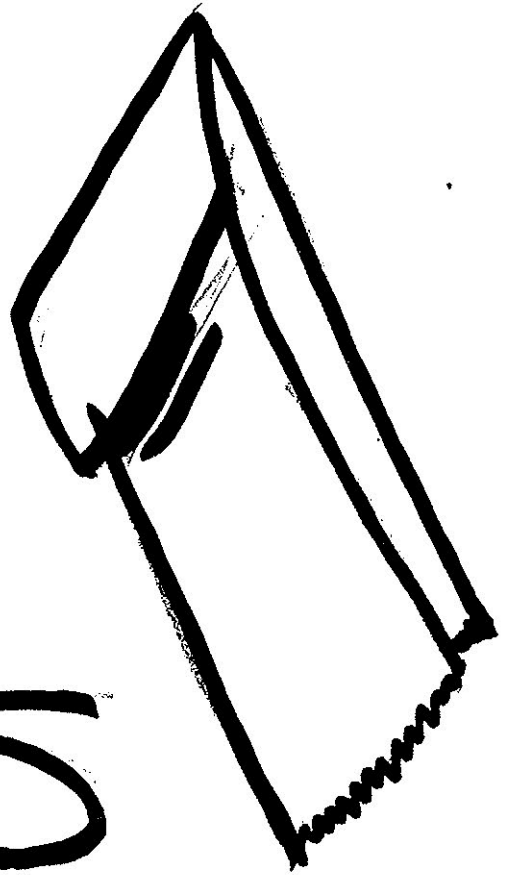
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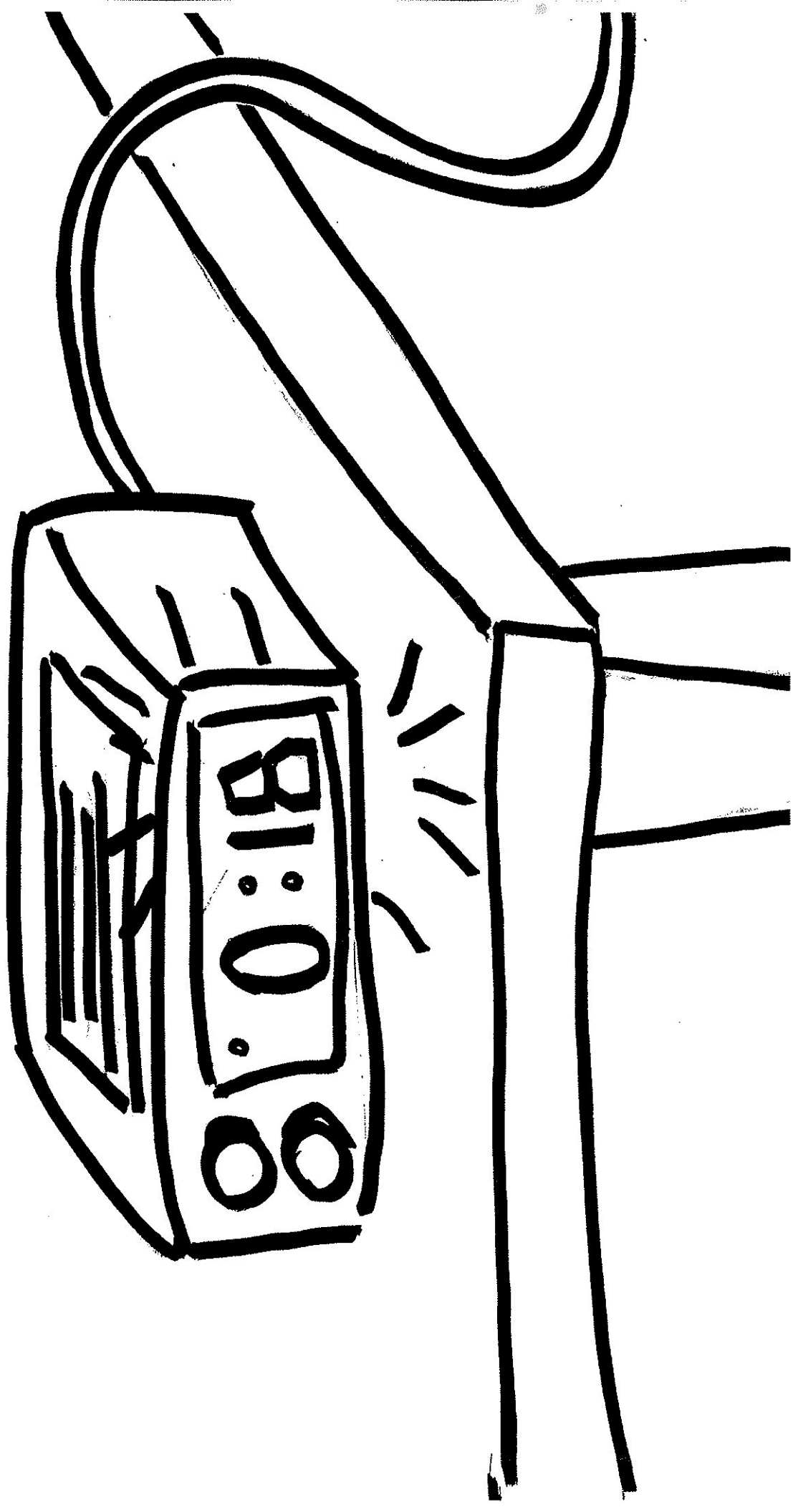
or





SNAP!





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?

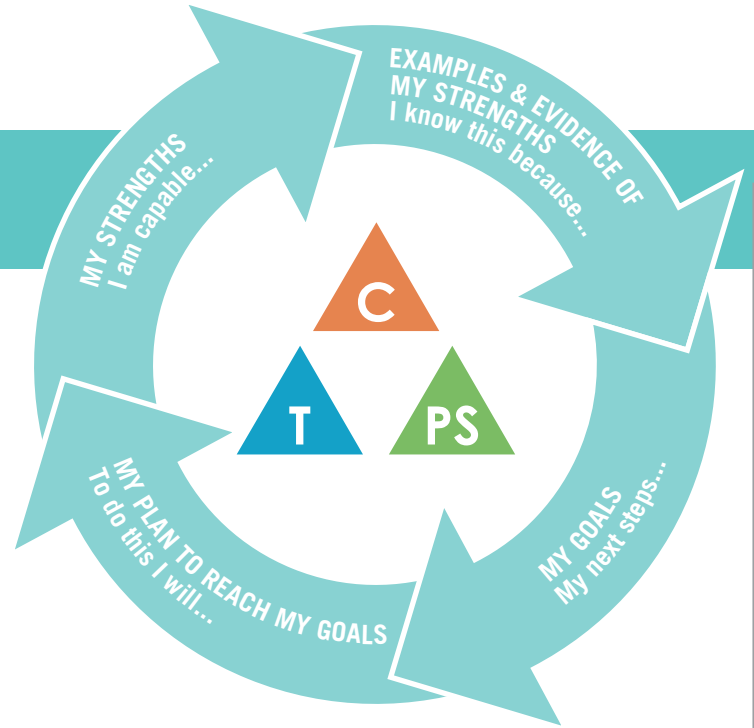
A core competency I demonstrated was _____ because

CORE COMPETENCIES SELF-ASSESSMENT

Name: _____

Date: _____

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

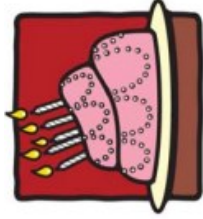


Self-assessment can take many forms and may focus on one, a few, or all of the core competencies.

What worked?

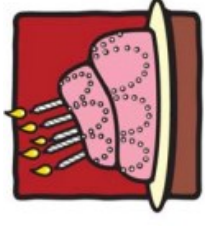


What was difficult?



What would you do differently next time?





What was difficult ?



What would you do differently next time ?



What worked ?

Design Challenge

Names: _____