

Cranky Contraption

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Lesson summary: Grade 5 Students explore simple machines by building a “Cranky Contraption”. As well, they view YouTubes that explain da Vinci’s contributions and ultimately use Design Thinking to create a model of a wheelchair-accessible tree fort (featuring at least 2 simple machines). Students may opt to dig deeper into the life of da Vinci with book study extension activities.



Guiding Questions

How do we use simple machines to improve our quality of life?

How can we collaboratively design projects?

How do Applied Design Skills and Technology (ADST) projects that embrace **Design Thinking** foster growth mindset, creativity, innovation and problem-solving?

Know: (content)	Understand: (Big Ideas)	Do: (Creative Thinking Core and Curricular Competencies)
<p>Applied Design <i>Define:</i> ID constraints & create Designs <i>Ideate:</i> Choose a design to pursue <i>Prototype:</i> Outline plan & acquire tools <i>Test:</i> & gather peer feedback</p> <p>Applied Skills Use materials, tools, and technologies in a safe manner, and with an awareness of the safety of others, in both physical and digital environments</p> <p>Applied Technologies Demonstrate a willingness to learn new technologies as needed</p>	<p>Skills are developed through practice, effort, and action. The choice of technology and tools depends on the task.</p>	<p>Creating and innovating: Students get creative ideas that are novel and have value.</p> <p>Evaluating and developing Students reflect on their creative ideas in order to decide which ones to develop.</p> <p>Generating and incubating Students may generate creative ideas through free play, engagement with other’s ideas, or consideration of a problem or constraint, and/or because of their interests and passions.</p>

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INSTRUCTIONAL MODEL (5E)



Engage: *(interest piqued, prior knowledge of simple tools assessed)*

Show “[What are Simple Machines?](https://youtu.be/EBLYVoKNbnU)” (<https://youtu.be/EBLYVoKNbnU>) & create a list of simple machines that kids have used. (Level/Fulcrum, screw, wheel/axle, inclined plane, pulley and gears.

►► Watch Moneca’s Cranky Contraptions Video, [here!!](#)



Tasks:

1. **Build Moneca’s Cranky Contraption.**
 - a. Identify the simple machines used to create this contraption.
2. **Pose this “Design Thinking Challenge” to your students:**
 - a. Your 3 best friends & you spend every summer in an amazing 8x8’ tree fort that you all built together out of random scraps and your own creativity. It has a rope ladder and a fireman’s pole. The fort is 10’ off the ground and is perfect for summertime sleepovers under the stars.
 - i. Unfortunately, one of your best friends is involved in a collision that leaves him paralyzed from the waist down.
 - ii. You and your friends are determined to retrofit the treehouse to allow your friend wheelchair access.
 1. **Limitations & Specs**
 - a. 1 raw egg = your friend (no extra eggs permitted).
 - b. **Materials** (no extra supplies permitted):
 - i. 1 pulley, 2 m string, 200 popsicle sticks, 30cmx30cm cloth, 1 m duct tape, 2 red solo cups, 1 piece of legal-sized paper, 5 hot glue sticks, 1 plastic shopping bag, 500 mL white glue, 10 screws, 1m dowel (6mm-19mm dia), 3 pieces of wood from scrap bin (or 1 meter of 2x4), 10 regular-sized elastic bands, 2 paper clips.
 - c. Hand tools only
 - d. “Tree fort” = desktop height.
 - e. The device must include two simple machines.
 2. **Rules:** Your wheelchair accessible device must hold the egg safely and successfully raise/lower from floor to tabletop 3x.
 - a. Success = no broken egg-buddy
 - b. Winner = 3 successful lift/lowers x total mass of materials used (Lowest weight wins).

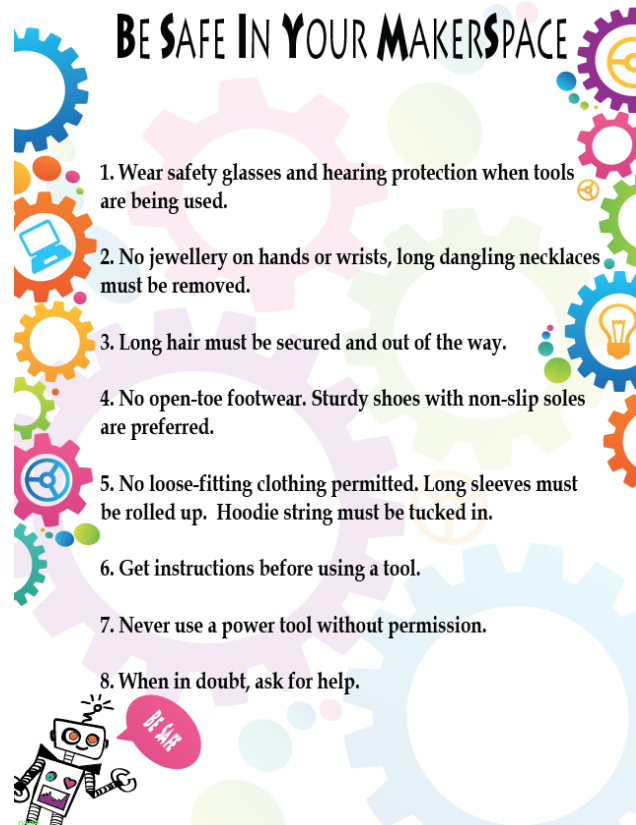
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SAFETY

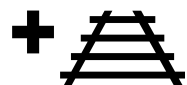
- **Introduce** expected behaviours poster for hand tools



- ➡ This is a fun [YouTube](#) about shop safety.

TOOLS

- Hammer, saw, screwdriver, screws



Explore & Extend (*an inquiry-based activity that transfers knowledge to other concepts*)

- **Pair a novel study with a Leonardo da Vinci inquiry project:**
 - Pair [Monday with a Mad Genius \(Mary Pope Osborne - Magic Treehouse\)](#) with the matching [da Vinci Fact Tracker](#) and give kids the best of both fiction and non-fiction. Use *Monday with a Mad Genius* to get their imaginations churning and the nonfiction Fact Tracker to help them dig deeper into the life of Leonardo da Vinci.
 - Explore when & where da Vinci created his masterpieces: Pin a map that shows where he lived, where he created his best-known works and where those works are now.

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Explain: *(students communicate what they have learned).*

Core Competency reflections: Assign one or more to individuals or groups. Reflections could take the form of a checklist, a recorded reflection, a written paragraph, etc.



Creative Thinking Competency Discussion/Writing Prompt:

Tell me about how you got your idea for your Cranky Contraption.

I can get new ideas or build on or combine other people's ideas to create new things within the constraints of a form, a problem, or materials.

- I can get new ideas to create new things or solve straightforward problems.
- My ideas are fun, entertaining, or useful to me and my peers, and I have a sense of accomplishment.
- I can use my imagination to get new ideas of my own, or build on other's ideas, or combine other people's ideas in new ways.
- I can usually make my ideas work within the constraints of a given form, problem, or materials if I keep playing with them.

Profile 2 (curriculum.gov.bc.ca)



Critical Thinking Competency Discussion/Writing Prompt:

Tell me about any skills that made you S-T-R-E-T-C-H today. What was new/challenging?

I can ask questions and consider options. I can use my observations, experience, and imagination to draw conclusions and make judgments.

- I can ask open-ended questions, explore, and gather information.
- I experiment purposefully to develop options.
- I can contribute to and use criteria.
- I use observation, experience, and imagination to draw conclusions, make judgments, and ask new questions.
- I can describe my thinking and how it is changing.
- I can establish goals individually and with others.
- I can connect my learning with my experiences, efforts, and goals.
- I give and receive constructive feedback.

Profile 3 (curriculum.gov.bc.ca)

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Collaboration Competency Discussion/Writing Prompt:

Tell me about the way you and your partner shared resources, ideas and jobs.

I contribute during group activities with peers and share roles and responsibilities to achieve goals.

- I take on different roles & tasks. I work respectfully & safely in our shared space.
- I express my ideas & help others feel comfortable to share theirs so that all voices are included.
- I work with others to achieve a common goal & can evaluate group processes and results.

Profile 3 (curriculum.gov.bc.ca)



Communication Competency Discussion/Writing Prompt:

Tell me about the different ways you communicated with each other. Did you talk? Model? Draw? Listen? Question? Who did what?

I communicate purposefully, using forms and strategies I have practiced.

- I participate in conversations for a variety of purposes (e.g., to connect, help, be friendly, learn and share).
- I listen and respond to others.
- I can consider my purpose when I am choosing a form and content.
- I can communicate clearly about topics I know and understand well, using forms and strategies I have practiced.

Profile 3 (curriculum.gov.bc.ca)

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Personal Awareness Competency Discussion/Writing Prompt:

Tell me about what (if anything) was stressful and how you coped with that

I can make choices that help me meet my wants and needs and increase my feelings of well-being. I take responsibility for my actions.

- I can take action toward meeting my own wants and needs and finding joy and satisfaction and work toward a goal or solving a problem.
- I can use strategies that increase my feeling of well-being and help me manage my feelings and emotions.
- I can connect my actions with both positive and negative consequences and try to make adjustments; I accept feedback.
- I make decisions about my activities and take some responsibility for my physical and emotional well-being.

Profile 3 (curriculum.gov.bc.ca)



Social Awareness & Responsibility Competency Discussion/Writing Prompt:

Tell me about a time that you helped someone or someone helped you.

I can take purposeful action to support others.

- I can build relationships and be a thoughtful and supportive friend.
- I can identify ways my actions and the actions of others affect my community and the natural environment.
- I look for ways to make my classroom, school, community, or natural world a better place and identify small things I can do that could make a difference.
- I demonstrate respectful and inclusive behaviour in a variety of settings, and I recognize that everyone has something to offer.

Profile 4 (curriculum.gov.bc.ca)

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Evaluate: (assess student understanding)

Students can self-assess their current state of being by highlighting any applicable statements on the **Core Competencies**, above. Consider posting their self assessments onto a learning portfolio such as FreshGrade or MyBlueprint for a **connectivist extension**.

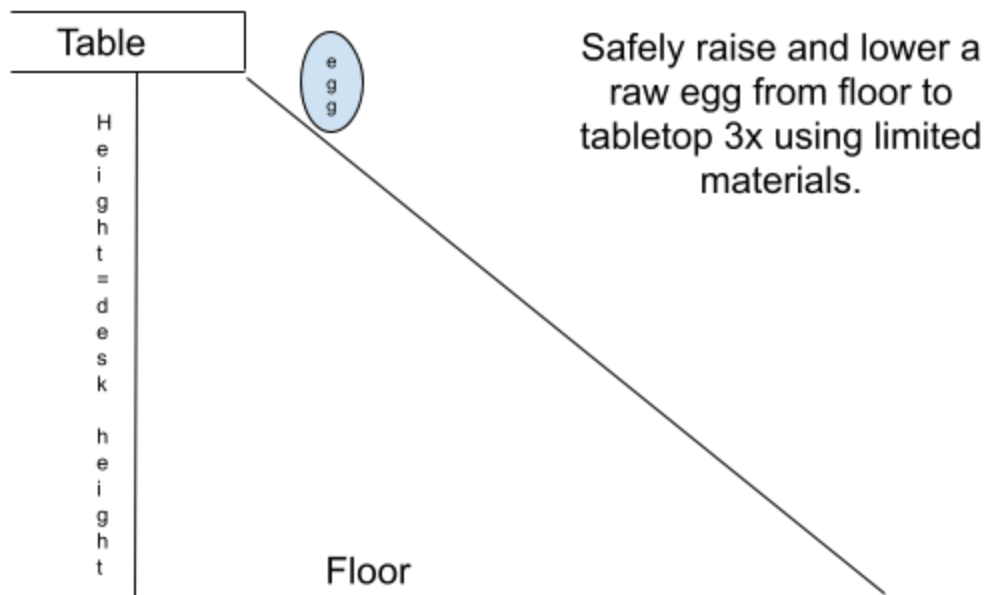
Questions? Connect with Elaine McEachern for support or to collaborate on how we can combine classrooms & harness the power of collaboration.

Here is a visual that summarizes the lesson:



Question → connect to text → Youtube → make it → reflect on competencies → extend thinking.

Template Downloaded from curriculum.gov.bc.ca (Used with permission from Sarah McQuillan. Excerpted from Masters Thesis: Instructional Tools to Support the Implementation of BC's Redesigned Curriculum)
Lesson developed by Elaine McEachern.



Cranky Contraction

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Resources & Links

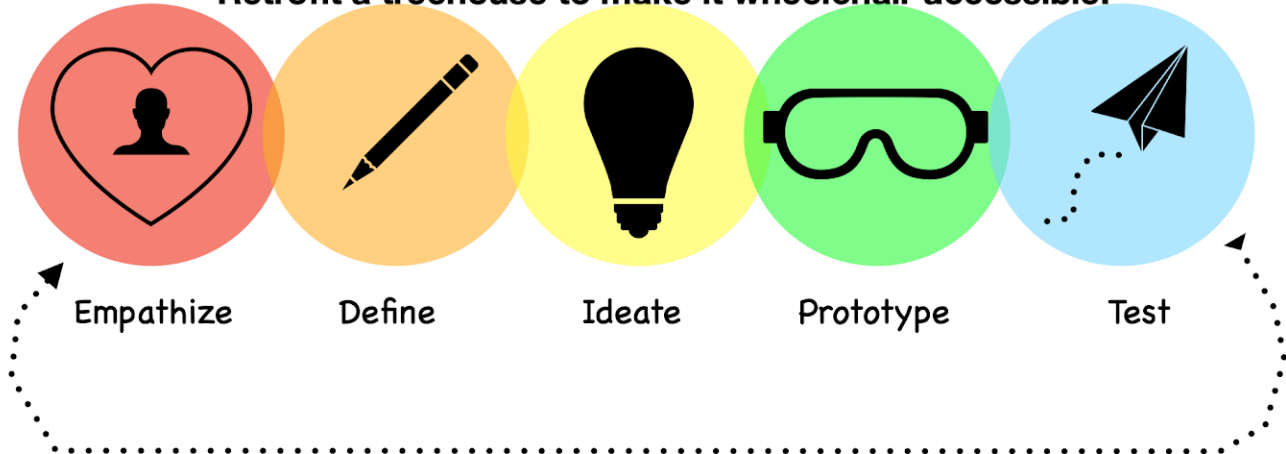
1. Amazon.ca: Magic Tree House Fact Tracker #19(Leonardo Da Vinci(A Nonfiction Companion to Magic Tree House #38(Monday with a Mad Genius).
https://www.amazon.ca/Leonardo-Nonfiction-Companion-RESEARCH-Paperback/dp/B00QPO854S/ref=sr_1_1?keywords=da+vinci+fact+tracker&qid=1590871002&s=books&sr=1-1
2. Amazon.ca: Monday with a Mad Genius (Mary Pope Osborne, 2013).
https://www.amazon.ca/gp/product/0375837302?pf_rd_r=7X2TAR867M28X4BSNM92&pf_rd_p=05326fd5-c43e-4948-99b1-a65b129fdd73
3. BC Curriculum. Science 5. Building Student Success.
<https://curriculum.gov.bc.ca/curriculum/science/5>
4. 5th Grade Simple Machine Ideas (Pancare, R. Sciencing. 2018).
<https://sciencing.com/make-pulley-4448722.html>
5. Museum Leonardo: Machines; World's Best Collection.
<http://www.leonardo3.net/en/l3-works/machines/>
6. 30 simple machine projects for kids. (Beth Gordon, January 2020).
<https://www.123homeschool4me.com/24-simple-machine-projects-for-kids-97/>
7. National Museum of Science and Technology Leonardo da Vinci
<https://artsandculture.google.com/partner/museo-nazionale-della-scienza-e-della-tecnologia-leonardo-da-vinci>
8. YouTube: Top 7 Leonardo da Vinci inventions (nowUknow, 2014).
<https://www.youtube.com/watch?v=PwOllGGDVjE>
9. YouTube: Leonardo da Vinci: His life in 3 minutes (OutMonkey, 2015).
<https://www.youtube.com/watch?v=n-h32XpDYBw>

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Retrofit a treehouse to make it wheelchair accessible.



DESIGN THINKING

Interview Questions:	PARTNER A Responses	PARTNER B Responses
Tell me about the most wonderful times you had in the treehouse.		
Show me some of the things you loved doing most with your friends in the treehouse.		
Tell me about the last time you went to the treehouse.		
If you could get into the treehouse every day, you would...		

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Retrofit a treehouse to make it wheelchair accessible.

Sketch at least 3 ideas for wheelchair accessible treehouse, below.
Pretend that anything is possible, as long as it's kind, helpful & meets your friend's needs.

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