4-H Canada Science Contest

4-H CANADA WANTS TO KNOW:

"If you could invent something that would change the world of agriculture, what would it be?"

Bayer CropScience

4-H Canada Science Contest
Activity Book & Guide

They say that necessity is the mother of invention. What does that even mean?

On the farm, or even around the house, it can mean a whole lot! Something that doesn't work as well as it needs to becomes a problem that needs to be solved. And those problems have been solved by people just like you for hundreds of years!

They are the inventors of the world - and you can be too!

When you see this 4-H Science & Technology icon, be sure to enter your answers online!

EXPLORE

The ideas you have brewing

- **It's time to initiate and plan your invention!**
- **Identify a problem or need through curious observation.**
- **Brainstorm possible answers and solutions.**
- **Revisit your observations about the problem, to continually improve the answers and solutions!**

This step is about brainstorming and researching your invention ideas! When you come up with some of the great ideas and have created a plan, go back to your on-line account and enter the following information:

How did you or your group brainstorm ideas about your invention? What brainstorming approaches did you use? (Check all that apply).

- ☐ Mind mapping
- ☐ Working in small groups and discussing
- ☐ Individual brainstorming, followed by group sharing
- ☐ Examined existing tools, processes, and their purposes in agriculture.
- ☐ Sketched your ideas
- ☐ Made lists
- ☐ Surfed the internet
  If so, what links influenced you?
  _____
  _____
  _____
- ☐ Talked to people
  If so, who did you talk to? What did you ask them? What did they say?
  _____
  _____
  _____
- ☐ Other
  _____
  _____

Quick Tip: If you used mind mapping and Post It Notes, check out 3Ms "Post it Plus" app on the iTunes store!

Does your invention idea have a name yet? If so, what?

_____

What purpose does your invention idea serve? What problem does it solve?

_____
_____
_____
_____

What does your invention do to improve the world of agriculture?

_____
_____

What supplies will you need to build your invention?

_____
_____
_____
_____

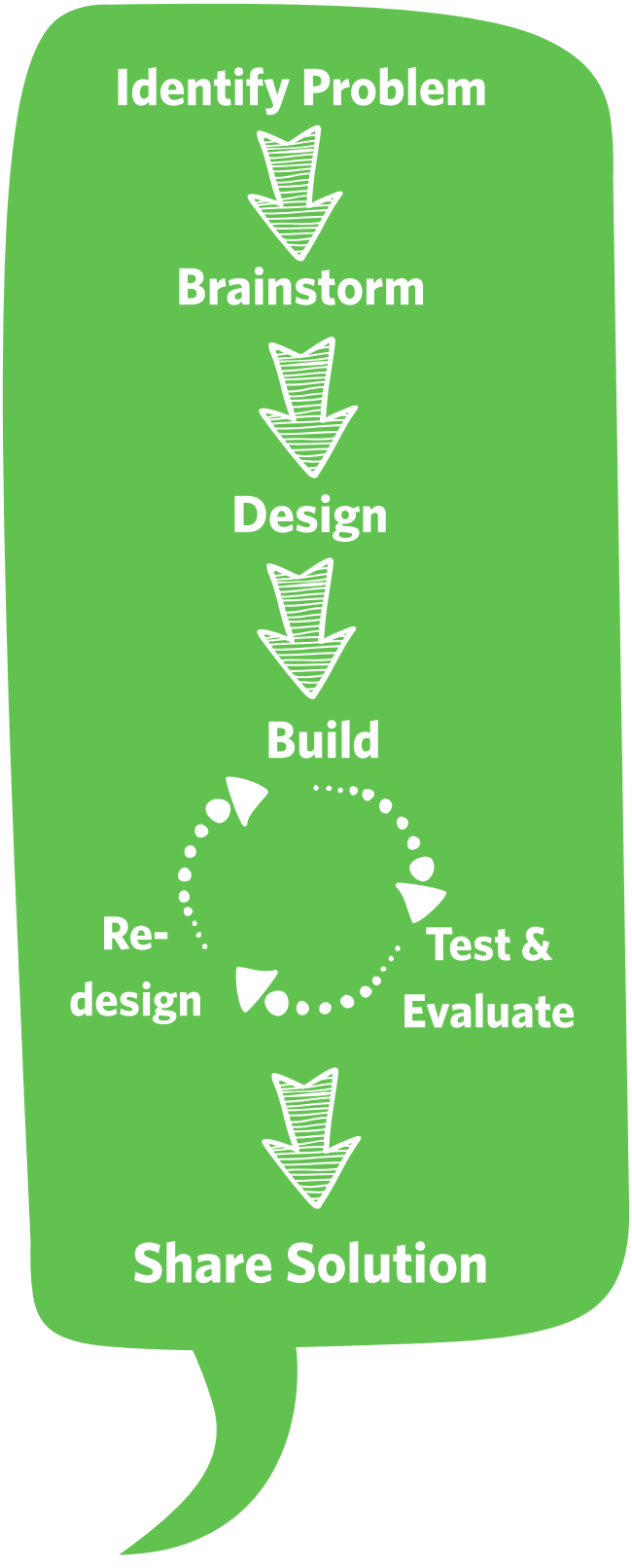
What challenges do you expect, when building your invention?

_____
_____

Be sure to take pictures of your brainstorming process, activities, and notes and share them on your online account!

The Design Process

Whether the goal is to automate the feeding of your cows, or to prevent your pick-up truck's inner windshield from frosting up in the winter, inventors and innovators rely on the design process to guide them. As you go through each of the steps—Explore, Explain, Extend—keep in mind where you are on the design process.



1. Identify the Problem or Key Question

It's simple, but identifying the problem is sometimes the most overlooked stage of the design process. If you understand the problem well enough, sometimes you'll find the solution hidden right there!

What is your problem?

2. Brainstorm

Once you get the question, you can start trying to find the right answer by brain storming. Find tips for brain storming on the next page!

Be sure to take notes, or pictures of your notes, and share them on your online account!

3. Design

If you did a good job brainstorming, you wrote everything down . . . even the most wacky. Now, narrow down the ideas, and select one or two to consider building and testing.

Be sure to take photos of your design and share them on your online account!

4. Build > Test & Evaluate > Redesign > Build . . .

Now that you have your design, do you have the resources to build it, or a prototype of it? If so, build it, test it, think about what works and what could be better with it, and redesign it. Then build it again and ask the same questions again!

If you build it, be sure to record all of the supplies, and take lots of pictures of how you tested it, along with what you changed with each redesign.

5. Share Solution

We cannot wait to see what you came up with! Share your design with your club, your family, and with us!

Brainstorming is how you might come up with your invention idea! If you brainstorm, be sure to take a picture of your notes and share it with us on your contest account! Follow the tips below for brainstorming success!

Brainstorming—The Rules

- NO CRITICISM!
- Work for quantity—more is better!
- Hitchhiking is welcome. Hitchhiking is when someone builds on another's ideas.
- Share EVERYTHING. Outrageous, silly, and seemingly unimportant ideas should be recorded. It's not uncommon for the most off-the-wall ideas to inspire brilliance.

Brainstorming—Getting Started

Tricks to start brainstorming your new invention or innovation

- Read about famous inventors and their stories
- Talk to a real inventor—they're closer than you think!
- Examine inventions and ask questions about them. How do they work? Why was it invented? What do you think the original problem was?

BRAINSTORMING

is a GROUP or ***INDIVIDUAL*** creativity technique where people try and find a **solution** for a specific **PROBLEM** by gathering a list of ideas **spontaneously** contributed by its member(s).

Identify Problems

- What is broken? What needs to be fixed?
- Talk to people, like your family or neighbours. What is taking too much time around the farm, yard, or house? What is harder than it needs to be? Is there anything that gets the job done, but not as well as it could?

Thinking Sideways

This activity gets you thinking differently about the use *or* utility *of things. Turn your imagination sideways!*

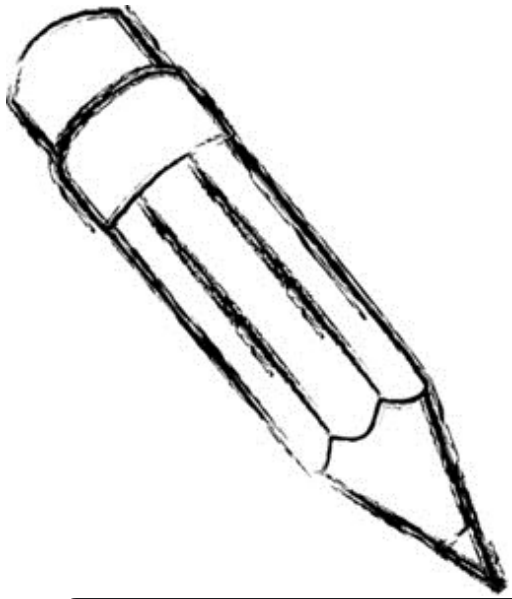
Supplies needed: 2-4 random items such as:

- a bar of soap
- A wheel barrel
- A broom
- A coat hanger
- A candle

Challenge: Come up with at least eight new uses for the item.

Example— Bar of Soap:

- *hockey puck*
- *Paper weight*



EXPLAIN

Your plan and what you've come up with

- **Develop blueprints, and maybe even prototypes!**
- **Consider whether your idea will work.**

By this step, you should be well on your way! It's now about designing and trying out your invention ideas! We want to know how things have been going. In your online account, explain the following:

Have you made a blueprint of your invention?

YES NO

Have you made a prototype of your invention?

YES NO

What has been working well in your design process so far?

_____
_____
_____
_____

What have been some challenges?

_____
_____

What have you changed or adjusted as a result of these challenges?

_____
_____
_____
_____

Has anything surprised you?

_____
_____

How have you tested your ideas to see if they could work?

_____
_____
_____
_____

Bringing your invention to life!

Blueprints

Blueprints are sketches and drawings of your invention. You may have several drawings to help illustrate the purpose of your invention, and what it could look like from different angles.

3D Modelling

It's easier than ever to make your sketches pop! 3D modelling can be done through lots of different apps and downloadable programs like Google's SketchUp.

Wireframes

Wireframes are pretty much what they sound like; they're the skeletons of your invention. Only the lines of your design are represented, but it gives your invention shape and is something that can be touched!

Prototypes

Prototypes are simple models that let you test out your idea! You can use anything to help make your prototype: paper, blocks, modeling clay, sticks, simple machines. . . Things are really coming together now!

3D Printing

3D printers print those digital 3D models we talked about earlier. Once a design is complete, you press print and the 3D printer stacks layers of material on top of each other in order to create your digital 3D design. People have created awesome things using 3D printers, from musical instruments, to prosthetics, to bicycles!

It's time to SCAMPER

Whether the goal is to automate the feeding of your cows, or to prevent your pick-up truck's inner windshield from frosting up in the winter, inventors and innovators rely on the design process to guide them. As you go through each of the steps—Explore, Explain, Extend—keep in mind where you are in the design process.

S ---> Substitute

C ---> Combine

A ---> Adapt

M ---> Modify
Magnify
Minify

P ---> Put to other uses

E ---> Eliminate

R ---> Rearrange

SUBSTITUTE—What or who can be used instead? What other ingredients? Other material? Other process? Other power? Other place? Other approach? Other sounds?

COMBINE—What materials, features, process, people, products, or components can be combined?

ADAPT—Is there anything that can be changed? What else is like this? What could be copied?

MODIFY or **MAGNIFY** or **MINIFY**—Can you change the meaning, colour, motion, sound, smell, form, or shape? Can you distort it?

PUT TO OTHER USES—Are there new ways to use or reuse it? Is there another market or audience?

ELIMINATE—Can you reduce time, effort, or cost? Can you remove part of it?

REARRANGE—Can you interchange components or patterns? Can you change the pace or schedule? Can it be reversed?

Talk the Talk

Now that you're an inventor, here are some key words to help you along the way!

HYPOTHESIS—An informed guess that you make about the outcome of a scientific experiment. Educated predictions means that you should be able to say *why* you expect things to go the way you do.

EXPERIMENT—A test to find something out.

MANUFACTURE—The process of making products and things.

INVENTING—Designing something useful, for the first time, through the use of imagination, ingenious thinking and/or experimentation.

MODELING—Building physical or drawn out representations of ideas, objects, or events to help illustrate expectations. Models help to understand things that cannot be directly observed.

ANAYLYZING—Seeing implications and relationships, figuring out what is a cause and what is an effect, and locating new problems.

RESEARCH— An investigation or study to find out facts in order to reach a conclusion

QUESTIONING—A strategy to make meaning or wonder about uncertainties.

GRAPHING—Visually representing data

CONCLUSION—Things that can be worked out from doing an experiment. To finish or conclude, with an explanation, judgement or opinion based on interpretations.

EXTEND

Your mind and reach for the sky!

Let your genius shine and share with us (and others) what you did!

Time for the big reveal! Take pictures or videos of your invention or design and share them on your online account! Be sure to think about answers to these questions as well!

How many versions of your blueprint did you make? _____

How many versions of your prototype did you make? _____

What materials did you ultimately use?

_____
_____
_____
_____

Did it work? Do you think it would work?

_____
_____
_____
_____

If you had $1,000,000.00 to invest in your invention, what would you do?

_____
_____
_____

Did you share your invention? With who? What did they say? Did they have other recommendations as to how to make it even better?

If you`re proud of your invention consider submitting it to Quirky.com. It doesn`t matter if it`s, "a napkin sketch, a sentence or a fully baked idea". Sharing your idea is the first step toward bringing your invention to life!

Contest Judging Criteria

Creativity and innovation –Entry demonstrates a new idea, creative solutions, imagination and "reaching for the sky".

Attention to detail – Entry demonstrates critical thinking, outlines a process or set of steps that were taken, explanations are provided using good sentence structure and grammar.

Realistic –Entry addresses a real issue or challenge in the world of agriculture. It has the potential to actually work and function. Logic and some form of scientific thought were used in the process of creating this idea.

Youth-led – Entry demonstrates that club members took on leadership roles throughout this project. Leaders, mentors, and parents provided support and guidance but did not "run the show".

Teamwork– Group entry demonstrates that everyone participated. Older club members helped younger club members. Roles were shared and cooperation, collaboration, and communication took place among members. Individual entry demonstrates that that member got advice and input from potential users of their invention.