

STEM Workshop Planner

PLAN AN EVENT IN 3 EASY STEPS



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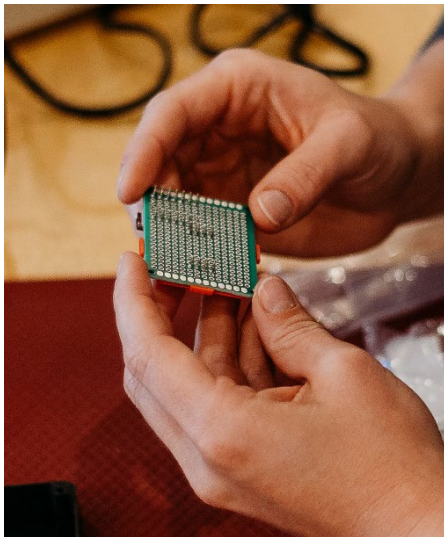
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Introduction

This planner aims to streamline the processes needed to host a Makers Making Change (MMC) STEM Workshop. Below are succinct steps to start the process and an FAQ ready to provide details. Please visit the STEM with purpose page the MMC website to view current opportunities in your area. Thank you to the teachers across Canada whose input was invaluable in creating this resource.

Science, technology, engineering, and math (STEM) skills are an essential part of education. Through focusing on STEM with a purpose, youth learn new skills and serve their community, all while improving their awareness and understanding of people with disabilities. Workshops and projects can be integrated into school STEM programs or extra-curricular activities including robotics clubs, hack clubs, and other afterschool programs. Makers will create and donate assistive devices for people with disabilities while incorporating the principles of design thinking, using 3D modeling (CAD) software, and 3D printing for social good.



Why run STEM programs with Makers Making change (MMC)?

- STEM activities foster new ideas and creative exploration. Students are encouraged to be curious and use their critical thinking skills to tackle real-world challenges.
- Hands-on experience with engineering, design, robotics, coding, and manufacturing can help youth choose their post-secondary path.
- STEM teaches makers how to work with others through collaborative learning. Students are encouraged to empathize with others and share insights they've learned.



Step 1: Explore our Workshops

There are a variety of STEM Workshops available for Canadian youth. These are open to classrooms, robotics clubs, after-school organizations, and any youth group. The STEM Workshops are currently paid for by the Government of Canada. Workshop supplies are separate but may be covered depending on your region. Speak to your MMC regional coordinator to learn more.

Workshops	Beginner (Little to no subject knowledge and/or skills)	Intermediate (Moderate subject knowledge and/or skills)	Advanced (Substantial subject knowledge and/or skills)
<u>3D Printing 101</u>	Basics of 3D printing. How does a 3D printer work and how to convert your file to object. 1 hour	Modifying and slicing models in CAD and Slicer programs. 1 - 1.5 hours	Customizing print files with textured surfaces and inlaid text. 1 – 2 hours
<u>Build Assistive Technology</u>	Introduction to the world of assistive technology. Learn to assemble items or build an assistive switch. 1.5 - 2 hours	Build more complex assistive devices or hack a simple adaptive toy. 1.5 – 3 hours	Build complex switches and learn how to hack a new type of toy. 1.5 – 3 hours
<u>Circuits and Electronics</u>	Introduction to assistive switches and their components or build a working paper circuit. 1 – 1.5 hours	Build assistive switches and devices or hack a simple adaptive toy. 1.5 – 3 hours	Explore electronics in depth by building complex assistive tech and uploading their code. 1.5 – 3 hours
<u>Design Challenge</u>	Design Thinking Challenge 1 hour	Design Thinking Challenge or Make:able Challenge 1 – 3 hours (With multiple sessions)	Make:able Challenge 1 – 3 hours (With multiple sessions)
<u>Design for 3D Printing</u>	Intro to Computer Aided Design (CAD) using Tinkercad. 1.5 – 2 hours	Explore basics of Autodesk Fusion 360, a CAD program used by engineers and designers. 1.5 – 2 hours	Learn advanced techniques used by engineers in Autodesk Fusion 360. 1.5 – 2 hours
<u>Microcontrollers</u>	Intro to microcontrollers and assembly of a simple device. 1 hour	Discuss the applications of microcontrollers and explore the basics of micro-controlled systems. 1.5 – 2 hours	Learn advanced applications of microcontrollers and build complex devices. 1.5 – 2 hours

Step 2: Complete the Details Checklist

*MMC Presence and Event Length are subject to availability, funding, and location, please note down your preferences to discuss with the regional coordinator in Step 3.

List your workshop choice(s) from Step 1: _____

Your location

Province/Territory: _____

School name and city: _____

MMC presence*

- ☐ Coordinator shows up to run the event(s)
- ☐ Run independently
- ☐ Virtual Build with Staff support
- ☐ Train the trainer/Pre-training for volunteers

Event Length*

- ☐ Single event: Choose a couple of possible individual days you would ideally like the event to take place.
- ☐ Series of events: Back-to-back days or over multiple weeks

Location of the build

- ☐ Do you have a built-in location to hold this (classroom, gym, art room, 3D printing room)
- ☐ Does a location need to be found (Rec Hall, church, library etc.)

Grade/Age group(s)

- ☐ Grade 1-3
- ☐ Grade 4-6
- ☐ Grade 7-9
- ☐ Grade 10-12
- ☐ Post Secondary
- ☐ Adult
- ☐ Mixed group: _____

Average Skill level

- ☐ Beginner level skills (Low fine-motor skills and/or little subject knowledge)
- ☐ Intermediate level skills (Good fine-motor skills and/or moderate subject knowledge)
- ☐ Advanced level skills (Excellent fine-motor skills and/or advanced subject knowledge)

Maximum Number of participants

Organization of participants

- ☐ Independent work
- ☐ Pairs
- ☐ Groups

Number of available staff/volunteers to help during event

- ☐ 1
- ☐ 2
- ☐ 3+

Time limitations

- ☐ 30 minutes to 1 hour
- ☐ 1-2 hours
- ☐ 2+ hours
- ☐ Flexible

Special requirements MMC team needs to enter the School/Building

The following section of the checklist is required for specific workshops only.

What tools and safety gear do you have available? (Build Assistive Technology and Circuitry Workshops)

- ☐ Safety goggles
- ☐ Wire strippers
- ☐ Small/Jewelry sized Philips head Screwdrivers
- ☐ Flush cutters
- ☐ Soldering Irons
- ☐ Glue Guns
- ☐ Access to minimum 3 electrical outlets

Do you have any 3d printers? (3D printing, Design for 3D printing, and Build Assistive Technology workshops)

- ☐ No
- ☐ 1 or more, not available for preprinting
- ☐ 1 or more, available for preprinting

Do you have access to a class set of computers? (Design for 3D printing and 3D printing Workshops)

- ☐ Yes
- ☐ No

Step 3: Contact your Regional Coordinator

Western Region

Shanelle Gilman

T 403 461 4783

E shanelleg@neilsquire.ca

Eastern Region

Courtney Cameron

T 902 240 1538

E courtneyc@neilsquire.ca



FAQ

1. How do these workshops connect to what I am teaching in my classroom?

Our workshops relate to various units in science, computer science, design studies (computer based), robotics, automation, and electrical courses including:

- Forces, Simple machines, and Mechanical systems
- Structures, Materials, and their usage
- Properties and Changes of materials
- Impacts of technology and beneficial scientific innovations
- Practical applications of science and technology
- Understanding electricity, circuits, currents, and electromagnetic energy
- Testing materials and designs
- Programming and trouble shooting
- Design thinking and Universal design
- Prototyping and the Engineering process

In addition to the STEM skills, we aim to develop, students will also learn a variety of soft skills through our workshops including:

- Empathy and connection
- Volunteerism
- Confidence building
- Social Collateral
- Inter-personal skills
- Teamwork
- Time Management
- Awareness of Equity, Diversity, and Inclusion

2. How is safety implemented during a workshop?

Most of our workshops start with a brief presentation explaining what MMC does and why creating assistive devices is important. During this presentation we review the safety points needed for the build ahead. Safety points include washing hands after soldering, how to safely hold a soldering iron and wearing safety goggles throughout the build.

3. How can I best set up my space for the workshop?

Each setup is going to look different based on the number of participants and the availability of tools. Here are some general guidelines that we have found to be effective that may help with setting up the most efficient workspace for an event.

- Rearranging desks into pods or tables as opposed to rows
- Small groups of 3-5 participants works best for sharing tools.

- Designating a specific location for soldering works well for first time groups, meaning soldering is better monitored.
- If multiple instructors are present, they are often best used to help with soldering and hot gluing.

4. What are the recommended ratios for kids to adults/volunteers?

The number of kids to every adult helper in the room is highly variable depending on the skill level of participants. Below are our general recommendations for what has been effective during past events; the number of adults in the room helping is ultimately your choice.

- Grades 1-6: 5 Kids to 1 Adult
- Grades 7-12: 10 kids to 1 Adult

In addition to adult volunteers, students in higher grades or university who have experience with the workshop topic can be great resources for help during the workshop.

5. What tools do I need for a building workshop?

Most common tools used are:

- Wire strippers
- Soldering Irons and Solder
- Small Jewelry sized Phillips Head Screwdrivers (x-shaped)
- Hot Glue Guns and Sticks

You may also encounter these tools depending on what is being built:

- Flush cutters
- Pliers
- Craft knife
- Drill



6. I don't have the necessary tools, where can I borrow them?

There are plenty of places to borrow tools, although many of them depend on that service being near you. If you need to borrow tools, try any of the following sources:

- Tool rentals from businesses like Home Depo or Canadian Tire
- Local High Schools with a workshop or a STEM program
- Parent Volunteers
- Makerspaces
- MMC (depending on location)

7. I'd like the AT we build to stay in our community, where can it go?

Our Regional Coordinators can work with you to establish ongoing relationships with centers in your community such as:

- Occupational Therapists in community
- Local hospitals and rehabilitation centers
- Within the school, to individual students or special needs programs
- Local disability advocacy groups
- Seniors Homes
- Local individuals with disabilities
- "Maker Wanted" section on the MMC website

8. I've never used some of these tools before, how can I prepare?

Tool tips:

- [How to Solder](#)
- [What are Flush Cutters](#)
- [How to strip wire](#)
- [Understanding Wire Gauges \(we use 24-18 AWG\)](#)
- [Cleaning up 3D prints](#)

Build Tutorials:

- [Dice roller](#)
- [Interact Switch](#)
- [Raindrop Switch](#)
- [Light Touch Switch](#)
- [MMC60 Switch](#)

9. Do we need the students to sign a waiver?

Yes. There is a liability waiver that will need to be signed before an event, it is located at the end of this document for easy printing. The liability waiver is intended to ensure that individuals and their parents/guardians understand the inherent risks involved with our events. If you work with kids that have already signed a similar waiver, please mention this in your discussion with your Regional Coordinator to determine the next steps.

Workshop Details



3D Printing 101 Workshop

3D printing is a quick and easy way to make assistive devices. Makers can select from a variety of materials and colours to suit the users needs. The best part? A single roll of filament can print dozens of devices, which significantly lowers the cost compared to traditionally manufactured assistive tech.

This workshop walks students through the basics of 3D printing, as well as tips and tricks to optimize their prints, so they can independently 3D print devices at school or at home.

SKILLS LEARNED

Manufacturing, 3D printing, material science, and printer operation and maintenance.

SUGGESTED ACTIVITIES

Beginner: Understand the basics of 3D printing in this workshop. Young makers will learn how a 3D printer works and the 3D printing workflow from file to object.

Intermediate: Optimize designs for 3D printing using CAD and slicer programs. See how overhangs, hole placement, and walls can affect the printing speed and strength.

Advanced: Students will build the MMC60 switch and use a neat trick in Prusa Slicer to create their own custom textured toppers.



Build Assistive Technology Workshop

Cost is often cited as the main barrier to assistive technology (AT). By volunteering to build open-source devices from AT libraries like the one from Makers Making Change, we help provide low cost and affordable solutions to those who need it.

Every device built by students will be donated to individuals with disabilities in Canada.

SKILLS LEARNED

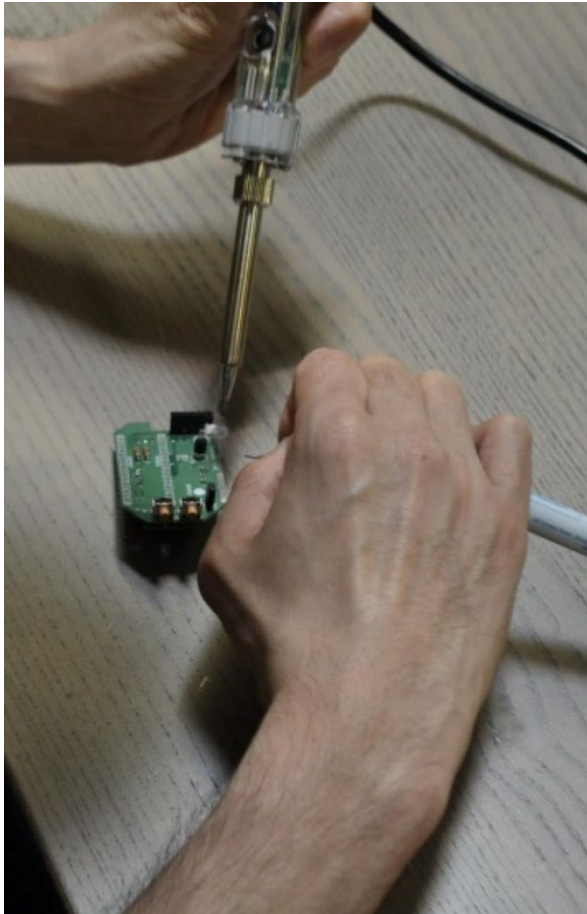
Electronics, PCBs, Soldering, technical assembly, 3D printing.

SUGGESTED ACTIVITIES

Beginner: Discover the world of DIY assistive technology. Assemble a pen ball or wobble switch or pick up a soldering iron to create a Raindrop or Light touch switch.

Intermediate: Build assistive devices for people with motor challenges, like the dice rumbler, MMC60 switch, or an adaptive toy. All these devices involve assembling electronic components and 3D prints.

Advanced: Challenge a student's maker skills by building complex switches and adapting toys. Students will use their critical thinking skills and be encouraged to help each other throughout the build.



Circuits and Electronics Workshop

The shift to electronics has become the trend in many industries and assistive technology is no different. From simple circuits used to switch adapt a toy to the more complex workings of a sip and puff device, there is plenty for youth to explore and engage with.

Students will get a deep understanding of various assistive technologies and how devices work from the inside out.

SKILLS LEARNED

Circuits Electronics, PCBs, soldering, and technical assembly.

SUGGESTED ACTIVITIES

Beginner: Students will get an introduction to assistive switches and how devices can be created with just a few components. This lesson involves building a simple working circuit on paper or assembling a Raindrop or Light touch Switch.

Intermediate: Hack into a simple battery-operated toy or build the Interact Switch. Makers will use flush cutters and soldering irons in this workshop and develop the confidence to create their own DIY assistive devices.

Advanced: Explore electronics and circuitry more in depth by building the LipSync sip and puff device, challenging themselves to hack a new toy, or building the Birch joystick. These devices are comprised of 3D printed parts and a variety of electronic parts (like resistors, PCB boards, breakaway headers, to name a few)



Design Challenge Workshop

Make:able is an assistive technology design challenge by PrintLab, Autodesk, and partners (including MMC).

This international challenge is for youth interested in 3D design and 3D printing. Students learn to empathize with others by designing for a person with disability over several months.

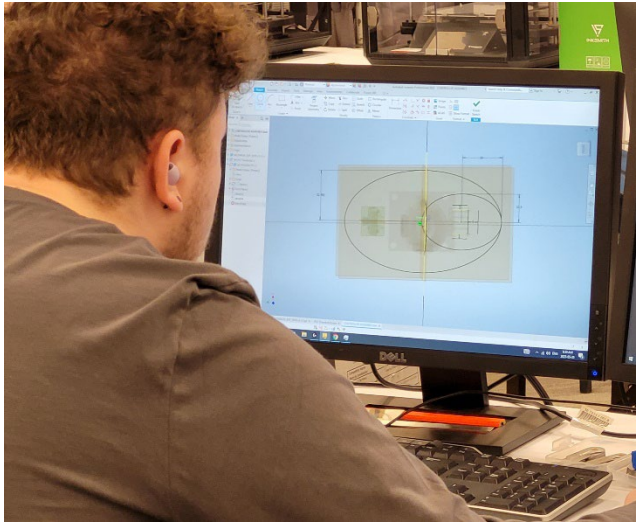
The 2020 Make:able challenge saw 17,000 students across 72 countries.

<https://www.makeablechallenge.com/>

In addition to the Make:able challenge, MMC offers a less intensive “Design Thinking Challenge”. This version enables students to start building design thinking and problem-solving skills in a lower stakes’ environment.

SKILLS LEARNED

3D design, 3D printing, Empathy



Design for 3D Printing Workshop

Learning computer aided design (CAD) is the first step to designing DIY assistive technology. Typical 3D design work is done in CAD modeling programs such as Autodesk Fusion 360 and TinkerCAD. The design for 3D printing workshop provides hands-on experience with CAD programs and design techniques to improve efficiency and reduce waste.

SKILLS LEARNED

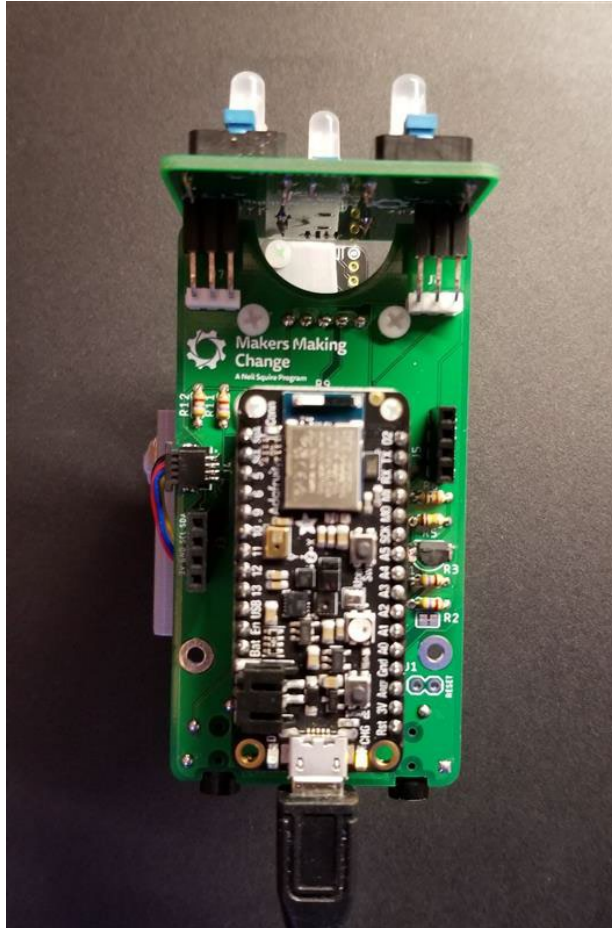
Computer Aided Design (CAD), manufacturing, material science, and 3D prototyping.

SUGGESTED ACTIVITIES

Beginner: Get hands-on experience with Computer Aided Design (CAD) using Tinkercad. Students will get a fundamental understanding of how 2D shapes are translated into 3D objects. At the end of this workshop, learners will design a custom topper for the Interact Switch.

Intermediate: Explore the basics of Autodesk Fusion 360, a CAD program used by engineers and designers. Students will apply what they have learned by creating and modifying 3D designs.

Advanced: In this more advanced CAD workshop, students will use Autodesk Fusion 360 to create more complex designs. They'll learn advanced CAD techniques used by engineers.



Microcontrollers Workshop

Microcontrollers are a small simple computer integrated into many of the technologies we interact with daily. From wearables to toys, Microcontrollers let us do a number of unique tasks. The Microcontrollers workshop provides a look into what Microcontrollers really are and how they work.

SKILLS LEARNED

Logical thinking, identifying ranges of application, Circuits Electronics, PCBs, soldering, and technical assembly.

SUGGESTED ACTIVITIES

Beginner: Learn about microcontrollers and explore how they function while assembling a simple device that includes a microcontroller.

Intermediate: Explore further into the intricacies of microcontrollers by assembling and loading the code or “flashing” an adaptive device of intermediate difficulty.

Advanced: Flex your skills by putting together some of our most advanced microcontrolled devices, while learning how the microcontrollers allow it to perform its specific functions.

Event Participation Waiver – Makers Making Change

I, the undersigned, hereby acknowledge and agree to the terms and conditions outlined in this Event Participation Waiver (“**Waiver**”) in consideration for my participation in the Makers Making Change event (the “**Event**”) organized by the Neil Squire Society (the “**Organizer**”).

- 1. Assumption of Risk:** I understand and acknowledge that participating in the Event involves certain inherent risks, including but not limited to physical injury, property damage, and other unforeseen dangers. I voluntarily and willingly assume all risks associated with my participation in the Event.
- 2. Release of Liability:** In consideration for being allowed to participate in the Event, I hereby release, waive, discharge, and covenant not to sue the Organizer, its officers, employees, agents, volunteers, or any other representatives from any and all claims, liabilities, demands, actions, or causes of action whatsoever arising out of or related to any loss, damage, injury, or death, including those that may result from the negligence of the Organizer and including arising under the *Occupiers Liability Act* (British Columbia).
- 3. Compliance with Rules:** I agree to comply with all rules and instructions provided by the Organizer or its representatives during the Event.

I certify that I am the age of majority (18 or 19, depending on the province or territory) and have read and understood the terms of this waiver. If I am under the age of majority, my parent or legal guardian has read and understood this Waiver and has executed it on my behalf.

Name: _____

Signature: _____

Date: _____

Name of parent/guardian (if applicable): _____

Signature of parent/guardian (if applicable): _____