MAKER DAY TOOLKIT 2

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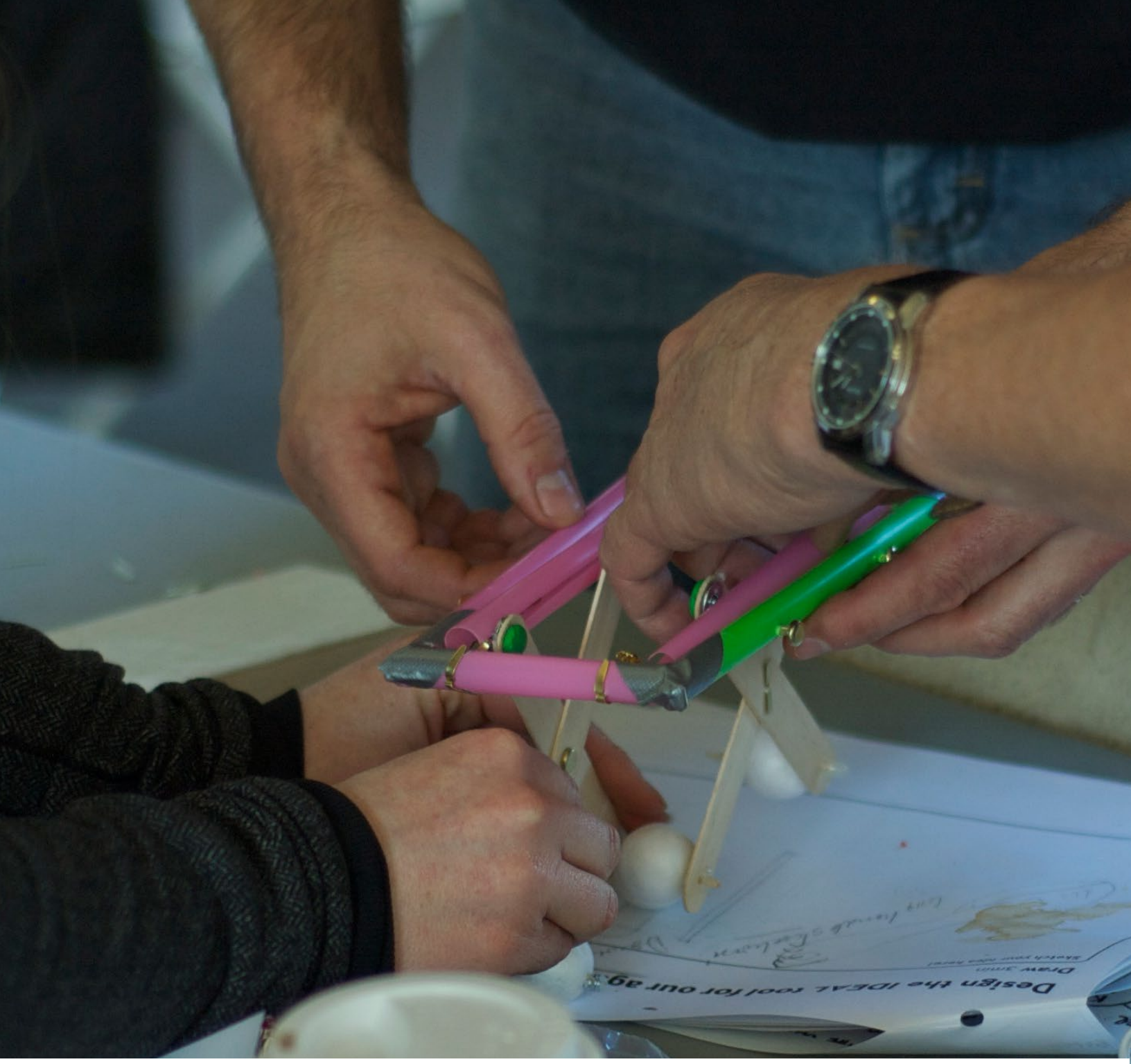
YOUR TICKET.

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA
Faculty of Education
Okanagan Campus



Embrace the change that will naturally occur as you go through your maker journey. Since making is fundamental to what it means to be human, you will become a more complete version of you as you make.

Acknowledgements

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Innovative Learning Centre Advisory Board
Dr. Margaret Macintyre-Latta

Introduction

Welcome to Maker Day Toolkit (v2): Taking Making Into the Schools

Taking Making Into the Schools is an immersive professional development approach. Designed for educators, this approach requires ALL participants to thoughtfully and fully engage in design thinking and creative problem finding. At the heart of the day is the Maker ethos (love of making) which "values learning through direct experience and the intellectual and social benefits that accrue from creating something shareable" (Martinez & Stager, 2013).

The goals of Maker Day are:
1) understand the importance of purposeful Making, a pedagogy which embodies active, constructionist learning and

2) develop approaches to integrate Making and tinkering seamlessly into their classroom practices.

As part of the event, educators are introduced to Design Thinking; Inquiry; Making; and hands-on Experiential Learning through their active engagement within small groups.

The Innovative Learning Centre (ILC) in the Faculty of Education at University of British Columbia's Okanagan campus compiled these materials and offer them in three formats (ePub, PDF, and Word. docx). You can use, modify and share them with colleagues and friends. Please note these materials are covered by a Creative Commons license (http://creativecommons.org/about), and we ask you to respect that as you use the Toolkit.

The materials were piloted and tested November 2013 when 80 educators gathered to experience the inaugural Maker Day: Taking Making Into Schools professional development event. Since then, we have facilitated numerous Maker Days and engaged over 400 participants – aged 12 – 60+. Each event has helped us to refine our approach and modify our Toolkit. The Maker Day: Taking Making Into the Schools concept and initial professional development days would not have been possible without the generous and helpful support from the Faculty of Education at the University of British Columbia's Okanagan campus, Industry Training Authority BC (ITA) and the Women In Trades Program at Okanagan College. In November 2013, the first version of the Maker Day Toolkit (http://issuu.com/ubcedo/docs/mar27makerdayToolkit) was published by the Innovative Learning Centre (ILC) in the Faculty of Education at University of British Columbia's Okanagan campus (http://innovativelearningcentre.ca/) and the Industry Training Authority (http://www.itabc.ca/events/maker-day). Iterations of Version 1 have documented the immersive professional learning activities of Maker Day: Taking Making Into the Schools. Subsequently, educators, administrators and community members facilitated Maker Day: Taking Making Into the Classrooms experiential learning events for their students. In 2014, Maker Days have taken place across the province of British Columbia, Canada and in Tanzania, East Africa. Maker Day Toolkit (version 2) incorporates lessons learned from these events.

We welcome all feedback and suggestions for improvement! Please let us know how your Maker Day professional development event goes and whether other resources are needed. Also, please tweet out any of our events so we can follow all Maker activities (@UBCedO; @crichtos; @ilcubco).

Susan Crichton
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Maker Day Toolkit

MAKER DAY AGA KHAN UNIVERSITY,
INSTITUTE OF EDUCATIONAL DEVELOPMENT, TANZANIA

1. Conceptualizing a Maker Day

Celebrating The Best Gifts of Humanity: The Ability to Think Wisely and Tinker Creatively and Share Generously

We know that it is hard to share meaningfully things that we have not experienced deeply. If we are going to take Making into our schools, we believe educators need to participate actively in a full day Maker Day: Taking Making into the Schools experience to help them feel confident and "own" the ideas of design thinking, problem finding, collaborative prototyping, collegial and convivial critique, and reflection.

Maker Day: Taking Making into the Schools introduces participants to the Maker Movement, focusing on five distinct yet related elements:

- **Design challenge**
- **Design thinking**
- **Design solution through collaborative prototyping**
- **Design charrette**
- **Group reflection**

This immersive professional development approach is NOT the same thing as a makerspace or Maker Faire. Makerspaces are places where individuals come together to "share some aspects of the shop class, home economics class, the art studio, and science labs. In effect, a makerspace is a physical mash - up of different places that allows makers and projects to integrate these different kinds of skills" (Dougherty, 2013, p. 9). A Maker Faire is "a space where [makers] could get together to extend the conversation. At the Faire, a maker could put an object they created up on a table and have people ask them about it" (Dougherty, 2012, p. 11).

1.1 Making a Case for Making

Humans have a need to make. It stems from our curiosity with the world and our basic human desire to make things and then make those things better. The Do-It-Yourself movement is evidence of this – from cooking channels to home improvement shows, we have been knitting, tinkering with cars, renovating our homes, and making gifts for friends of all ages.

Now, we are reclaiming this need and formalizing it into a movement. We are creating shareable workshops (makerspaces), providing hours of instructional videos (i.e., YouTube, Instructables, etc.), and offering workshops (i.e., lumber yards and hardware centres offering 'how to sessions'), reclaiming the model building kits from our recent past while adding 3D printers and robotics. Educators have a role to play – especially when we take Making as pedagogy into our schools.

Basically, we are in a time where digital literacy is not enough; digital fluency is essential and because we now have the potential to learn, both formally and informally, at any time, place or in any format we need. Learning opportunities have probably never been more ubiquitous and flexible. We can upgrade our calculus skills, learn to restore an Airstream trailer, or track our fitness using a range of devices, platforms, and media. Specifically, we can search edX on our tablets, use our mobile phones to join a blog or user forum, or sync our personal data using a USB dongle to connect with a secure website. Any or all of these tasks / applications / hardware devices can be accessed and updated with semi-ubiquitous Wi-Fi connections.

Globally, five generations share in our work force, where previously there would have been only three or four. Currently, "Millennials—the people born between 1977 and 1997—... account for nearly half the employees in the world." (Shah, 2011, para. 3).

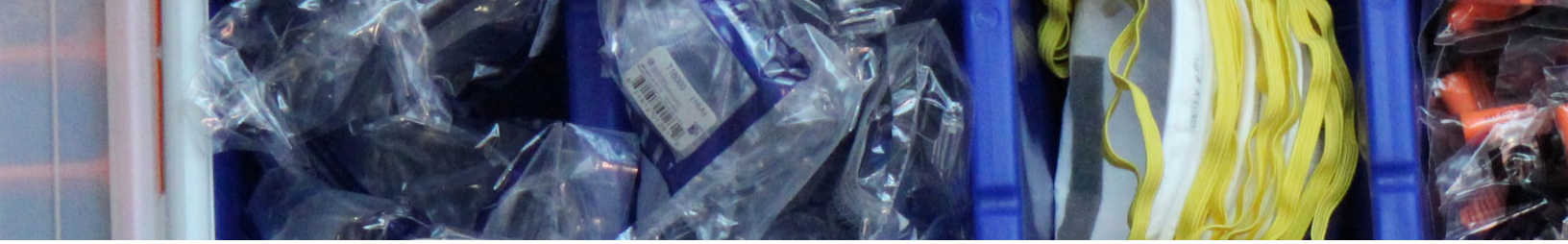
Fifty per cent of the content accessed is cloud based. In North America, approximately 95% of 12 – 17 year olds are regularly online, 76% of them use social networks, and 77% have cell phones. Globally, there are over 1 billion smart phones, and the sum of human knowledge, in the form of Wikipedia, is available offline in a downloadable format (http://www.labnol.org/software/download-wikipedia-offline/20012/). Since we have few problems accessing information or finding opportunities to connect with others, one would think our educational needs should be changing as well. To work with all the available information, we need to help students gain "knowledge" skills.

The Organisation for Economic Co-operation and Development (OECD) describes learning environments that foster knowledge skills as being:

- **Learner-centred:** highly focused on learning but not as an alternative to the key role for teachers
- **Structured and well-designed:** needs careful design and high professionalism alongside inquiry & autonomous learning
- **Profoundly personalised:** acutely sensitive to individual and group differences and offering tailored feedback
- **Inclusive:** such sensitivity to individual and group differences means they are fundamentally inclusive
- **Social:** learning is effective in group settings, when learners collaborate, and when there is a connection to community (OECD, 2011).

These learning environments are consistent with what Pink (2005) calls our current Conceptual Age – a time where logical and linear thinking is valued, especially when it is coupled with creativity and innovation. Exploration, visual aesthetics, problem find and problem solving have been identified as essential skills in this age. With all levels of education calling for knowledge skills situated in learning environments such as those described above, one might ask, how can educators adapt and adopt the much needed changes?

Hatch (2014), author of the *Maker Manifesto*, suggests that as part of this Conceptual Age, we are actually entering a new industrial revolution. If the first revolution was fuelled by factories powered by steam and the second by electricity, our new age is to powered by unlimited access to information, the development of increasingly reasonably priced, powerful tools, and the ability to obtain a range of globally sourced materials and resources with which to make things. Hatch suggests the Maker Movement is actually an Internet of Physical Things (p. 3) claiming it is in reality bigger because it consists of physical objects connected via sensors to the Internet. Running parallel with this new age and Internet of Things is "the largest untapped human resource on the planet ... the space time, creativity, and disposal income of the 'creative class' " (Hatch, p. 52).



Richard Florida identifies this creative class as an "amalgamation of engineers, artists, lawyers, programmers, designers, and other who have the educational or professional propensity to 'create'" (cited in Hatch, p. 52). Florida suggests this class is fostering the majority of contemporary innovation and is moving into advanced manufacturing which in turn is supporting an economic recovery, new employment options, and the rapid growth of the Maker Movement. In 2010, estimations of 40 million people in the United States alone – 50% of the employed workforce – to this creative class and controlled $474 billion in disposable income (p. 52). This income is increasingly being directed to creative and imaginative work, often using makerspaces for prototyping and networking.

Oddly, at the same time, we are questioning where all the skilled workers are in Canada? (Mason, Oct. 18, 2013). Mason states

> Once upon a time, shop class was mandatory in most high schools. There was a belief that even if a student wasn't intent on becoming a mechanic or carpenter, having some basic life skills in these areas wasn't a bad thing.
>
> Over time, however, shop began to look dated and irrelevant and was given less status. Somewhere along the way, it was drilled into students that the only way to get ahead in life was to go to university and earn a degree.

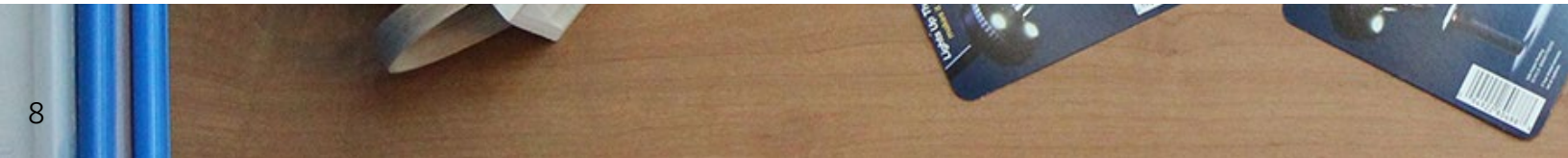
The complete Mason article is reprinted with his permission in Section 4 of this Toolkit.

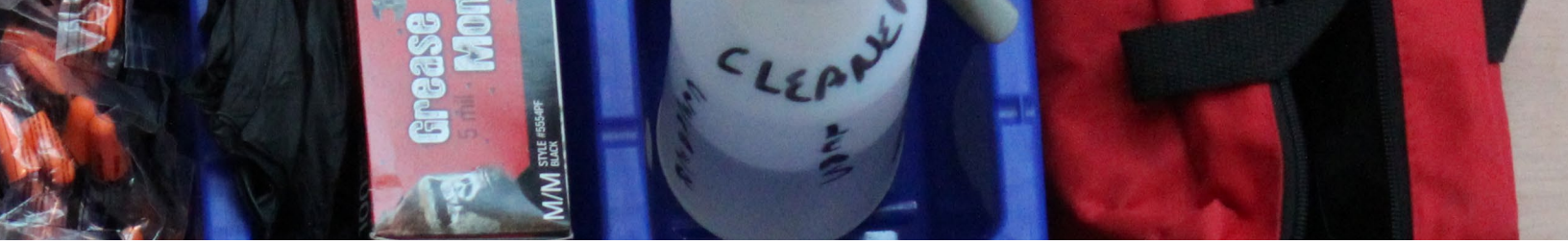
Taking Making Into Schools

Hatch's (2014) Maker Movement and classrooms seem perfect partners. Inquiry based learning, problem based learning, constructionism, experiential learning, Reggio Inspired learning all cry out for hands-on experiential approaches to making learning visible.

Sylvia Martinez and Gary Stager (2013) explain Making as an authentic way to bring STEMx (Science, Technology, Engineering, Mathematics and Design) into the classroom. Martinez and Stager (2013) provide a background to the Maker Movement and the numerous educational thought leaders who have underpinned its principles. They also provide links to current educational theories and practices (constructivism and constructionism), descriptions of good projects, suggestions for classroom design, and a range of resources and references.

Making is a pedagogical orientation (Crichton & Carter, 2015) and a mind set (Dougherty, 2013) that integrates imagination and creativity with design thinking, problem solving, and even more importantly, problem finding. Making and makerspaces cannot be simply added to school spaces and integrated into an already overcrowded curriculum. Bringing Making into the schools is NOT about adding another course or discipline. Rather, it is an intentional way of integrating STEMx and supporting personalized, constructionist learning across the curriculum. It is also a way to encourage ALL students to explore Trades and Technology as a course of study, to reclaim"Shop class" as a valuable place to turn theory into practice, ideas into design, design into prototype. By taking Making into the schools, we may just begin to answer Mason's question of where the skilled workers are ... recognizing they are probably sitting right there in our classes just wanting an opportunity to explore their creativity and actually make something new and meaningful!





1.2. Fostering Innovation in Our Schools

As baby boomers, many of us remember going to the school library in the 1960s to do research. Our starting point was usually the *Encyclopedia Britannica* with its multiple volumes. We would be assigned 1 of the 17 volumes. From there, our quest for a fascinating topic would start. Somewhere, within the approximately 1000 pages of text in each volume, was a topic that would prompt our curiosity and become the catalyst for deeper exploration. Information appeared finite and physical. What the librarian selected for the school was it – the sum of human knowledge as curated by that individual to support and enhance the mandated curriculum. Isaacson (2014) notes when the Encyclopedia Britannica quit publishing its print addition in 2010, it held 80,000 articles – which is less than 2% of articles currently available in Wikipedia. In many ways, one could say that Wikipedia is "the greatest collaborative knowledge project in history" (p. 444).

Jimmy Wales, one of the originators of Wikipedia, had a "huge, audacious, and worthy goal – 'Imagine a world in which every single person on the planet is given free access to the sum of all human knowledge'" (p. 445). In many ways, Wikipedia is about much more than free access; it is also about providing a participatory forum in which we all can be contributors, editors, and consumers of information. The assigned volume no longer limits us. We search across topic areas and compile various ideas until new knowledge informs the 'things' in which we are truly interested. Access and opportunities such as those provided by Wikipedia and Google should change almost everything – including the ways in which we learn and teach.

When we can get content from anywhere, what we learn (literacies) and the skills we need to gain expertise with (fluency) must change. Knowing things is less important than knowing how to find things, value things, and connect things together in new configurations. While core literacies are certainly essential, fluency and competencies - critical thinking, problem solving, authentic learning, and collaboration – become increasing critical in a knowledge age (Trilling & Fadel, 2009).

Educators have significant choices to make, and in Canadian provinces like Alberta and British Columbia, the mandated curriculum is encouraging them to re-think learning and teaching.

In 1967, Marvin Minsky at MIT commented on "the dreadful way that schools were crushing the creativity of young students by not teaching them to deal imaginatively with complexity" (Isaacson, 2014, p. 284). Minsky and Seymour Papert, along with Alan Kay, went on to produce LOGO, Lego Logo Robotics, Lego Mindstorms, and other simple computers and computer interfaces for children to explore and learn with (n.d.). Their work continues with Mitch Resnick and others at Lifelong Kindergarten at the Media Lab at MIT (https://llk.media.mit.edu/).

By Taking Making into your classrooms and schools, you can join this movement to foster creativity and innovation as well.

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A Challenge

So, how are you teaching your students to deal imaginatively with complexity?

While some schools are combining their libraries with computer labs to create "a full-service learning, research, and project space" or learning commons (Loerscher & Koechlin, n.d.), others are adding makerspaces into their buildings. Often called a STEM lab or fab lab, school based "[m]akerspaces provide hands-on, creative ways to encourage students to design, experiment, build and invent as they deeply engage in science, engineering and tinkering" (Cooper, 2013). However, we fear that the introduction of redesigned spaces and the addition of tools and new technologies will not change teaching and learning anymore than the introduction of computer labs fostered digital literacy or fluencyand 21st century learning (Trilling & Fadel, 2009). Unless educators intentionally pursue innovation and creativity as learning outcomes, makerspaces will become "imagination ghettos" (Crichton & Carter, 2015) where issues of access, purpose, and ownership resemble those common in the cloistered environments of early computer labs and many of today's shops where students are tasked with cookie cutter activities and trivial projects to complete.

Without intentionality in terms of curricular purpose, teaching and learning may remain the same in these new learning commons and makerspaces. New teaching and learning environments may be used to only repurpose shop-worn tasks of previous reforms. However, access to information allows us all to find ways to create almost anything we can imagine and reach across the globe to find others with the curiosity and expertise to help us design and develop it.

What Might Be Different This Time?

Past practice suggests that simply adding new tools and technologies to existing educational activities changes very little in terms of learning outcomes, student achievement, and student engagement (Dunleavy & Milton, n.d.). What typically supports innovation and innovative practices are timing, technology, and intuition. As Einstein states, "A new idea comes suddenly and in a rather intuitive way, but intuition is nothing but the outcome of earlier intellectual experience" (cited in Issaacson, 2014, p. 68).

Our intuition, research (Crichton & Carter, 2015; Macintyre Latta & Crichton, 2015), and experience suggests that educators need to experience the excitement of innovating, tinkering, and making something new before they can comfortably invite their students to these activities. Further, when these activities are integrated into formal learning environments such as schools, we suggest intentionality in both purpose and process are required.

Intentionality in purpose comes from a deep understanding of the importance of nurturing a mindset for innovative and creative thinking. Put simply, we see an intentional mindset consisting of the following flow:

INNOVATION & CREATIVITY
FUELED BY CURIOSITY
SUPPORTED BY NIMBLE, LATERAL & CONNECTED THINKING
GAINED THROUGH PERSONAL EMPOWERMENT & AGENCY
BUILDS CONFIDENCE FOR RISK TAKING & EXPLORATION

Intentionality in process includes the components we share in this Toolkit:

- Ability to develop relevant design challenges that support curriculum areas and prior learning (see Section 1.3.)
- Ability to understand, facilitate and engage in design thinking (see Section 1.4.)
- Ability to participate in and facilitate a design charrette (see Section 3.6.)
- Ability to personally reflect on previous practice and facilitate group reflection (See Section 3.6)

As human beings, we distinguish ourselves with our ability to consider alternative ways of seeing, doing, and being – to make things and then make those things better. As Isaacson (2014, p. 486) notes, "We posess an imagination that brings together things, facts, ideas, conceptions in new, original, endless, every-varying combinations. We weave information into our narratives. We are storytelling as well as social animals." In our schools we must let those abilities flourish and be nurtured. We believe Maker Day: Taking Making into Our Schools, an immersive professional development approach with an intentionality of purpose and process, is a way to do that, building on what we intuitively know about Making and what we are beginning to know about how learning actually occurs.

We believe the timing is right for innovative approaches for educational practices by Taking Making into our schools and fostering curiosity and creativity in the pursuit of personal knowledge building. It is time to combine what we know about learning with the technologies and tools of our times and create engaging learning environments for our students and ourselves.

1.3. Making the Connection to Curriculum: Designing a Design Challenge

Linking Thinkering to Making

At some point during the numerous professional development events we have facilitated, educators ask, "So, we get it - Making is fun and we know kids will love it, but how does it help us to cover the required content because we barely have time to teach the things we teach now." Each time we hear this or something similar we sigh a bit and are puzzled that so little has changed. Despite the exciting and permissive curriculum reforms and the access to the information we now have, and the brain research exploring how we actually learn, school activities tend to remain much the same. We know now that simply covering the curriculum in a teacher directed manner does little to improve learning and even less to foster curiosity. Eric Mazur, a Harvard professor, suggests less than 10% of what is taught is retained two years later (Lambert, 2012). We believe active learning through thinkering with problems worth puzzling over appears to be the answer rather than merely attempted to cover more content.

To achieve the flow shared in Section 1.2. students need rich learning environments that provide important things for them to think about and grapple with – what is often called Thinkering. Thinkering combines thinking with the act of tinkering – a marriage of problem finding and problem solving. It fosters the kind of nimble, lateral, connected thinking that prompts curiosity and fuels creativity and innovation. Sites like Thinkering Studio (http://thinkeringstudio.wikis.birmingham.k12.mi.us/) provide background readings and tips as well as a rubric to guide the integration of thinkering into classroom learning (http://thinkeringstudio.wikis.birmingham.k12.mi.us/Thinkering+Studio+Rubric).

Libraries and museums are increasingly creating thinkering spaces in proximity to their more traditional offerings. The Children's Museum of New Hampshire describes such a space as being "dedicated to creative problem solving and imagination. It contains a set of design challenges for a range of ages, interests and levels of involvement, including projects that might be continued at home after a visit" (http://www.childrens-museum.org/cmnh2010/exhibits/exhibit.aspx?id=470).

Countries such as Singapore have already radically changed their national policies and embraced movements such as Teach Less Learn More. This movement began in 2006 as a way to help "teachers and schools to focus on the fundamentals of effective teaching, so that ... students are engaged, learn with understanding, and are developed holistically, beyond preparing for tests and examinations. ... [it has required schools to change in terms of] curriculum (what to teach), pedagogy (how to teach) and assessment (how much have learners learnt)" (Singapore Ministry of Education, 2015). While we're not huge fans of high stakes exams, the 2012 PISA results, which was the first year to assess creative problem solving, ranked Singapore #1 ... Canada was 5th followed by Finland 7th and the USA 13th (http://www.oecd.org/pisa/singapore-and-korea-top-first-oecd-pisa-problem-solving-test.htm). Samples of the types of questions asked can be found at http://www.oecd.org/pisa/test/.

So, we see a purposeful way of Taking Making In the Schools is by intentionally linking the process of Making (designing, thinkering, prototyping, tinkering, reflecting) with a well considered, thoughtfully crafted Design Challenge building on prior learning and scaffolding the introduction of new ideas. The Design Challenge is the curriculum tie that allows the students to uncover the learning. What aligns the design challenge to the curriculum in schools is the subject knowledge / curriculum understandings needed to respond to design challenge and the need to use design thinking and hands-on construction (prototyping) to solve the problem. A design challenge is the starting point or narrative from which participants use design thinking to find creative solutions to problems drawing on empathy, creativity, and research.

Educators must adopt an inquiry approach to fully bring Making into their schools. Wiggins and McTighe (2006) offer guidance in approach in their book, *Understanding by Design*. Central to their approach is the suggestion of planning with the end in mind – or backward design. This approach encourages educators to consider the learning objectives, instructional strategy, the types of materials and resources when planning the instruction and encouraging students to have an active role in determining individual aspects of the project and the ways in which it might be completed. The educator has an active role in shaping the inquiry with the students and guides the students within the specific context of the learning environment and curriculum under study. The students actively engage in the learning while educators thoughtfully scaffold and facilitator the process.

Considering a Range of Maker Day Activities

While each Maker Day event should be unique and customized for its specific audience, we would suggest there are some commonalities amongst them and some critical elements that need to be prepared in advance. Three of these are

1. Consumable materials (Participant Group Kits) to be used for the Design Solution – Prototyping Activities
2. Photocopying of materials for facilitators and participants
3. Materials for the reflection panels to be used during the Design Charrette

Depending on the degree to which you may want to encourage more complex prototyping (moving into simple fabrication), you may want to have a collection of shareable hand and power tools – a tool crib – along with a mentor to share just-in-time tips as to their safe and appropriate use.

Depending on your budget, you may also want to have a shared pantry of items that support/supplement the participant group kits used by each group. The table below suggests a variety of materials you will need to support Maker Days with two different outcomes – one focused on design thinking and simple prototyping and one that introduces the use of simple hand and power tools.

Table 1: Types of Maker Days

	Maker Day with Simple Prototyping	Maker Day with Introduction to Fabrication
Sample Design Solutions	Cardboard models with simulated buttons and functionality using duct tape and a range of found & dollar store items	More robust models with moving parts; wooden doweling and plastic pipe to provide structural integrity and form
Suggested Materials	Items found in Participant Group Kit (Section 3.7), including glue guns	Items found in Participant Group Kit (Section 3.7), including glue guns
Suggested Supplemental Tools	Larger glue gun (higher heat for stronger holding power), small battery powered drill, v blocks and clamps as simple table vices to safety when cutting and drilling	Chop saw, electric drill stand, larger glue guns, drills with spade and standard drill bits, portable table vices

Three Approaches to Forming a Design Challenge

Our experience suggests there are three primary ways to structure a design challenge:

1. inquiry question

An Inquiry Question allows curriculum to be explored through authentic learning experiences (Alberta Learning, 2004) – a key contribution of Making to teaching and learning activities. Authentic learning encourages students to inquire into things that are real and of interest to them. It positions the learning activities as problems to be solved. Edutopia has a site sharing tools, tips and ideas about problem-based learning (PBL) (http://links.edutopia.mkt5094.com/ctt?kn=17&ms=NzE3NDM0OAS2&r=MjcyODg5NjI0MjMS1&b=0&j=OTMyNDg3NjYS1&mt=1&rt=0).

2. a problem to be solved

Problem solving is "cognitive processing directed at achieving a goal when no solution method is obvious to the problem solver" (Mayer & Wittrock, 2006, p. 287). Students need five kinds of knowledge to be successful problem solvers:

- facts: knowledge about characteristics of elements or events, such as "there are 100 cents in a dollar";
- concepts: knowledge of a categories, principles, or models, such as knowing what place value means in arithmetic or how hot air rises in science;
- strategies: knowledge of general methods, such as how to break a problem into parts or how to find a related problem;
- procedures: knowledge of specific procedures, such as how to carry out long division or how to change words from singular to plural form; and
- beliefs: cognitions about one's problem-solving competence (such as "I am not good in math") or about the nature of problem solving (e.g., "If someone can't solve a problem right away, the person never will be able to solve it" (Mayer & Wittrock, 2009).

3. scenario

Scenarios are a form of story or narrative. They can be used to introduce students into a project. The purpose of a scenario is to set a scene for a project and to create a common starting point. A scenario may also set the parameters for the project, outlining any limiting factors, special conditions and time / context constraints. Scenarios are creative ways of imagining a "different future" or an alternative way of doing something. They help the students visualize the context for the task as they usually cover environmental, social, technical, political and economic concerns.

Why We Prefer Design Challenge Scenarios

We briefly shared three ways to craft a Design Challenge. There are many other ways, and we are sure you will find the one that fits your teaching style the best. We prefer casting our Design Challenges as scenarios as our Maker Day professional development activities are completed in small groups of four individuals. Typically, we try to make groups as heterogeneous as possible, attempting to make learning interprofessional and interdisciplinary as possible. A scenario appears to be a generous way of inviting the entire group to participate fully. Stanford University, home of d.School and one of the lead developers of Design Thinking, suggests groups of four individuals are the most optimal.

Our scenarios consist of the following components:

- Overview Statement which provides the background for the challenge
- Design Rationale which provides the authentic context for why the challenge is important
- Problem Scenario which situates the challenge within the group that has been tasked to solve it
- Success Determinants which provide the criteria for how the design solutions will be assessed / or peer evaluated during the design charrette
- Parameters or the rules and limitations to which groups have to follow or adhere

Understanding good projects will help you create a great Design Challenge. In Section 4.2 What Makes a Good Project outlines eight elements of a good project written by Gary Stager for the Creative Educator blog (http://creativeeducator.tech4learning.com/v05/articles/What_Makes_a_Good_Project).

To date, we have field-tested four Design Challenges, and they can be found in Section 4 of this Toolkit. Please use or modify any of the challenges, and share the ones you create with us (innovativelearningcentre.ca).

Design Challenge topics include:

Our Aging Society
Inclusive Playgrounds
Food Security
Helping New Parents

1.4. Background to Design Thinking

Mau describes design as "the human capacity to plan and produce desired outcomes" (cited in Berger, 2009, p. 3). It is through the design process that problems, old or new, simple or wicked, can be problematized, allowing designers to ask, "How can we reboot and rebuild – and do it better, more thoughtfully?" (Berger, 2009, p. 5). It is a significant part of the intentional process we use in Maker Day: Taking Making Into the Schools. Once people are introduced to a Design Challenge, they tend to rush to a solution. Design Thinking is a process by which designers can thinker and talk purposefully within their groups and consider, discuss, research, and explore options. Thinkering is often called lateral thinking – thinking that tends to foster creativity and innovation.

Design thinking aligns nicely with the Maker Movement by helping makers consider what they would like to create and what might be needed. It allows makers to "creatively attack the world's greatest problems and meet people's most urgent needs" (Hatch, 2014, p. 10). As Walt Disney is attributed to have said, "It is kind of fun to do the impossible!"

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Process of Design Thinking

The process of design thinking involves a series of decisions that inform the user experience. "Design doesn't just make things beautiful, it makes them work" (Dadich, 2013). In the 1980's, Dieter Rams, an architect and a designer for Braun, became concerned with the seemingly "impenetrable confusion of forms, colors and noises" in the world around him. To help sort out what might be considered as good design, he drafted ten principles (Vitsoe, 2013). They include

- **Good design is innovative**
- **Good design makes a product useful**
- **Good design is aesthetic**
- **Good design makes a product understandable**
- **Good design is unobtrusive**
- **Good design is honest**
- **Good design is long-lasting**
- **Good design is thorough down to the last detail**
- **Good design is environmentally friendly**
- **Good design is as little design as possible.**

Design thinking is a process for solving problems, and it typically consists of seven steps: define, research, ideate, prototype, choose, implement, and learn.

Define

- Decide what issue you are trying to resolve.
- Agree on who the audience is.
- Prioritize this project in terms of urgency.
- Determine what will make this project successful.
- Establish a glossary of terms.

Research

- Review the history of the issue; remember any existing obstacles.
- Collect examples of other attempts to solve the same issue.
- Note the project supporters, investors, and critics.
- Talk to your end-users, that brings you the most fruitful ideas for later design.
- Take into account thought leaders' opinions.
- Ideation.
- Identify the needs and motivations of your end-users.
- Generate as many ideas as possible to serve these identified needs.
- Log your brainstorming session.
- Do not judge or debate ideas.
- During brainstorming, have one conversation at a time.

Prototype

- Combine, expand, and refine ideas.
- Create multiple drafts.
- Seek feedback from a diverse group of people, include your end users.
- Present a selection of ideas to the client.
- Reserve judgment and maintain neutrality.
- Create and present actual working prototype(s).

Choose

- Review the objective.
- Set aside emotion and ownership of ideas.
- Avoid consensus thinking.
- Remember: the most practical solution isn't always the best.
- Select the powerful ideas.

Implement

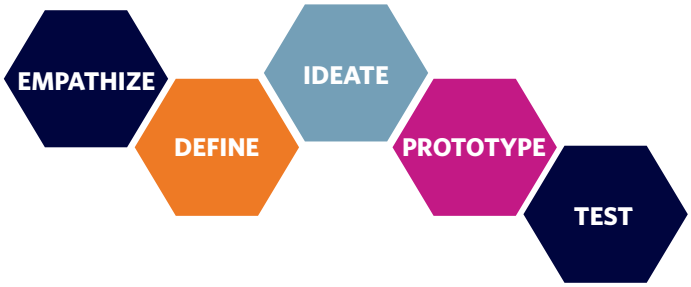
- Make task descriptions.
- Plan tasks.
- Determine resources.
- Assign tasks.
- Execute.
- Deliver to client.

Learn

- Gather feedback from the consumer.
- Determine if the solution met its goals.
- Discuss what could be improved.
- Measure success; collect data.
- Document.

Although design is always subject to personal taste, design thinkers share a common set of values that drive innovation: these values are mainly creativity, ambidextrous thinking, teamwork, end-user focus, curiosity (Wikipedia, n.d.).

Stanford's d.School offers a great series of resources on design thinking. Please explore http://dschool.stanford.edu/dgift/



Tie to Education

Increasingly educators are called upon to be designers of learning experiences. This is a shift from their previous roles as implementers or interpreters of curriculum. A good way to incorporate design thinking in the classroom is to use it to help students intentionally find linkages between authentic learning experiences and curricular problems.

Because of its emphasis on empathy, design thinking invites students to focus on human centred design and think about things worth considering. It aligns nicely with STEMx projects grounded in improving the human experience. Mitch Resnick, director of Lifelong Kindergarten at MIT's Media Lab, suggests educators should incorporate the process of creative thinking – imagine, create, play, share, reflect (Resnick, 2007) in their practices as it "reflects the natural way that young children learn and play" (Martinez & Stager, 2013). Design thinking and thinkering align quite nicely! One caution though, as with any process: honour the steps and trust the process. There are no shortcuts to innovation!

1.5 Annotated Reference List

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Videos to Watch

Apollo 13 – Clip from the movie – Square peg in a round hole
(http://www.youtube.com/watch?v=C2YZnTL596Q)

The real story – Apollo 13
(http://www.youtube.com/watch?v=69LDSL-9--g)

Software to Explore

Autodesk 123D (http://www.123dapp.com/)
Free 3D modeling software that is integrated with content and fabrication services. It also has links to projects, patterns, models.

Autodesk Inventor (http://www.autodesk.com/)
The professional, commercial version of Autodesk 123D. Inventor® 3D CAD software offers an easy-to-use set of tools for 3D mechanical design, documentation, and product simulation. Digital Prototyping with Inventor helps you design and validate your products before they are built to deliver better products, reduce development costs, and get to market faster.

Lego Building Software
(http://www.lego.com/en-us/mindstorms)

Logo Software
(http://el.media.mit.edu/logo-foundation/products/software.html) The original turtle programming software.

Maya (http://www.autodesk.com/products/autodesk-maya/overview) Maya® 3D animation software offers a comprehensive creative feature set for 3D computer animation, modeling, simulation, rendering, and compositing on a highly extensible production platform. Maya now has next-generation display technology, accelerated modeling workflows, and new tools for handling complex data.

Scratch (http://scratch.mit.edu/)
With Scratch, you can program your own interactive stories, games, and animations — and share your creations with others in the online community. Scratch helps young people learn to think creatively, reason systematically, and work collaboratively — essential skills for life in the 21st century. Scratch is a project of the Lifelong Kindergarten Group at the MIT Media Lab. It is provided free of charge.

Hardware to Explore

Arduino (http://www.arduino.cc/)
Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists and anyone interested in creating interactive objects or environments.

littleBits (http://littlebits.com/)
littleBits is an opensource library of electronic modules that snap together with tiny magnets for prototyping, learning, and fun.

Leap Motion (www.leapmotion.com)
Leap Motion, Inc. is a company that manufactures and markets a computer hardware sensor device that supports hand and finger motions as input, analogous to a mouse, but requiring no hand contact or touching.
Lego Mindstorms (http://www.lego.com/enus/mindstorms/?domainredir=mindstorms.lego.com)

McMaster (http://www.mcmaster.com/#)
Site for all types fasteners

Sites to Check Out

Adafruit (http://www.adafruit.com/)
Site for Adruino hardware and project ideas.

Etsy (www.Etsy.com)
Shopping site for a range of arts and crafts and collectables from global entrepreneurs

Instructable (www.Instructables.com)
A site to share what you make with others. Instructables has directions for a range of projects.

Invent to Learn (http://www.inventtolearn.com/)
Official site of the book, Invent to Learn. http://www.inventtolearn.com/resources/ lists a range of resources mentioned in the book

Khan Academy (https://www.khanacademy.org/)
A site to learn – just for free. The library of content covers math, science topics such as biology, chemistry, physics, and the humanities with playlists on finance and history.

Kickstarter (www.kickstarter.com)
Kickstarter is the world's largest funding platform for creative projects.

Lynda (www.Lynda.com)
Subscription fee to learn software skills

SpakrFun (https://www.sparkfun.com/)
Online retail store that sells the bits and pieces to make your electronics projects possible

Thingiverse (http://www.thingiverse.com)
Thingiverse is a website dedicated to the sharing of user-created digital design files. Providing primarily open source hardware designs licensed under the GNU General Public License or Creative Commons licenses, users choose the type of user license they wish to attach to the designs they share. 3D printers, laser cutters, milling machines and many other technologies can be used to physically create the files shared by the users on Thingiverse.

Toys to Play Use

Erector Sets (http://en.wikipedia.org/wiki/Erector_Set)
An Erector Set (the trademark has always been "ERECTOR") is a brand of metal toy construction sets, originally patented by Alfred Carlton Gilbert and first sold by his company, The Mysto Manufacturing Company of New Haven, Connecticut in 1913. In 1916, the company was reorganized as the A.C. Gilbert Company. Erector consists of various metal beams with regular holes for assembly using nuts and bolts. Other mechanical parts such as pulleys, gears, wheels, and small electric motors were also part of the system. What made Erector unique was the ability to build a model, then take it apart and build something else (over and over). Erector quickly became the most popular

construction toy in the United States, most likely because it was the only construction set at the time to contain a motor. Erector was commonly referred to as an Erector Set, though erector set has become somewhat of a generic trademark denoting a variety of construction toys, irrespective of brand. The trademark for ERECTOR is owned and marketed by Meccano. It is still available at Toy R Us.

Goldibox
(http://www.goldieblox.com)
Debbie Sterling, founder of Goldiblox, is an engineer who wants to inspire the next generation of female engineers... More information about Debbie Sterling, http://www.engineergirl.org/Engineers/Directory/13512.aspx).

From Goldiblox webpages: At GoldieBlox, our goal is to get girls building. We're here to help level the playing field in every sense of the phrase. By tapping into girls' strong verbal skills, our story + construction set bolsters confidence in spatial skills while giving young inventors the tools they need to build and create amazing things... Read more, http://www.goldieblox.com/pages/about

Elenco's Snap Circuits
(http://www.snapcircuits.net/)
Elenco Electronics Inc. (http://www.elenco.com/) is a leader of innovative toys and educational science kits. One of their toy lines, Snap Circuits, makes learning electronics easy and fun for beginners as they follow the manuals provided. All parts are mounted on plastic modules and snap together with ease. Build exciting projects such as AM radios, burglar alarms, doorbells and much more!

Additional Readings

Make Magazine (http://makezine.com/)
Designed after Popular Mechanics, Make Magazine is the go to site for all things Maker – from ideas to tools.

Wired magazine (http://www.wired.com/magazine/)
A subscription magazine (digital and print) that reports on emerging tools, technologies and trends. The recent issue has a feature on education and fostering the next Steve Jobs (http://www.wired.com/business/2013/10/free-thinkers) Yes & Yes Designs.

Places to Go

MIT Center for Bits to Atoms
(http://cba.mit.edu/about/)
MIT's Center for Bits and Atoms is an interdisciplinary initiative exploring the boundary between computer science and physical science. CBA studies how to turn data into things, and things into data.

MIT Media Lab – Lifelong Kindergartner
(http://llk.media.mit.edu/)
The home of Scratch – Mitch Resnick and his team design tools and software to support design, creation and learning.

Stanford's Hasso Plattner Institute of Design – d.school (http://dschool.stanford.edu/)
Home of design thinking ... The school was founded by Stanford mechanical engineering professor David Kelley in 2004. It is a joint project between the university and the Hasso Plattner Institute of University of Potsdam in Germany. Like some other design schools, it integrates business and management training into more traditional engineering and product design education.

2. Planning a Maker Day

2.1. Checklist for Planning a Maker Day

As we all know, planning and hosting a professional development day is challenging. This checklist is offered to help you organize a Maker Day for colleagues. While every effort has been made to make this checklist as complete as possible, each venue is different and the potential for creativity is endless. Generally, we learned to try to prepare the most detailed plans and then let the magic unfold!

Beginnings

Set your date and agenda for the day - start early.

- Secure your venue as soon as possible — determine any services, permits and permissions required.
- Refine the agenda for the day with a work-back schedule for each key action on your agenda (i.e., set-up of venue, greeting/registering participants, opening the day, coffee breaks and food, capturing the day, grouping participants and facilitators, design thinking process, prototype building, reflecting on the day, clean-up of venue, debriefing / evaluating the day, etc.). We have included a sample agenda in this Toolkit (Section 2.3).

Develop

- A budget and who will be monitoring the spending
- Determine whether funding or sponsors for the event may be required – If so, start proposal writing and connecting with potential sponsors as soon as possible
- Your planning committee, list of volunteers, facilitators, guest speaker(s), sponsors / funders, special guests, and participants.
- A communication plan from your work-back schedule and lists of people involved to set key pre-events, roles and responsibilities (i.e., marketing, volunteer meetings, facilitator trainings, guest speaker(s) topics / times, invitations, confirmations, reminders, etc.)

Determine

- Key milestones and set times to review whether 'the plan' is on track (i.e., adjustments need to be made (i.e., change in venue, participant numbers, guest speaker(s), problem sketch), steps need to be added, more / less feedback required, communication is happening, budget needs adjusting, more / less marketing, etc.)
- If you want / need to have a formal evaluation of the day – if yes, prepare the evaluation forms with your planning committee

Pre-event planning

Note: Share all materials with the planning committee and keep them appraised of roles / responsibilities as plans unfold

Set-up of venue:

- Sketch floor plan(s) for the day
- List of equipment required (i.e., how many chairs / tables? who will set-up? What time will set-up happen on the day? number of volunteers required? parking paid or free? other transportation required?
  -Make sure you have ample power outlets or extension cords for glue guns and other hand tools

Registration / Greeting:

- Any marketing required (posters, radio / TV announcements, newsletter insertions, newspaper ads, PAC agenda item, etc.)
- Lists of participants (i.e., what will the invitations say and look like (i.e., emails, letters, website registration, contacts, etc.)? how will participants register? when will reminders be sent? name badges for the day?

Opening the day:

- Ice breaker activities, meet and greet, coffee / snacks at beginning, speaker topics / time to speak confirmed, guest speaker(s) invited, confirmed, MC necessary, formal or informal opening, special guests to be welcomed officially

Coffee breaks and food:

- Who will take charge of coffee, tea, drinks, snacks and lunch, ordering, catered event, pot luck, working lunch, how will food allergies and / or special diets be addressed (i.e., part of invitation, specific person to contact) a work-back schedule for each key action (i.e., facilitators, invitees, problem sketch, kits and pantry, food, etc.)
- "Thinkering" (a combination of thinking and tinkering) is hard work – experience tells us folks will eat lots of food and snacks – chips, veggies, etc.

Capturing the day:

- Will video, audio or pictures be taken, who will be responsible for media and distribution, what will happen with prototypes (i.e., participants take them home, displays will be available after the event, transportation of prototypes to where they will be displayed), consent forms required, what would sponsors and / or grant funders require after the day

Grouping participants:

- How many participants in a group (best to consider even numbers — 4 or 6 participants per group and facilitator — since working in pairs is part of the design thinking process), who forms the groups, when do groups form on the day of the event, how will facilitators meet up with participants on the day, are areas assigned to groups or may groups chose their space, have a plan of how to combine groups IF a participant or facilitator is not available on day of event

Design Challenge and Design Thinking process:

- Who develops the Design Challenge, how/when will facilitators be trained, who will be responsible for photocopying and distribution of materials, pens / pencils /coloured markers

Design Solution - Prototype building:

- What will be in the design kits, pantry and / or tool crib, who will do the purchasing of materials, who will be responsible for building the design kits, pantry, and / or tool crib for the day, when will kits be distributed to facilitators, who helps in the pantry, who helps with the tool crib, any special rules and / or regulations required to be posted for the day. See Shopping and Copying (page 28 in this Toolkit) for suggestions.

Design Charrette - Reflecting on the day:

- How many three-fold presentation panels required, what materials will be available for this activity (i.e., coloured construction paper, coloured markers), who will organize the Gallery Tour and ensure every group is ready to present, what do participants need to know about the Gallery Tour, how long will the tour take, formal or informal presentations

Clean-up of venue:

- Who is responsible for clean-up of venue, who is responsible for removal / transportation of prototypes and three-fold presentation panels
- What happens to left over food, who takes responsibility for collecting / distributing / storing design kits, pantry and / or tool crib

Debriefing / evaluating the day:

- What have sponsors / funders requested, formal or informal process,
- What would a 'successful' day look like / what might be done differently,
- What worked / what required adjustments / what are participants saying

On the Day

- Before participants start to arrive
- Meet and introduce all the volunteers and facilitators to the planning committee before the event starts. Make sure these people arrive 30 mins. before the event – at least!
- Go through the day, roles, responsibilities, and circulate contact list in case of emergencies to volunteers and facilitators
- Have a couple of 'floaters' from the planning committee who know the agenda and intention of the day and are willing to jump in and help when there are any 'bottlenecks' (i.e., registration is slow, distribution of kits, finding groups, helping with pantry or tool crib, helping with Gallery Tour, etc.)

After the event

- Thank you letters / presentations
- Debrief / evaluate as planned with planning committee
- Determine time to close-off budget


UBC

2.2. Shopping and Copying

Shopping

Please refer to the Participant Group Kit Contents (page 36) and Shared Tool Crib (page 38) in this Toolkit. They provide suggestions for equipment and materials needed to support your Maker Day. Please remember, these are only suggestions. You can change the items based on your budget, availability of the items, and the type of Maker Day you are hosting (see Table 1 - Types of Maker Days on page 14).

Remember – you need 1 Participant Group Kit for each group of 4 participants and 1 Shared Tool Crib and / or Pantry for the entire group.

We have provided suggestions of where you might purchase the items suggested on pages 36-39. Truly, the entire shopping adventure will take less than half a day for a "keen" and intrepid shopper armed with a large van and the district credit card.

Copying

There are a number of documents that each participant needs, depending on their role in your Maker Day. The table below itemizes each document and the numbers required.

Event	File Name	# of copies required
Facilitator Training / Pre-reading	• Facilitator Checklist.doc • Facilitator Guide.doc • Design Challenge • MakerDayFacilitatorGuide_Standford.pdf • Design Charrette – Reflection Panel.doc	1 copy of each document / facilitator
For Maker Day	Design Challenge.doc	2 copies / kit
	Maker DayParticipantGuide_Stanford.pdf	1 per participant group kit = 4 copies per group
	URL to Taking Making Into the Schools ePub Toolkit	1 page makes 30 labels
	Maker Movement Manifesto.docx	1 copy / participant group kit

3. Hosting a Maker Day

3.1 Group Facilitators: Roles and Responsibilities

Background
Maker Day is an immersive professional development event for educators that requires ALL participants to thoughtfully and fully engage in design thinking and creative problem finding. At the heart of the day is the Maker ethos which "values learning through direct experience and the intellectual and social benefits that accrue from creating something shareable" (Martinez & Stager, 2013).

Your role as a facilitator of one of the groups is to help the participants experience Design Thinking; Inquiry; Making; and hands-on, Experiential Learning through active engagement in their small group. They will experience problem finding through a design challenge.

Your task is to guide your group through the activities, following the steps provided in this guide. There are very few rules to the day other than:

- Everyone must actively engagement and participate in all aspects of every activity
- Participants must use some of ALL the materials in their participants' group kits.
- Participants can also make a pitch to take materials from a shared pantry of items and tools.
- Participants must collaboratively and creatively imagine, design, prototype, tinker, and share solutions to the design challenge.

Your Role and Responsibilities
As a group facilitator, it is your task to

- Facilitate the design thinking process
- Keep your group on task and on time
- Help your group make connections to the trades and professions
- Help your group select one design and build a viable prototype
- Reflect on their process and document it on the group trifold panel
- Discuss how their might integrate Making and Design Thinking into their practices

Please make sure you have a digital timing device with you ... your phone or something ... as you need to time /manage the Design Thinking Process activities.

Please refer to your agenda so you can keep your group on schedule.

Each participant will have been assigned to a group. Their group number should be on the nametag that they received when they registered.

1. Participants are expected to actively and consistently participate in ALL group activities – there are NO watchers or lurkers.

2. When you registered, you received your group's kit. No one is to look at the contents within the bag until you share it with them at Step # 10. This is very important. If you show the kit too early, it may influence and limit project design ideas.

3. Please participate in the Low Tech Social Networking activity throughout the day.

4. After the "official" speaking / opening, the host will invite the participants to find their groups.

5. Once you are in your groups, read the Design Challenge document to your group. Don't spend time discussing the problem at this stage, just tell your group members you will now lead them through the Design Thinking Process that will help them identify a possible solution.

6. Tell your group that once you start the Design Thinking Process, it will take approximately 90 minutes and there will be no breaks. Encourage your group to take a bio break before starting the Design Thinking Process activity – if necessary.

7. Follow the Design Thinking script. You have a Facilitator's Guide in your Kit and you have worksheets for each of your group members. Distribute the worksheets and tell your group not to look ahead and to just follow your lead.

8. Facilitate the Stanford's d.School Design Thinking Process - approximately 90 minutes.

9. Once you have completed the Design Thinking activity and shared the various solutions, you can invite your group to pause and gather their thoughts. If lunch has arrived, they bring it back to your group area. Invite them to glance at the pantry and the tool area as they gather their lunch.

LUNCH NEEDS TO BE EATEN WITHIN THE GROUP – it's a working lunch

10. Show your group the kit items and determine which of the solutions the group is going to develop to the prototype stage.

11. Start building the prototype.

- Tell your group that they need to use some of all the items in the kit, and tell then they can make a pitch to use some of the items from the pantry.
- Encourage them to work with work with the helpers in the shared tool / pantry area. This is an important element of the experience.
- Remind the group of the design criteria from the Design Challenge

12. Explain the purpose of the reflection panel that will document their thinking and design. Refer to the Design Charrette document for process ideas and let your group know they must create a reflection panel for the Design Charrette where the group prototypes will be shared.

Tips for the Reflection Panel include:

- The panel is to document the group's progress through the design thinking process: define, research, ideate, prototype, choose, implement, and learn.
- Each group has total creative license with the production of their panel, but
  - -1 panel should annotate the group's copy / version of the Maker Manifesto
  - -1 panel should elaborate on its design process / prototype
  - -1 panel should share how group imagines it could integrate Design Thinking and Making in their professional practices in their schools

13. Encourage the group to work hard, push for detail.

14. Remind everyone takes an active role in the work – no passive partners.

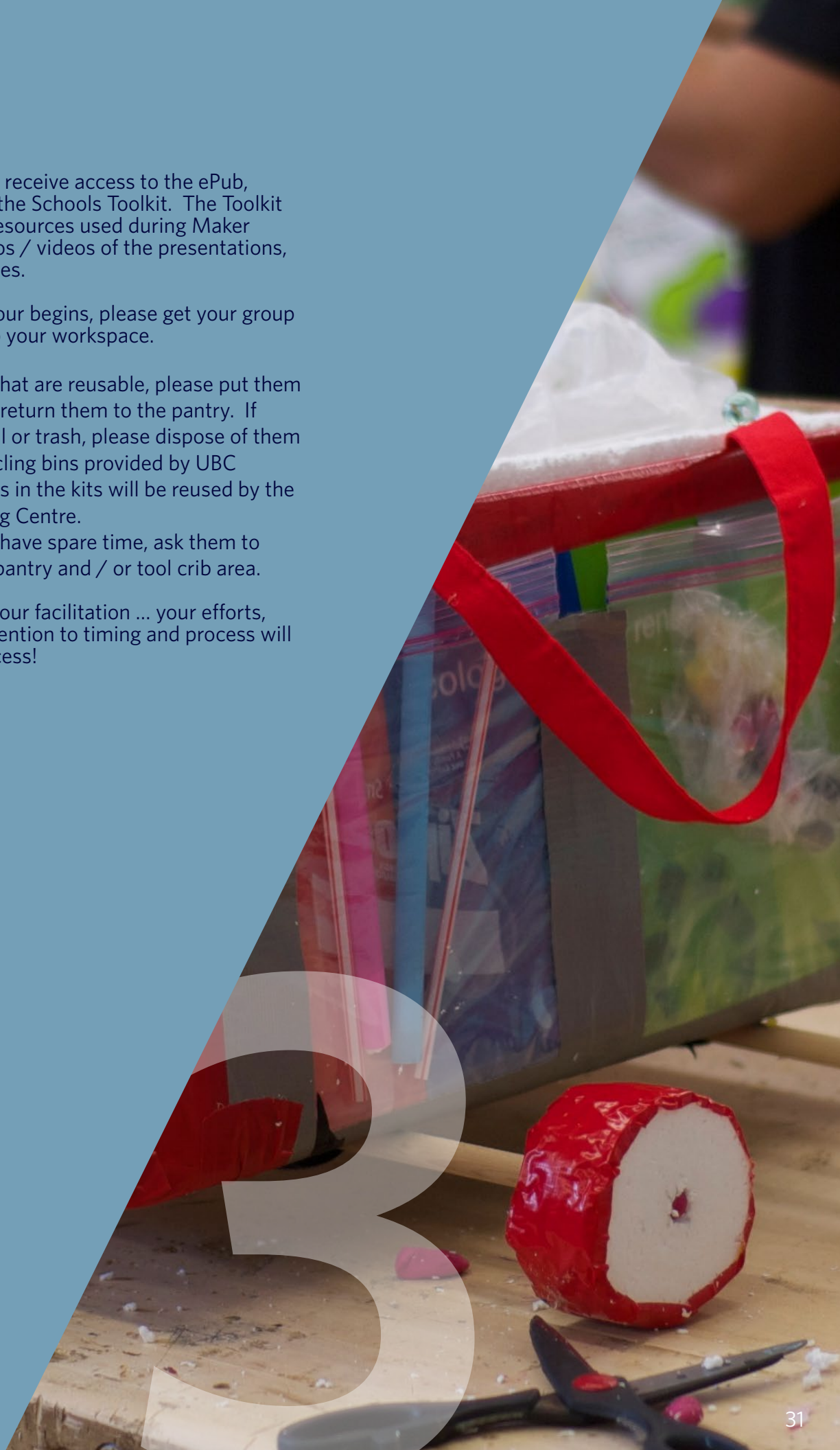
15. Explain the purpose of Gallery Tour is to share the ideas and lessons learned amongst the groups. Details of the Gallery Tour and purpose of the Design Charrette are shared in the document – Design Charrette.

16. Tell participants will receive access to the ePub, Taking Making Into the Schools Toolkit. The Toolkit will include all the resources used during Maker Day as well as photos / videos of the presentations, panels and prototypes.

17. Before the Gallery tour begins, please get your group to help you clean up your workspace.

    - If you have items that are reusable, please put them back in your kit or return them to the pantry. If items are too small or trash, please dispose of them in the proper recycling bins provided by UBC
    - Tools and materials in the kits will be reused by the Innovative Learning Centre.
    - If group members have spare time, ask them to help clean up the pantry and / or tool crib area.

Thanks in advance for your facilitation ... your efforts, energy, enthusiasm, attention to timing and process will make Maker Day a success!



3.2. Facilitator Checklist

Prior to the event, please make sure you have read the Group Facilitator Guide (3.1).

This checklist is a quick guide to help you make sure you have addressed each component of the design / prototype/ reflection process.

1. Before facilitating at Maker Day, please make sure you
   - Have read and understood theDesign Challenge and Stanford's Design Thinking script
   - Know what's in the Maker Toolkit, what is included in the Participant Group Kit and how you might use each of the items
   - Are familiar with the items and tools in the Tool Crib and / or Pantry.

2. During the event:
   Check you have all your group members

   - Monitor your group to make sure they use some of everything in their kit
   - Remind your group of the design criteria from the Design Challenge
   - Remind your group to think of items they would like to include on the reflection panel
   - The panel is to document the group's progress through the design thinking process: define, research, ideate, prototype, choose, implement, and learn
   - Ensure everyone takes an active role in the work – no passive partners
   - Explain the purpose of Gallery Tour

3.3 Introduction to the Design Thinking Facilitator and Participant Guides

As we stated earlier, Design Thinking is a process that enables participants to engage in lateral thinking, divergent thinking and begin to gain empathy for other people's points of view toward a design challenge.

The Hasso Plattner Institute of Design at Stanford University (http://dschool.stanford.edu/dgift/) is a leader in Design Thinking and has provided a numerous wonderful resources and readings to support the integration of Design Thinking into educational contexts (http://www.k12lab.org/).

We have successfully used the Gift Giving worksheet and facilitator guide (http://dschool.stanford.edu/dgift/#gear-up) in our Maker Days. We have used Abode Acrobat Pro to modify the text to align with our Design Challenges.

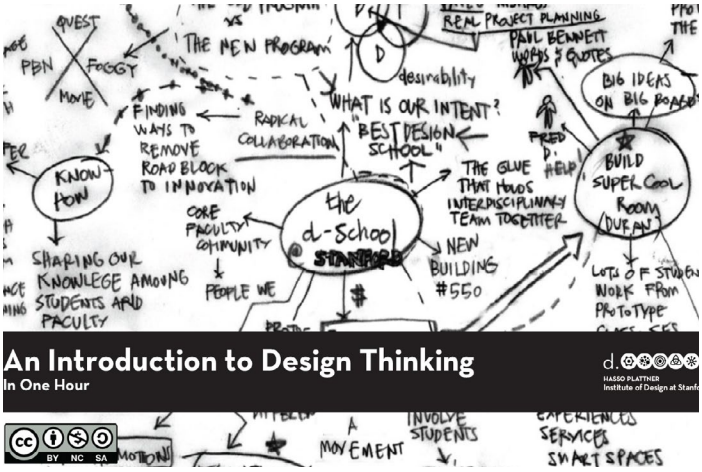
The Facilitator Guide and the Participant Guide included in this Toolkit are already modified to support the Design Challenge – Our Aging Society.

3.4. Facilitator Guide to Design Thinking (Modified Stanford materials)

blogs.ubc.ca/centre/files/2013/11/MakerDayFacilitatorGuide_Revised-copy.pdf

3.5. Participant Guide to Design Thinking (Modified Stanford materials)

blogs.ubc.ca/centre/files/2013/11/TheAgingToolProject.pdf



Stanford's d.School is developed some open access design thinking materials. These materials are available to use and repurposing under Creative Commons licensing.

Website
Site of Stanford's "virtual crash course" in design thinking. On this site are sample projects, facilitator workshop guides, and a video.

dschool.stanford.edu
Design for Educators

K12 Lab Network
k12lab.org

3.6. Design Charrette and Reflection Panels

A Design Charrette or gallery tour is a great way to conclude the Maker Day activities. Despite the fact that participants have responded to the same Design Challenge and have used similar materials and processes, the Design Solutions will be different. The Gallery Tour allows participants to view each group's prototype and Reflection Panel and participate in a Design Charrette.

The term charrette comes from the French word for "cart" or "chariot". In the École des Beaux-Arts in Paris in the 19th century, it was not unusual for student architects to continue working furiously in teams at the end of the allotted term, up until a deadline, when a charrette would be wheeled among the students to pick up their scale models and other work for review while they, each working furiously to apply the finishing touches, were said to be working en charrette, in the cart (Wikipedia, http://en.wikipedia.org/wiki/Charrette).

The charrette process involves students and their teachers engaging in discussion and critique about the works created. The critiques are meant to be collaborative and positive, similar to what many of you do now with formative assessment activities. Daniel Dennett (2014) suggests critique can take the form of critical commentary, suggesting it is best to gain empathy and offer constructive feedback so that your comments can be easily considered. He suggests the following four steps:

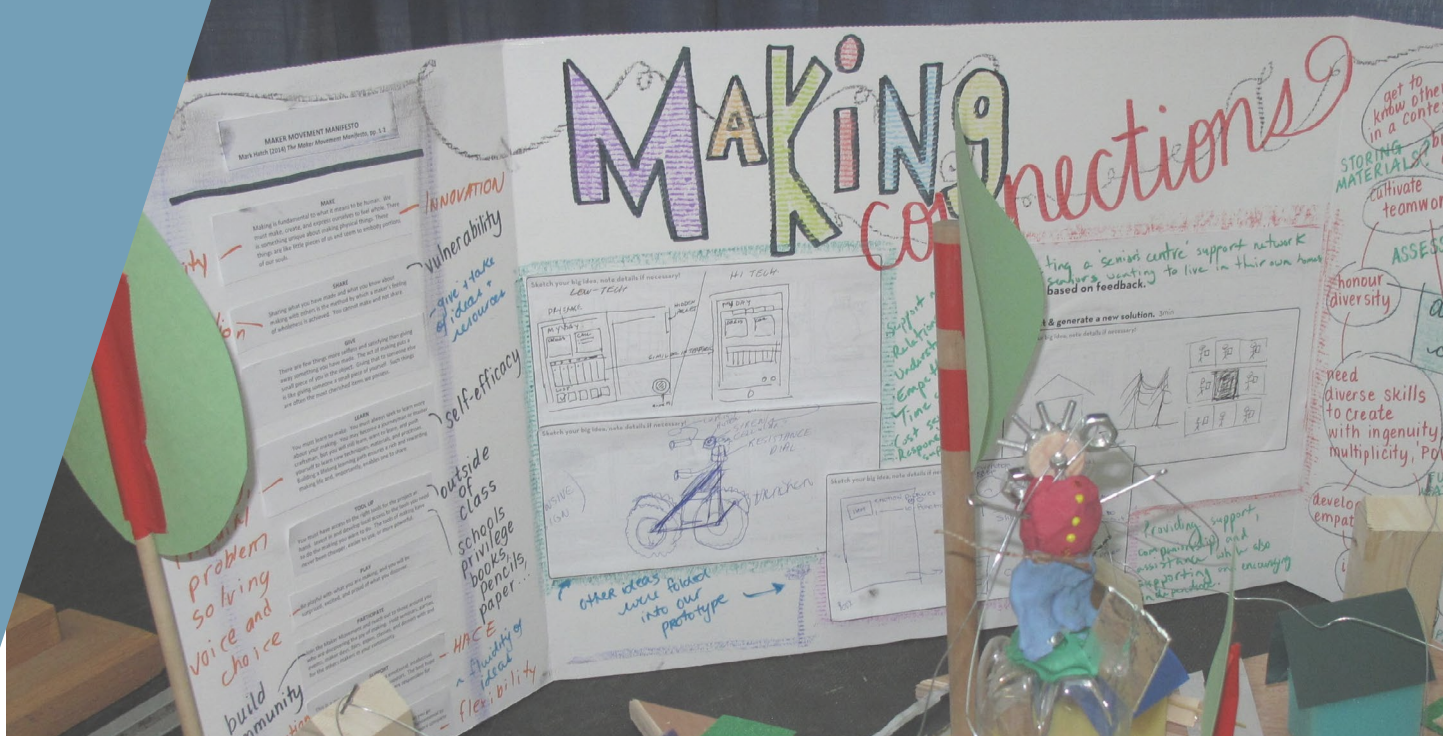
1. You should attempt to re-express your target's position so clearly, vividly, and fairly that your target says, "Thanks, I wish I'd thought of putting it that way."
2. You should list points of agreement (especially if they are not matters of general or widespread agreement).
3. You should mention anything you have learned from your target.
4. Only then are you permitted to say so much as a word of rebuttal or criticism (http://www.brainpickings.org/2014/03/28/daniel-dennett-rapoport-rules-criticism/).

Other great ways to engage in a design charrette are to focus on the following question types (Alber, 2013):

1. What do you think? This question interrupts us from telling too much. There is a place for direct instruction where we give students information yet we need to always strive to balance this with plenty of opportunities for students to make sense of and apply that new information using their schemata and understanding.
2. Why do you think that? After students share what they think, this follow-up question pushes them to provide reasoning for their thinking.
3. How do you know this? When this question is asked, students can make connections to their ideas and thoughts with things they've experienced, read, and have seen.
4. Can you tell me more? This question can inspire students to extend their thinking and share further evidence for their ideas.
5. What questions do you still have? This allows students to offer up questions they have about the information, ideas or the evidence.

Gallery Tour

During the gallery tour – Design charrette, group members circulate to other groups, observing their prototypes, asking good questions, and reviewing their reflection panels. Typically, one group member stays with the group's panel and prototype, and other members trade off viewing and "staying home" at the group's display.



Reflection Panels

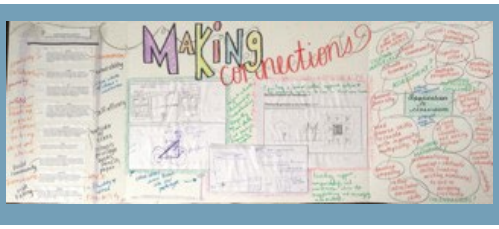
Each group is asked to create a reflection panel to document and foster reflection on their design thinking, tinkering, and making process. We view making the panel as a way of helping to make the group's "thinking visible" (Eisner, 1998). For many of you, documentation aligns with the Reggio Emilia approach (http://ecrp.uiuc.edu/v13n2/wien.html) which views documentation as a type of design process. It suggests documenting as a visual way of capturing thinking and learning activities and inviting discussion about what is collected and how it is portrayed on the panel. This form of curating content supports the reflective practice that is so important for educators during professional development activities.

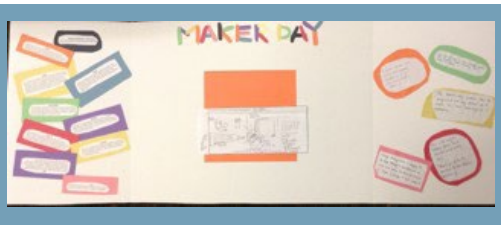
For Maker Day, we believe the panels are essential to support a group's progress through the design thinking process: define, research, ideate, prototype, choose, implement, and learn.

While each group should be encouraged to exercise their creative license in the production of their panel, we suggest that each panel should have a minimum of three components.

Suggested panel structure:

- 1 panel should annotate the group's copy / version of the Maker Manifesto
- 1 panel should elaborate on the group's design process / prototype
- 1 panel should share how the group imagines they could integrate Design Thinking and Making in their professional practices in their schools





To facilitate the panel design, we suggest purchasing the cardboard, trifold display panels from a store such as Staples. Because of the short timeframe available to make the panel, we cut each trifold in half, horizontally, and found that groups had adequate space to document their work.

3.7. Participant Group Kit Contents

Depending on your budget and your access to materials, the contents of the group kits can easily vary. The list below is what we placed in our group kits for the Maker Days during 2013-2014. The quantities we suggest support a group of 4 participants / group. Please note, some items must be purchased in bulk so the itemized prices reflect the bulk costs for 15 kits. Bulk item prices are shown at the end of the list.

Note: If your budget is small you do not need to purchase the PVC pipe. However, the pipe is fun and encourages the use of different tools.

Item	Quantity	Note	Suggested Source	Approx. Cost
Small Washers	10	Match to size of the cotter pins	Auto supply/machine store	Bulk cost*
3" Ardox nail	2	Used as a punch/awl for holes	Building supply store	Bulk cost*
Small garbage bag	4	Used to replace fabric/create water proofing	Building supply store – size for kitchen garbage	Bulk cost*
Glue gun	1	Replacement glue for guns	Craft Store Tool store	$6.00
Glue sticks	1 package		Craft Store Tool store	$1.25
Modeling clay	Half package	Crayola makes a three colour package	Craft Store	$1.50
Jute twine	3 metre		Dollar store	Bulk cost*
Marbles	5		Dollar store	Bulk cost*
Duct tape	Small roll	48' x 5 mm	Dollar store	$1.25
Jumbo straws	10		Grocery store	Bulk cost*
Bamboo skews	10		Grocery store	Bulk cost*
Coloured cocktail straws	10		Grocery store	Bulk cost*
Tooth picks	25		Grocery store	Bulk cost*
Tongue depressors	10	Purchasing in medical supply store - much cheaper than craft store	Medical Supply store	Bulk cost*
Sharpie pen	1		Office supply store	$1.20
Cardboard trifold display	½ sheet cut in half horizontally	Used for project reflection/demonstration of learning	Office supply store	Bulk cost*
Graph paper	5 sheets		Office supply store	Bulk cost*
Brads	8	Used to make articulated joints	Office supply store	Bulk cost*
12" Ruler	1	Metal is best for both measuring and cutting straight edge	Princess Auto	$2.99
Utility knife	1	Put replacement blades in the Pantry	Princess Auto	$2.99
Tie wire	15 metres	This wire is easy to bend and cut with nail nose pliers	Princess Auto	Bulk cost*
Zip ties	10		Princess Auto	Bulk cost*

Item	Quantity	Note	Suggested Source	Approx. Cost
Needle nose pliers	1		Dollar store	$1.99
Cotter pins	4	Used to make joints/moveable parts	Princess Auto	Bulk cost*
Small springs	2	Used to make push-able buttons	Princess Auto	Bulk cost*
Cardboard sheet	32" x 48" sheet	Can be used to protect table tops and be used for projects	Recycle store or Costco	Free
Cardboard box	Wine box with dividers	Good source of multiple weight cardboard	Liquor store	Free
Bag to hold contents			Staples	$.99
			Non-bulk items cost/kit	$20.16
			1/15 of bulk items	$4.61
			Approximate total per kit	$24.77

Bulk cost* Items	Source	Price – before tax
Box of 100 washers	Industrial supply store	$2.99
Ardox nails – 3" box of 75 nails	Building supply store	$4.89
Small kitchen size garbage bags 60/box	Building supply store	$5.99
Jute twine 300 feet	Princess Auto	$1.99
Marbles – bag of 102	Dollar store	$1.25
Jumbo straws - 200	Dollar store or grocery store	$2.99
Bamboo skewers – 100	Dollar store or grocery store	$1.99
Coloured cocktail straws – 200	Dollar store or grocery store	$1.99
Toothpicks – 1,000	Dollar store or grocery store	$1.25
Tongue depressors	Medical supply store	$10.99
Cardboard trifold – cut in half	Office supply store – Staples	$13.89
Graph paper – 100 sheets	Office supply store – Staples	$5.39
Tie wire – 18 ga x 30 metres	Princess Auto	$2.29
Zip ties – 100 mixed	Dollar store	$1.25
Cotter pins – box of 144 misc. pieces	Princess Auto	$2.99
Small springs – bag of 101 mixed sizes	Princess Auto	$3.99
Brad – box of 100	Office supply store – Staples	$2.96
	Sub total	$69.08

3.8. Shared Pantry

Item	Quantity	Note	Suggested Source	Approx. Cost.
Cord	1 roll	40 feet	Dollar store	$1.99
Small magnets	Mixture of sizes	Consider sheets of magnets that can be cut	Dollar store	$1.25
Washers	1 box	Small sizes to match cotter pins	Machine shop	$2.99
Cotter pins	1 box	Small box of mixed sized pins-Package of 144 misc. pieces	Princess Auto	$2.99
Nuts and bolts	1 box	Small box of mixed sized sizes-Box of 172 misc. size pieces	Princess Auto	$9.99
Velcro	1 box	Velcro can be cut into appropriate length- ¾ x 66 feet	Princess Auto	$9.99
Styrofoam	Small pile	Use recycled Styrofoam from packing – used in place of wood	Recycling centre	Free
Cardboard	Small pile	Sheets of various thickness – used in place of wood	Recycling centre or Costco	Free

3.9. Shared Tool Crib

The following is a list of the basic items provided in the Tool Crib. The quantities suggested in the lists below supported 15 groups with 4 participants / group. The prices are estimates only, based on pricing at local stores on December 2013. If you need to reduce the budget, you could prototype using only cardboard and recycled materials, omitting the drills, saws, and PVC pipe from the list. As we stated earlier in the document about Design a Challenge, there are two types of Maker Day experiences, one that focus on simple prototyping and one that introduces fabrication.

Item	Quantity	Note	Suggested Source	Approx. Cost.
First Aid Kit	1	Basic Kit	Access to school First Aid kit	N/C
V Block	5 large	Used to hold 3 – 4" pipe for cutting	Ask a shop teacher to make them	N/C
V Block	5 small	Used to hold up to 1" pipe for cutting	Ask a shop teacher to make them	N/C
Dremel or rotary tool	1	Dremel is a common type, but more expensive. Generic rotary tool at Summit Tools for approx. $35	Summit Tools/Princess Auto Parts	$35.00
Power Drill	2	Cordless electric drill Kit – Approx. $100 ea.	Building supply store	$200.00
Drill bits	1 package	Small size set to create holes for wire or bolts		$15.00
Spade bits	3	Sizes to match outside dimension of PVC pipe		$10.00
Doweling	15 lengths / various thickness	Individual lengths could be pre cut; much cheaper than dowel lengths from hobby stores 1/2 " x 72" = $5.19 ¾ " x 72 " = $5.99 ¼ " x 48" = $1.40		$61.60
Hack saws	3	Easier to cut with than wood saws		$29.97
Hack saw blades	3	Fine blades to reduce chipping		$11.97

Item	Quantity	Note	Suggested Source	Approx. Cost.
Ratchet clamps	5	Used to make cutting safer; use with v block to hold round material $3.00 ea.	Building supply store	$15.00
PVC (1/2") – 90 degree elbows	15	Used for structural supports / framing	Building supply store	$8.85
PVC (3/4") – 90 degree elbows	15			$11.85
PVC (1") – 90 degree Elbows	15			$16.35
PVC (1/2") – 45 degree elbows	15			$10.35
PVC (3/4") 45 degree elbows	15			$17.85
PVC (1") 45 degree elbow	15			$23.85
PVC (1/2") Tee	15			$11.85
PVC (3/4") Tee	15			$11.85
PVC (1") Tee	15			$22.35
PVC (1/2") Cross	10			$17.90
PVC (3/4") Cross	10			$17.90
PVC (1") Cross	10			$27.90
PVC (1/2") Coupling	15			$7.35
PVC (3/4") Coupling	15			$8.85
PVC (1") – Coupling	15			$19.35
PVC (1/2") – Cap	10			$4.90
PVC (3/4") – Cap	10			$6.90
PVC (1") – Cap	10			$9.90
PVC (1/2" – ¾") Bushing	5			$2.95
PVC (1/2" – 1") Bushing	5			$8.90
PVC (3/4" – 1") Bushing	5			$5.95
PVC (1/2") pipe	10' x 10 pieces			$21.90
PVC (3/4") pipe	10' x 10 pieces			$26.90
PVC (1") pipe	10' x 10 pieces			$36.90
Vinyl Electrical Tape	3 rolls	Comes in red, yellow and green $1.49 / roll @ 66 feet / roll	Dollar store	$4.47

4. Supporting Materials

4.1. Sample Agenda

You can modify this agenda to fit your event. We have provided some comments to help you consider your own Maker Day. As you plan, please recognize the Design Thinking activity as described in the Stanford materials included in this Toolkit, is truly a 60 – 90 minute activity that is important to the project success. There are no pauses in that 60 – 90 minutes, so planning coffee breaks, speakers, etc. is important to consider.

	Agenda Item	Comments
8:30	**Registration**	Much of the work regarding participant groupings needs to be done in advance. We have found it is best if the groups are pre-determined to ensure the biggest diversity in groupings ... primary teachers with high school teachers, etc.
8:30-9:30	**Ice breaker – Low fi social networking**	Participants usually come at differing times and often think they know one another. The icebreaker suggested in our Toolkit (Lo-Tech Social Networking) helps participants to find connections they didn't know existed.
9:00	**Welcome By Hosts**	Good way to introduce the day, settle nerves and introduce any housing keeping concerns
9:15	**Introduction to Design Thinking**	It's important that participants understand the link between Design Thinking, Curriculum (Design Challenge), and the Design Solution Activities ... If you have a professional designer in your community who understands Design Thinking as a human centred / empathic design process, you might want to invite her/him to come for a Ted Talk style, 14 min introduction. Otherwise, please modify our documents from the first Section of this Toolkit to guide your presentation.
9:45	**Formation of Groups and Morning Coffee**	This time allows facilitators to find their groups and make sure they have everything they need before starting the Design Thinking phase. It also allows for a quick break prior to starting the 60 – 90 minute continuous Design Thinking activity.
10:30	**Start of project work**	Facilitators will start the design process with their groups. Each group will move through the activities at slightly different times, which is fine. You need to monitor the groups for questions / concerns and to encourage attention to detail.
12:00	**Working lunch**	Lunch should be eaten within groups so as not to disrupt the thinking, workflow, and conversation.
1:00	**Project work continues**	Again, this is the time for you to circulate and make sure folks are on schedule and getting tasks completed.
3:00	**Preparation of Group Presentation (organization of design notes, preparation for sharing**	Remind group facilitators to review the Design Challenge and the Design Charrette – Reflection Panel documents in order to help their groups prepare for the Design Charrette / Gallery tour.
3:30	**Closing comments and Introduction to Gallery Tour Process**	Please refer to the Design Charrette document. The gallery tour is a powerful way to share the day's efforts and to help participants see the variety of possibilities and talk with one another.
3:45	**Gallery Tour and Closing Reception**	Because the work of the day is so intensive and engaging, it is nice to wind down the event with some closing remarks, reminding participants of the importance of Taking the entire process of Making into their schools. It is important to reinforce the curricular ties and links to innovation and creativity. Offering coffee and snacks or wine is cheese is a great conclusion – depending on budget – as it fosters more community and conversation.
4:30	**DONE!**	Whew!

4.2. Design Challenges

Design thinking is a process by which individuals can address a challenge and through interviews and guided conservations gain empathy and alternative points of view regarding a design solution. In the Maker Day immersive professional development activity, participants, working in small group, are introduced to Design Thinking after they have been given a Design Challenge. Tips for writing a Design Challenge are shared in Section 1.

We have included four sample design challenges in this Toolkit with a description of the audience for each. Each challenge was written with a specific audience in mind as that prior knowledge and skills could be drawn on and new skills and ideas fostered through the design process and research.

Our Aging Society – Used with educators and Grade 8 – 12 students
Inclusive Playground Environments – Used with pre-service teachers and Grade 8 – 10 students
Food Security for Colder Climates - Grade 8 – 12 students
Helping New Parents TO Get Out of Their Homes - Used with educators and Grade 8 – 12 students

Design Challenge - Our Aging Society

Overview

In 2011, Human Resources and Skills Development Canada reported that 15.3% of British Columbia's population was classified as aged (age 65 and over). It also predicted that this population would increase to 23.8% by 2036. As a result, there is a real concern about providing support structures for these citizens.

Design Rationale

The population of BC prides itself on being mobile, whether it is by driving, riding public transportation, biking or walking. Mobility is important for many reasons, including shopping, accessing health care, and participating in social gatherings – just to name a few. Research suggests aging in place is beneficial on many levels, but experience tells us that as people age it becomes increasingly difficult to satisfy their need to enjoy the activities that make life rewarding as well as participate in everyday tasks.

Problem Scenario

Your team has been selected to develop the prototype of a tool that will help this identified population with their need to get out of their homes and participate in public outings.
This tool must be hand-held and be able to satisfy one of the following identified concerns:

- Getting dressed
- Transportation / travel
- Personal Security
- Carrying purchases
- Paying for purchases
- Shopping for food, clothing, other personal items
- Maintaining their homes – basic repairs, gardening, etc.

Success will be determined by

- Uniqueness and usability of the tool
- Alignment of the prototype with the design
- Ability of your tool to help the elderly get out and about
- Alignment to design motto: "Make it smaller, stronger, do more, be easier to use, be cheaper, be clean, be greener"

Parameters

- You must use some of all the items in participant group kit in some way
- You may make a pitch to use the materials found in the Pantry.
- You should use the tools located in the Shared Tool Area

Design Challenge – Inclusive Playgrounds

Overview

"Children with disabilities are often excluded from, or restrained in, play activities because of the physical barriers of play structures and the surrounding environment" (Ripat & Becker, 2012). According to the United Nations, 10% of the world's population has a disability. Canada and the United States report the rate of disability closer to 20%. It was reported that only 17 parks and playgrounds in British Columbia were identified as being fully accessible (Accessible Playgrounds, 2014).

Design Rationale

Canada is often described as being a civil society. We pride ourselves in our inclusion of others and our respect of diversity. However, 1 in 7 Canadians are excluded from enjoying our playgrounds and municipal parks. We need to revisit the notion of accessibility and ensure our play areas are inclusive for all users, including the disabled and the elderly.

Problem Scenario

Your team has been selected to develop a prototype of a structural element or component of a playground that is inclusive, safe, fun, and engaging. It needs to foster fitness, flexibility, and a joy of play. Your team needs to consider issues of mobility, access, sensory challenges, etc.

Your playground structure must be a small-scaled prototype of a structural element or component that could be found in a playground. It must satisfy two of the following identified concerns:

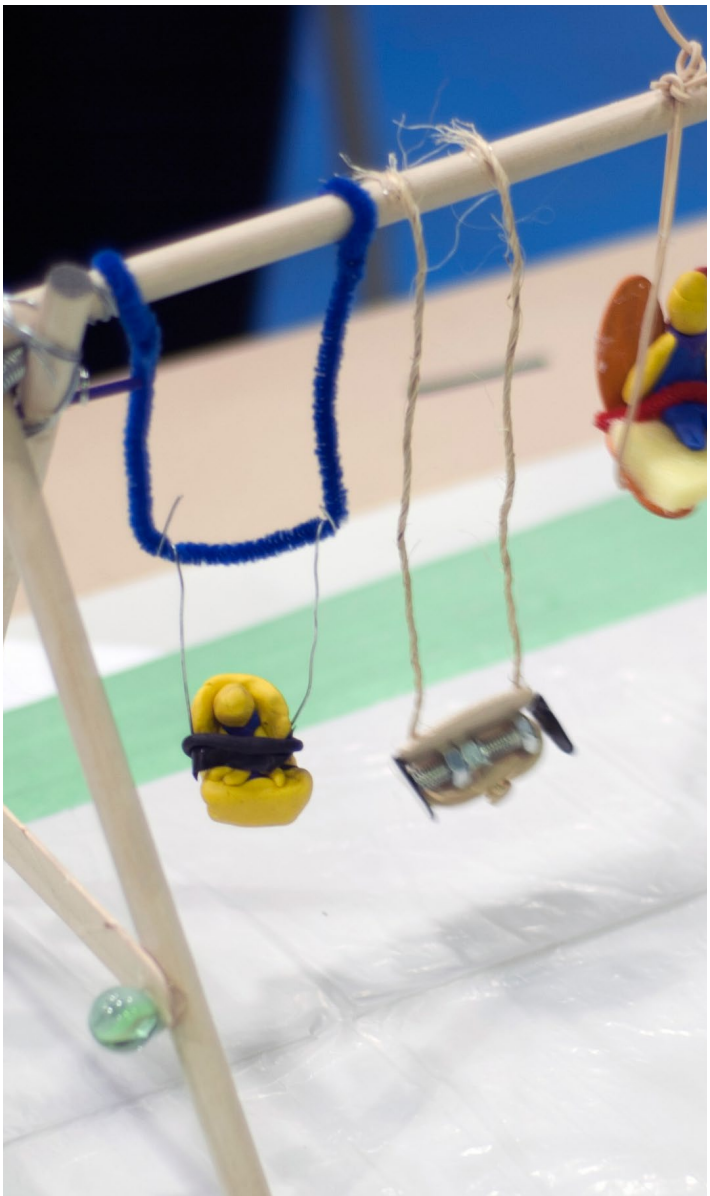
- Be accessible for someone with mobility issues
- Be accessible for users of variable heights / sizes
- Be accessible for someone with sensory issues
- Be accessible for someone with cognitive challenges
- Enjoyable for users of all ages

Success will be determined by

- Uniqueness
- Alignment of the prototype with the design sketch
- Ability of your item to help the user enjoy play
- Ergonomic design
- Colorfulness to match environment and attract users
- Intriguing enough to hold users' attention
- Degree to which it Is intuitive to all users
- Functionality
- Ease of long term maintenance
- Alignment to design motto: "Make it smaller, stronger, do more, be easier to use, be cheaper, be clean, be greener"

Parameters

- You must use some of all the items in participant group kit in some way
- You must consider how to make your prototype colorful, intriguing and ergonomic.
- You must complete a display panel, which include your design thinking sketch, your prototype, your design notes, and your reflections on the activity



Design Challenge – Food Security for Colder Climates

Overview

As stated by Heath Canada (http://www.hc-sc.gc.ca/fn-an/surveill/nutrition/commun/insecurit/index-eng.php)

Food security exists 'when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.' Household food insecurity is 'the inability to acquire or consume an adequate diet quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so.' It is often associated with the household's financial ability to access adequate food.

Since 2004, the Household Food Security Survey Module (HFSSM), a comprehensive and validated measurement tool of household food insecurity, has been included in Canadian national surveys, including cycles of the Canadian Community Health Survey (CCHS) and the 2010 cycle of the Survey of Household Spending (SHS).

Design Rationale

The population of rural BC prides itself on being self-sufficient and having the potential to "live off the grid." Providing healthy food, especially in the longer and darker days of winter, poses a problem to rural residents in terms of access to fresh food and the costs of healthy, organic produce during the winter season.

Problem Scenario

Your team has been selected to develop the prototype of a living wall that students can build and maintain as part of their education program.

This prototype must be stable, safe, and educative. Consideration must be given to the following points:

- Ease of maintenance
- Suitability to grow edible plants
- Flexible heights to accommodate disabled as well as able bodied gardeners of multiple ages / heights

Attention should be given to

- Light
- Fertilizer
- Soil
- Water
- Maintenance schedule during vacation times
- Pest control
- Mold

Success will be determined by

- Uniqueness and usability of the prototype
- Alignment of the prototype with the design
- Alignment of the prototype to curriculum expressed in the BC Plan
- Ability to interest novice and experienced gardeners
- Alignment to design motto: "Make it smaller, stronger, do more, be easier to use, be cheaper, be clean, be greener"

Parameters

- You must use some of all the items in participant group kit in some way
- You may make a pitch to use the materials found in the Pantry.
- You should use the tools located in the Shared Tool Area

Design Challenge – Helping New Parents to Get Out of Their Homes

Overview

In 2005 the total fertility rate of Canadian women was slightly above 1.5 children per woman. Women between 30 and 34 years of age had the majority of children, followed very closely by women aged 25 to 29.

For the first time on record, birth rates are higher for women in their late 30s than in their early 20s (http://www.pewresearch.org/fact-tank/2013/07/10/in-canada-most-babies-now-born-to-women-30-and-older/). Further, according to a new report by Statistics Canada, the switch happened in 2010 and widened in 2011, when there were 52.3 babies born per 1,000 women ages 35 to 39 and 45.7 babies per 1,000 women ages 20 to 24. Statistics Canada also reports that birth rates for women in their early 40s now are nearly as high as for teens.

In the U.S. and many other nations, it is no longer unusual for women to have a first child at age 35 or even 40 (http://www.statcan.gc.ca/pub/91-003-x/2007001/4129903-eng.htm). This shift in the age of parents having their first children might impact the challenges new families face as they re-establish daily routines with new babies.

Design Rationale

Parents, grandparents, other family members and friends of all ages struggle to maintain "daily" activities after the birth of a new child. Activities like shopping, visiting friends, going to the park, etc. become more complicated as everyone wrestles to leave their homes with an infant or small child / children. The organization of all the "things" required to support the new baby or small child / children, from diapers to food to toys, makes leaving the house for an hour almost as challenging as preparing for a week-long camping trip or holiday.

These activities can be even more challenging when the mothers are older and more accustomed to living independently, without children or other dependents.

Problem Scenario

Your team has been selected to develop the prototype of a tool to help new parents organize their belongings, the new infant / small child, and any other family members to easily and efficiently leave their homes and participate fully in everyday life with their infant / small child.

This prototype must be stable, safe, and helpful. Consideration must be given to the following points:

- Ease of maintenance
- Sanitary
- Usefulness

Attention should be given to

- Safety
- Function
- Efficiency

Success will be determined by

- Uniqueness and usability of the prototype
- Alignment of the prototype with the design
- Alignment of the prototype to meet the needs of all ages of new mothers
- Ability to interest new parents and those parents with small child / children
- Alignment to the design motto: "Make it smaller, stronger, do more, be easier to use, be cheaper, be clean, be greener"

Parameters

- You must use some of all the items in participant group kit in some way
- You may make a pitch to use the materials found in the Pantry
- You should use the tools located in Tool Crib

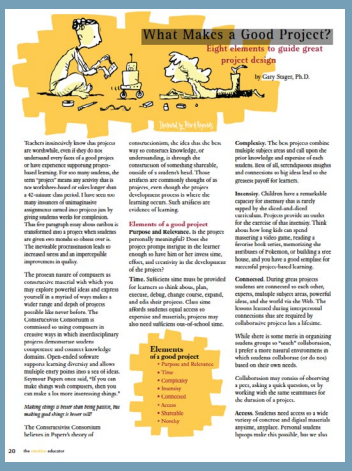
4.3. Suggested Ice Breaker

Because a Maker Day tends to bring together a variety of people with a range of backgrounds and experiences, an icebreaker is often an essential and fun way to meet the other participants and see where there are potential connections and previous relationships.

We suggest using the Low Tech Social Network icebreaker to bring people together during the registration process and throughout the day. Please check out this site for an idea (http://www.gamestorming.com/games-for-opening/low-tech-social-network/). Participants use Post It note to write their names and draw a little icon of themselves. They post their notes onto a large rectangle of paper and draw lines connecting their note with notes of participants with whom they have a connection.

4.4 What Makes a Good Project

http://blogs.ubc.ca/centre/files/2013/11/What-Makes-a-Good-Project-copy.pdf



What Makes a Good Project?

Eight elements to guide great project design

by Gary Stager, Ph.D.

Elements of a good project

Purpose and Relevance

Time

Complexity

Connected

Access

Gary Stager

4.5. Maker Movement Manifesto

MAKE
Making is fundamental to what it means to be human. We must make, create, and express ourselves to feel whole. There is something unique about making physical things. These things are like little pieces of us and seem to embody portions of our souls.

SHARE
Sharing what you have made and what you know about making with others is the method by which a maker's feeling of wholeness is achieved. You cannot make and not share.

GIVE
There are few things more selfless and satisfying than giving away something you have made. The act of making puts a small piece of you in the object. Giving that to someone else is like giving someone a small piece of yourself. Such things are often the most cherished items we possess.

LEARN
You must learn to make. You must always seek to learn more about your making. You may become a journeyman or master craftsman, but you will still learn, want to learn, and push yourself to learn new techniques, materials, and processes. Building a lifelong learning path ensures a rich and rewarding making life and, importantly, enables one to share.

TOOL UP
You must have access to the right tools for the project at hand. Invest in and develop local access to the tools you need to do the making you want to do. The tools of making have never been cheaper, easier to use, or more powerful.

PLAY
Be playful with what you are making, and you will be surprised, excited, and proud of what you discover.

PARTICIPATE
Join the Maker Movement and reach out to those around you who are discovering the joy of making. Hold seminars, parties, events, maker days, fairs, expos, classes, and dinners with and for the others makers in your community.

SUPPORT
This is a movement, and it requires emotional, intellectual, financial, political, and institutional support. The best hope for improving the world is us, and we are responsible for making a better future.

CHANGE
Embrace the change that will naturally occur as you go through your maker journey. Since making is fundamental to what it means to be human, you will become a more complete version of you as you make.

4.6 Where did all the skilled workers go? Globe and Mail

Gary Mason

Once upon a time, shop class was mandatory in most high schools. There was a belief that even if a student wasn't intent on becoming a mechanic or carpenter, having some basic life skills in these areas wasn't a bad thing.

Over time, however, shop began to look dated and irrelevant and was given less status. Somewhere along the way, it was drilled into students that the only way to get ahead in life was to go to university and earn a degree.

Occupations such as plumbers and pipefitters were looked down upon. They were the bedrock of blue-collar careers and commanded little respect. The people who made the big bucks wore white shirts and ties and owed their well-paying jobs to the swishy institutions of higher learning they attended. Kids and parents were told that in the future, most jobs would require a BA at minimum.

Today, Canada is dealing with the fallout from its ivory tower preoccupation. (We produce more university and college graduates, per capita, than most countries in the world.) We have an acute shortage of workers who actually build and fix things. It represents an alarming structural deficit that could cost the economy billions.

Let me say that this is not a diatribe against universities and colleges. While there are many university grads who've had trouble finding jobs in the past few years, statistics indicate that degrees generally hold their value. People who have them earn more than those who don't.

But in our single-minded obsession with academia, we forgot that the millions of people who literally built our economy would one day be retiring— and that there would be new industries sprouting up that would need skilled workers, too. Now, it's not an exaggeration to say we have a crisis on our hands.

Some of the numbers are sobering. According to the Canadian Manufacturers and Exporters, by 2016, Canada will have 1.3 million skilled labour jobs sitting vacant because there is no one to do them. In the construction industry alone, there will be 219,000 workers retiring between now and 2020 and not nearly enough people to take their positions. In the agriculture sector, 90,000 additional skilled workers were needed this year, according to the Canadian Chamber of Commerce.

Things are so bad that a coalition of construction companies is heading to Ireland —again— in the hopes of hiring 600 trained workers. Given the miserable state of the Irish economy, it shouldn't be a problem. In Ireland, construction-related jobs are still highly valued and not considered demeaning work.

While enrolment in trades schools in Canada has been increasing, the rise isn't fast enough to tackle the dangerous skills chasm that needs to be bridged. Also, completion rates sit at just 50 per cent. Many believe that education is at the root of our problem: Students need to be exposed to the benefits, financial and otherwise, of the trades. And it has to start at a much younger age.

B.C. Education Minister Peter Fassbender believes we need to be talking to students as early as Grade 5 about the value of being trained in a craft and about how technology has changed the nature of many of these jobs. (They aren't as dirty as they once were.) Eventually, students also need to know that demand has pushed wages into uncharted territory.

He might be on to something. Skilled workers remain an essential component of our economic well being. Without them, we're in trouble. In fact, we already are.

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