



THE LEARNING ENVIRONMENT TOOLKIT

THE DIGITAL MAKERSPACE

| **An Educational Resource for Supporting the Creative Learner in Project-Based Media Learning Environments.**

Version 1

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ABOUT

... THE LEARNING ENVIRONMENT TOOLKIT

The Learning Environment Toolkit was developed as an educational resource to support the creation of a modern project-based digital makerspace. Digital makerspaces are creative in design and are environments for the learner to initiate, build, and support self-directed project design. The digital makerspace environment is unique and fluid. It is ever-changing and growing to reflect the demands of the 21st Century learner.



Think CREATIVELY

Build to support the creative ideation of the learner. Think Creatively! Use your space wisely.



Design for SIMPLICITY

Design for simplicity! Ensure that the learning environment remains fluid and capable of growth and adjustment.



Support PROJECTS

Support an assortment of learner initiated project possibilities. Work to promote self-directed learning.



Maximize TIME

Utilize the time you have and maximize learner output. Time is precious and every second counts.

| INSPIRATION



BUILT WITH CREATIVITY
AND HAPPINESS
IN MIND

THE LEARNING ENVIRONMENT TOOLKIT

This Toolkit was designed as a support for educators interested in developing digital makerspaces for project-based learning environments.



The inspiration for this Toolkit was born out of an applied research project designed to examine the success of a project-based media learning environment. The primary goal of the project was to determine if and how the learning environment successfully promoted the creative ideation of the learner. Learner participation in the study took place and the generated feedback was

taken into consideration during the design of this resource. Additional consideration was made to apply suggestions for improvement presented by the learners and a select few educators who also participated in the study.

Built to inspire and promote creativity in the minds of the 21st Century learner.



THE DIGITAL MAKERSPACE

Digital makerspaces are designed with creativity in mind. They are self-directed learning spaces where the 21st Century learner can create, invent and develop their ideas. The digital makerspace is an environment that needs to remain fluid in its design. Over time, the makerspace will grow to reflect the design capabilities of the learner.

COMPONENTS

There is no set design for the makerspace. Digital makerspaces are often unique with common elements available in traditional design and fabrication courses. The makerspaces often include traditional manual and power tools, workstations that offer computers and tablets, elements for supporting robotics, craft supplies, 3D printing, and support for electronics fabrication.

COLLABORATIVE NATURE

The makerspace will maximize all available space for the learner. Many learners may be working simultaneously on project conception and design. Creating an environment that is collaborative will allow learners to move in and out of workstations and design areas with ease. The fluid nature of the environment will promote collaboration between learners.

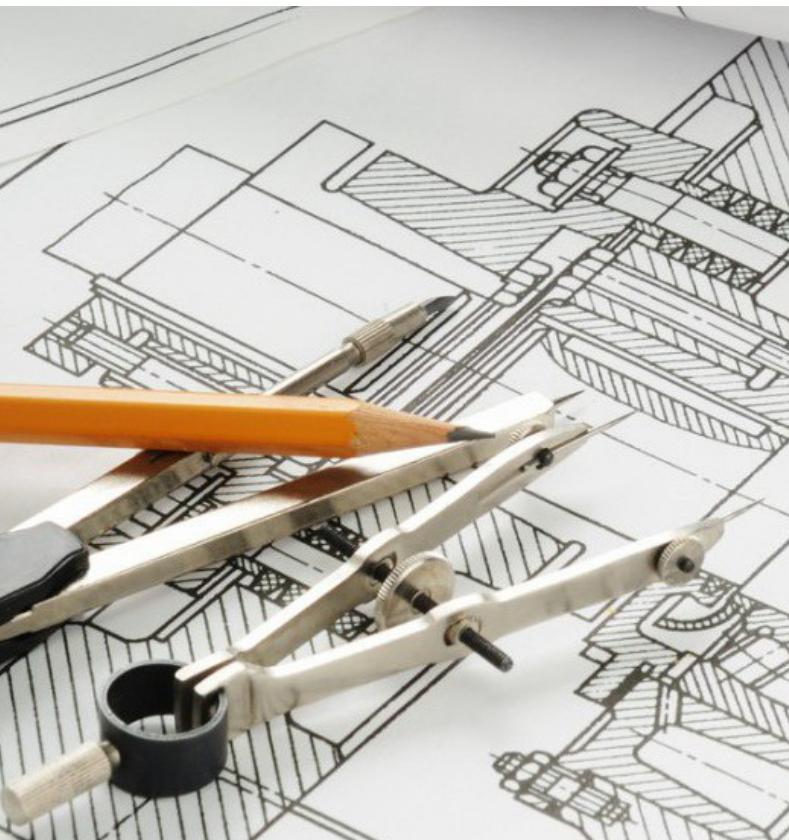
PROMOTE CREATIVITY

The makerspace should inspire and promote learner creativity. The ability for creative design is a necessity in project-based learning. Learners should have as many tools for creativity at their disposal as possible. An effective digital makerspace will promote creative ideation and support the learner.

DESIGNING A DIGITAL MAKERSPACE

TLE **TOOLKIT**

Design Elements



- + **FLUID DESIGN**
- + **SPACE & TIME**
- + **ACCESSIBILITY**
- + **COLLABORATION**
- + **LEARNER SUPPORT**
- + **TOOLS & TECH**
- + **SUSTAINABILITY**

FLUID DESIGN

A digital makerspace can take many forms. There is no set design pattern for the makerspace short of its ability to support the creativity of the 21st Century learner. When designing a makerspace it is important to keep in mind that the environment requires an ability to remain fluid. After all, the space is a reflection of the creative ideation of the learner. Students working within the space will need the ability to move around and customize their work areas to suit the needs of their projects.

WORK STATIONS THAT ARE MOVABLE

Consider designing workstations that can be moved around the learning environment. When possible build workstations and tool carts that are on wheels and can roll.

CENTRALIZE TOOLS OUTSIDE OF THE MAIN CREATIVE AREA

Centralizing tools in one area whenever possible will increase accessibility. Learners will have the ability to share tools without the need to disrupt a specific workstation. Minimizing the amount of tools at a workstation will also free up the space for project design and fabrication.

FLEXIBLE TECHNOLOGIES THAT ARE PORTABLE

The portability of technology is a huge advantage to the learner. Not all technologies can be made portable but, when possible consider the a flexible option. The ability to remove the technology out of the makerspace and into the World is worth pursuing as an solution.

SPACE & TIME

The size of the digital makerspace may be limited by many factors. First and foremost is limitation of the amount of space that can be dedicated to the makerspace. Schools face challenges when it comes to accessible and useable space for learning environments. You may need to become fairly crafting when it comes to designing your makerspace with limitations in space that are out of your control.

SHARING SPACE

Whenever possible consider the idea of sharing the available space with a colleague. Similar programs may have demands that are like minded and space can be consolidated in to a larger area that will in turn increase the size of the both programs.

MULTIPURPOSE WORKSTATIONS

Limiting learner workstations to one concept or design can constrain the potential of the makerspace. Whenever possible consider making the workstations multipurpose. Learners may use the workstation as a point of research, design, and fabrication. Allow for maximum flexibility.

ROLLOVERS

Consider implementing a curriculum or course method of delivery that will support a rollover concept. The makerspace will have demands that need to be addressed at varying points in the academic year. Consider creating the ability to rollover the environment to support deferent concepts at different points in the academic year. A film studio can support the use of a greenscreen and then be rolled over to support set design. Essentially, it becomes a multi-purpose zone of creativity in film development and production. Rollovers can also work to save time in the learning environment.



7 TIPS FOR PLANNING A MAKERSPACE WEB RESOURCE

[HTTPS://THEJOURNAL.COM/ARTICLES/2017/02/23/7-TIPS-FOR-PLANNING-A-MAKERSPACE.ASPX](https://thejournal.com/articles/2017/02/23/7-tips-for-planning-a-makerspace.aspx)



ACCESSIBILITY

When designing the digital makerspace you will need to account for the ability of a wide range of learners. Some students may have limited abilities and may not be able at access a work area or space with ease. You will need to account for this in your conceptual design. Each learner has different needs and you will not be able to plan for them all at first. Be mindful of the limitations of the learning environment during your design. A properly designed makerspace will be flexible and fluid and adjustments should be allowed to be made on an ongoing basis.

MOBILITY

Be mindful of mobility challenges that may present themselves. Workstations can be designed to accommodate wheelchairs and other devices. Consider using work surfaces such as table that can adjust in height. They may be purchased or fabricated to suit the needs of the environment.



TECHNOLOGY SUPPORT

Make available an assortment of technologies that will support both creativity and learning. The learner may be limited in their ability to use traditional technology. Incorporate tablets and software that can support potential mobility issues.

PEER SUPPORT

Consider designing an environment that will allow for an element of peer support. Peer interaction is an effective method of supporting the needs of a learner with accessibility issues. Be sure to brainstorm ways that you can encourage peer collaboration and relationship building within the makerspace. Peer relationships often extend out into other areas within the school. Your program and the school as a whole will benefit in the long run.

MAKING A MAKERSPACE? GUIDELINES FOR ACCESSIBILITY AND UNIVERSAL DESIGN WEB RESOURCE



[HTTPS://WWW.WASHINGTON.EDU/DOIT/MAKING-MAKERSPACE-GUIDELINES-ACCESSIBILITY-AND-UNIVERSAL-DESIGN](https://www.washington.edu/doit/making-makerspace-guidelines-accessibility-and-universal-design)

COLLABORATION

One of the most crucial components to an effective digital makerspace design is the ability of the learning environment to promote learner collaboration. Be sure to include this function in your initial design plans. Collaboration is beneficial on many levels and will assist in promoting creativity and inspiring sustainable happiness. The learner can draw upon the experiences of other members in the space. Learner interaction and collaboration can lead to the development of strong relationships and partnerships in design, development and project implementation.

MEETING AREAS

Create areas where groups of students can collaborate and exchange ideas. You do not need a single area in your design that can serve as a meeting place. You may consider expanding the areas of collaboration to include different points within the digital makerspace. Learners will congregate in an assortment of design layouts. Be mindful of including different areas for collaboration at a variety of locations within the learning environment.

NATURAL COLLABORATION

Collaboration should not be a forced action. The learner should be encouraged to collaborate with others whenever possible. Allow relationships to build naturally through mutual engagement and interaction. Learners will build relationships on their own terms and will begin to collaborate naturally. Providing a learning environment that supports and encourages collaboration is the most effective method of design.



**MAKERSPACE FOR EDUCATION - DESIGN THINKING
WEB RESOURCE**

[HTTP://WWW.MAKERSPACEFOREDUCATION.COM](http://www.makerspaceforeducation.com)

LEARNER SUPPORT

Building supports for the learner is an important component in the design of effective makerspaces. You may not have a clear picture of how the space will work and be implemented in the initial design. You will need to consider how you will offer supports. Are the workstations adequate for the learner? Will there be enough space for each active member in the space? You will experience several redesigns while determining the most effective model for implementation. Be mindful of the needs of the learner with respect to your course content and curriculum. As with accessibility, general supports will need to be tailored to each individual learner within the working makerspace.



CURRICULAR CONTENT

Students who pursue project-based learning are often self-starters who follow their interests to gain a higher level of understanding. The projects designed and created by learners are often cross-curricular in implementation. The learner will need support across a wide range of topics and concepts. The supporting educator will need to ensure that the learner has access to a variety of resources. Although not practical on a large scale, a library of resources that includes text books and materials to support different disciplines should be made available to the learner.

PRIOR PROJECT DEVELOPMENT AND EXEMPLARS

The learner may be inspired in different ways. Making past projects available as exemplars to current learners is an excellent way to inspire creativity. Digital media, such as film special effects, are often improved upon in later iterations of design and implementation. Students can build on the work of others to improve, enhance, or re-purpose previous ideas and work. Starting out you will not have an assortment of previous work to draw upon. Luckily, the Internet can serve as a depot for examples of success in project design and development.

The Web resource below can serve as an excellent source for student project examples.



PBLWORKS PROJECT DATABASE WEB RESOURCE

[HTTPS://MY.PBLWORKS.ORG/PROJECTS](https://my.pblworks.org/projects)

DESIGNING A DIGITAL MAKERSPACE

Design Elements

TLE TOOLKIT

TOOLS & TECH

The tools and technology that you select will provide the basis for effective project development and construction. The learner will require tools and technology beginning and the earliest stages of design and experimentation. Be mindful of the type and quantity of tools that you provide for your makerspace. Although each work space may require similar tools and technology, not every work station requires the same layout. Big ticket items that require a substantial investment in capital may be placed in a more central or common area. Items such as computers may be required at each work area. You will need to put considerable thought into your initial tool and tech design. You want to make sure you have what is needed when your makerspace becomes active and in production. Acquiring tools and tech down the road is often possible. Ask yourself if a desired item is a need or a want. Often, you won't be able to secure all needed tools, tech, and materials in the beginning.

THE BASICS

Do some research! Find out what are the basic necessities required for your makerspace to be successful. What can't you survive without? Build a list of items and begin to prioritize.

USED & PREVIOUSLY OWNED

Source out tools and tech that have been previously owned! One person's trash is another person's treasure. You can often acquire like new materials at a fraction of the cost.

BIG TICKET ITEMS

The modern makerspace often incorporates the latest in technology. Many have cutting edge computers, CNC Machines, and 3D printers. You may not be able to secure these items at the onset. Build a multi-year plan that is flexible and try to forecast what is needed and when. Many of the "big ticket items" will require special funding in the form of a donation or grant.



9 MUST-HAVE TOOLS FOR A SCHOOL MAKERSPACE WEB RESOURCE

[HTTPS://WWW.WHITBYSCHOOL.ORG/PASSIONFORLEARNING/9-MUST-HAVE-TOOLS-FOR-A-SCHOOL-MAKERSPACE](https://www.whitbyschool.org/passionforlearning/9-must-have-tools-for-a-school-makerspace)

SUSTAINABILITY

Making your learning environment sustainable can take many forms. Can you afford to run the makespace on an annual basis? Do your costs and bottom line prevent you from expanding and growing with the learners? You will need to do your best to forecast such concepts as operating costs and budgets for consumables. You will need to continuously revisit the idea of cost and operating budgets for years to come.

The concept of program sustainability also applies to the type of work that is being completed within the learning environment. Do the projects that are being fabricated fall in line with the best sustainable practise? Are learners reusing components and recycling materials? How does the “Do It Yourself” model of fabrication observe Global concerns related to plastics, chemicals, and bio-degradable materials? There are many questions related to sustainability that you will need to ask yourself when design your makerspace.

REDUCE, REUSE, AND RECYCLE FOR COST AND FOR THE PLANET

Follow the three R's of the environment for both cost savings and the sake of the planet. Look to fabrication standards that adopt the three R's. Even modern technology such as 3D printers can offer planet friendly alternatives to plastic filaments. There are many ways to incorporate sustainable concepts into a fuctioning makerspace. Encourage sustainability and sustainable concepts when designing and developing your digital makerspace.

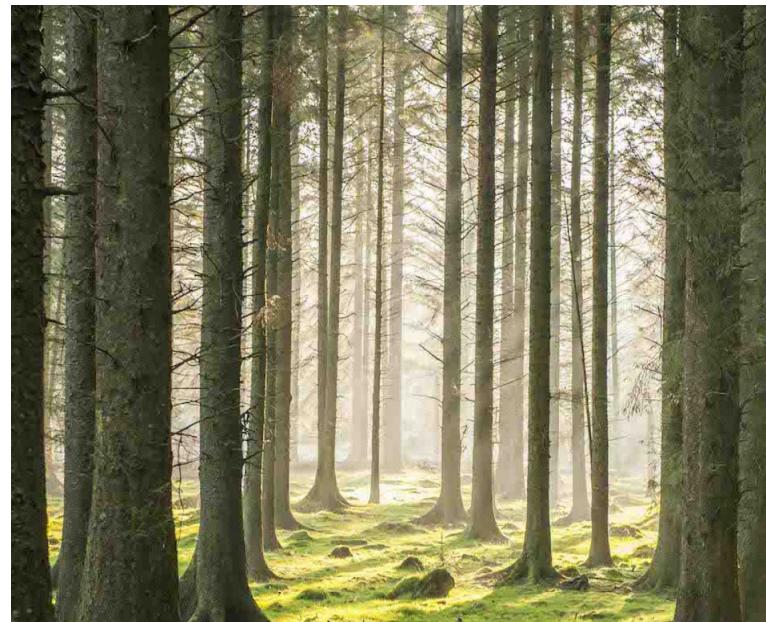


FOUR KEYS TO LAUNCHING A SUCCESSFUL MAKERSPACE WEB RESOURCE

[HTTPS://REMAKELEARNING.ORG/BLOG/2018/02/12/FOUR-KEY-TO-LAUNCHING-A-SUCCESSFUL-MAKERSPACE/](https://remakelearning.org/blog/2018/02/12/four-key-to-launching-a-successful-makerspace/)

The digital makerspace is about the **community**.

Working together to **design** and **build** projects for the future.



CONCEPTS & FRAMEWORKS

LEARNING STYLES

PROJECT-BASED LEARNING

PBL WORKS - THE BUCK INSTITUTE FOR EDUCATION

<https://www.pblworks.org/>

HQPBL - HIGH QUALITY PROJECT BASED LEARNING

<https://hqpbl.org/>

EDUTOPIA

<https://www.edutopia.org/project-based-learning>

CHALLENGE BASED LEARNING

CHALLENGE BASED LEARNING

<https://www.challengebasedlearning.org/>

BIG PICTURE LEARNING

BIG PICTURE LEARNING

<https://www.bigpicture.org/>



The digital makerspace is fluid and is forever **growing** and **changing**.

Learn from the **knowledge** of others.

MAKERSPACE DESIGN RESOURCES

SUGGESTIONS FOR CONSIDERATION

DIGITAL TECHNOLOGIES HUB - MAKERSPACES

<https://www.digitaltechnologieshub.edu.au/teachers/topics/maker-spaces>

SUSTAINABILITY IN EDUCATION - LAUNCHING A MAKERSPACE

<https://www.sustainabilityineducation.com/launching-a-makerspace-lessons-learned-from-a-transformed-school-library/>

MAKERSPACE FOR EDUCATION

<http://www.makerspaceforeducation.com/design-thinking.html>

EDUTOPIA - DESIGNING A SCHOOL MAKERSPACE

<https://www.edutopia.org/blog/designing-a-school-makerspace-jennifer-cooper>

MAKER ED

<https://makered.org>

MAKERSPACES - RESOURCE GUIDE

<https://www.makerspaces.com/makerspace-guide-school-and-library/>

THE YOUTH MAKERSPACE PLAYBOOK

An excellent resource for makerspace design and development.

www.makered.org/wp-content/uploads/2014/09/Makerspace-Playbook-Feb-2013.pdf

REFERENCES AND SOURCES

Credits

TLE TOOLKIT

TOOLKIT DESIGN AND DEVELOPMENT

Document prepared by

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Grade 9 - 12 Educational Resource

EDUC-6800 Project Course for The Masters of Education in Sustainability, Creativity and Innovation

Cape Breton University

Spring 2019

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IMAGE SOURCES

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Build, Create, and
Innovate

Apply what you have
learned so others
may benefit.