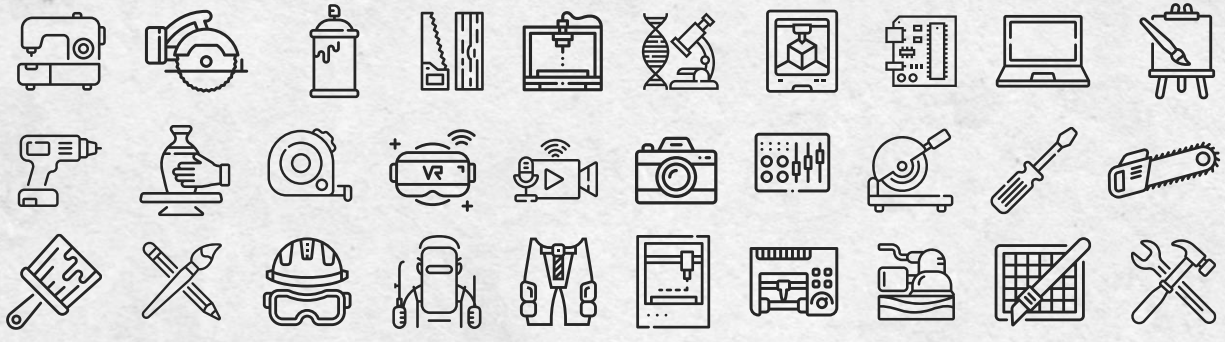
MINISTRY OF HIGHER EDUCATION

JPT | DEPARTMENT OF HIGHER EDUCATION

TRANSDISCIPLINARY

MAKER SPACE



Transdisciplinary Makerspace

9 789672 828136

Published in Malaysia by

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Ministry of Higher Education
Aras 4, No 2, Menara 2,
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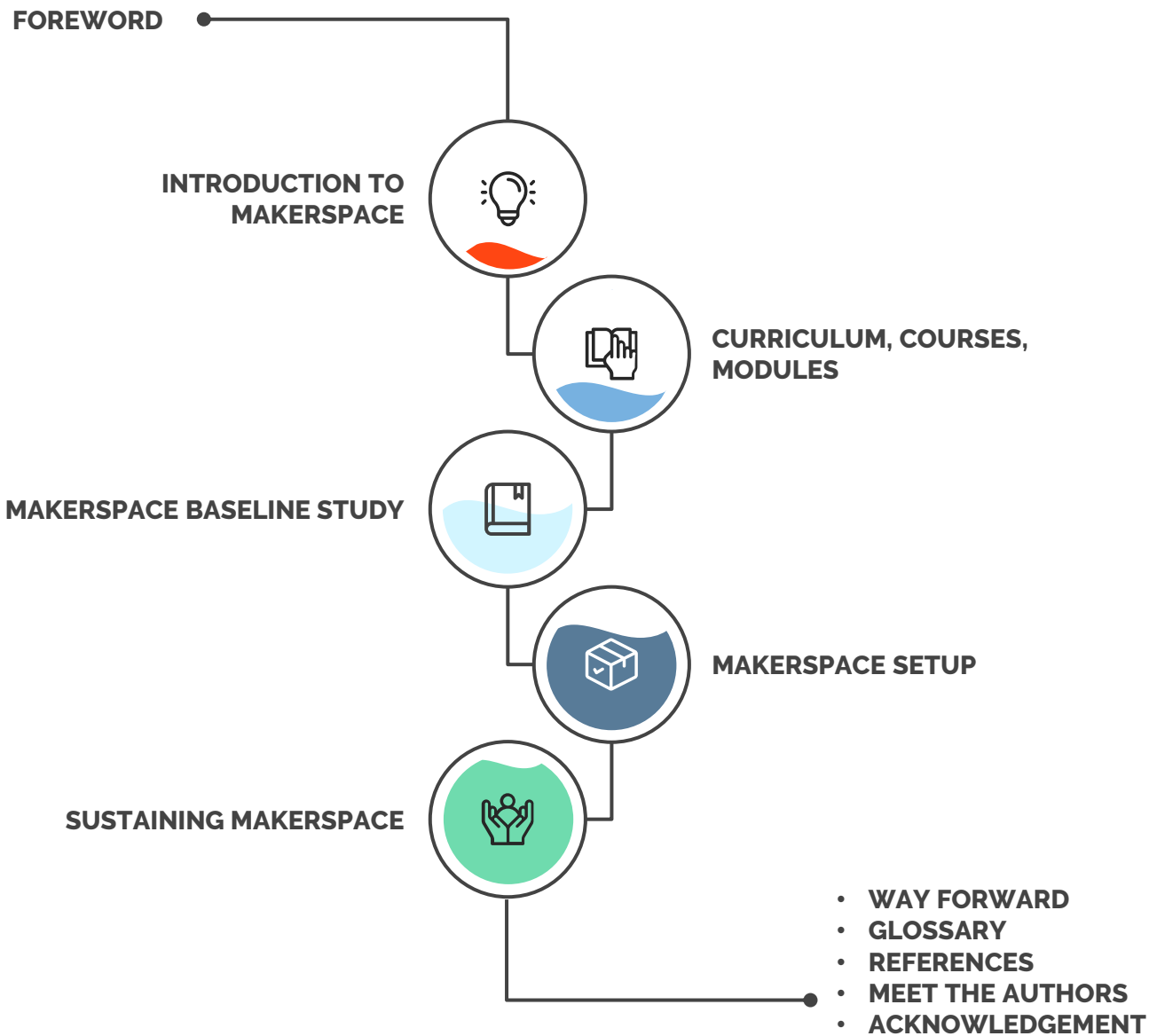
62000 Putrajaya, Malaysia.
https://www.mohe.gov.my/

WHAT'S INSIDE?



HOW TO DOWNLOAD
MAKERSPACE AUGMENTED REALITY CONTENT

Just follow these simple steps

System Requirements
Smartphone (Android)

Apps Installation
1. Scan the QR code to download the APK file of the Makerspace AR App
2. Download APK file of Makerspace AR App.
3. Install the APK file.
4. Once the installation is complete, the Makerspace Application will be ready for use.
5. You need the marker in order to use augmented reality function.

Once the app is installed, NEXT:
1. Launch the application.
2. Press 'Play' button from the main menu or 'Exit' button to exit or relaunch the Makerspace application.
3. Then it will direct to an interface which will explain the Augmented Reality. Press the camera button to go to augmented reality menu.
4. The menu have 5 makerspace layouts which you can choose:
   - Personal
   - Classroom
   - Community
   - University
   - Business

   Each button will direct to its augmented reality set up of makerspace
   'Back' orange button at bottom right will direct to the previous interface.
5. Direct your phone camera to page 42 to 46 (the markers) for each individual layout.
6. For each individual layout, you can use the...
   - *'Rotate' button to rotate the 3D model.*
   - *'Zoom' button to enlarge the marker as guide for user to find marker to scan.*
   - *'Previous' button to previous makerspace layout.*
   - *'Next' button to direct to next makerspace layout.*
   - *'Cross red' button top right corner of the scene will direct to the menu.*

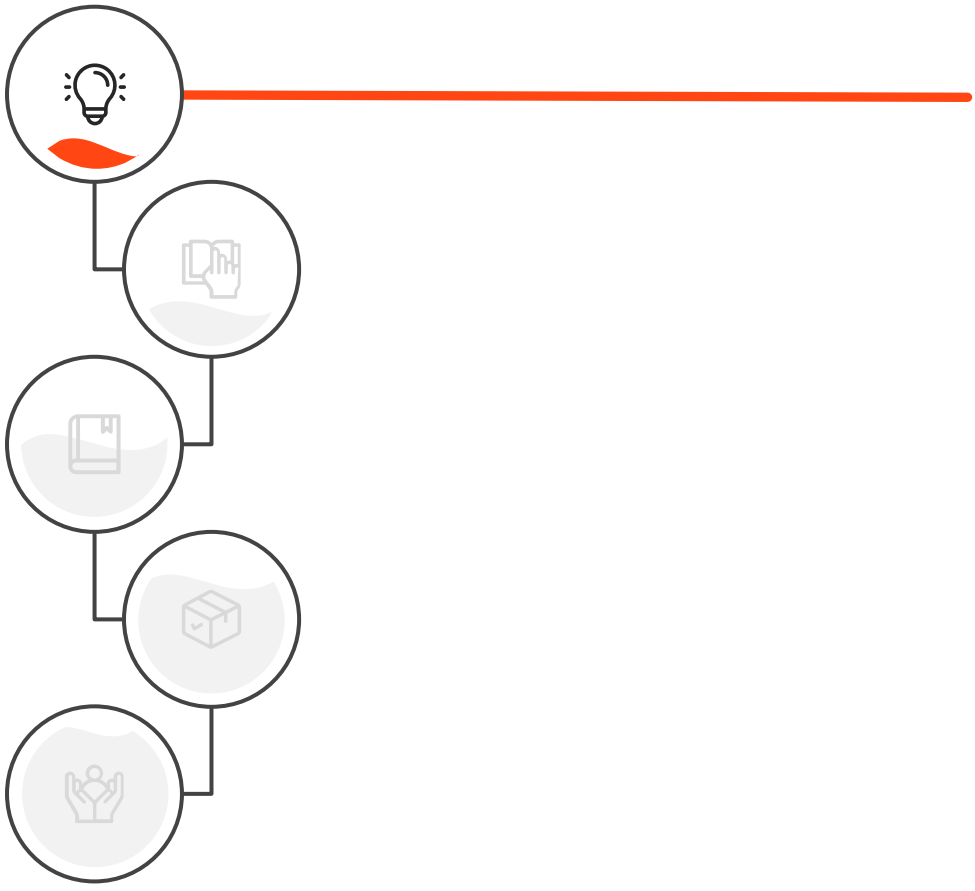
Scan
to discover!

FOREWORD

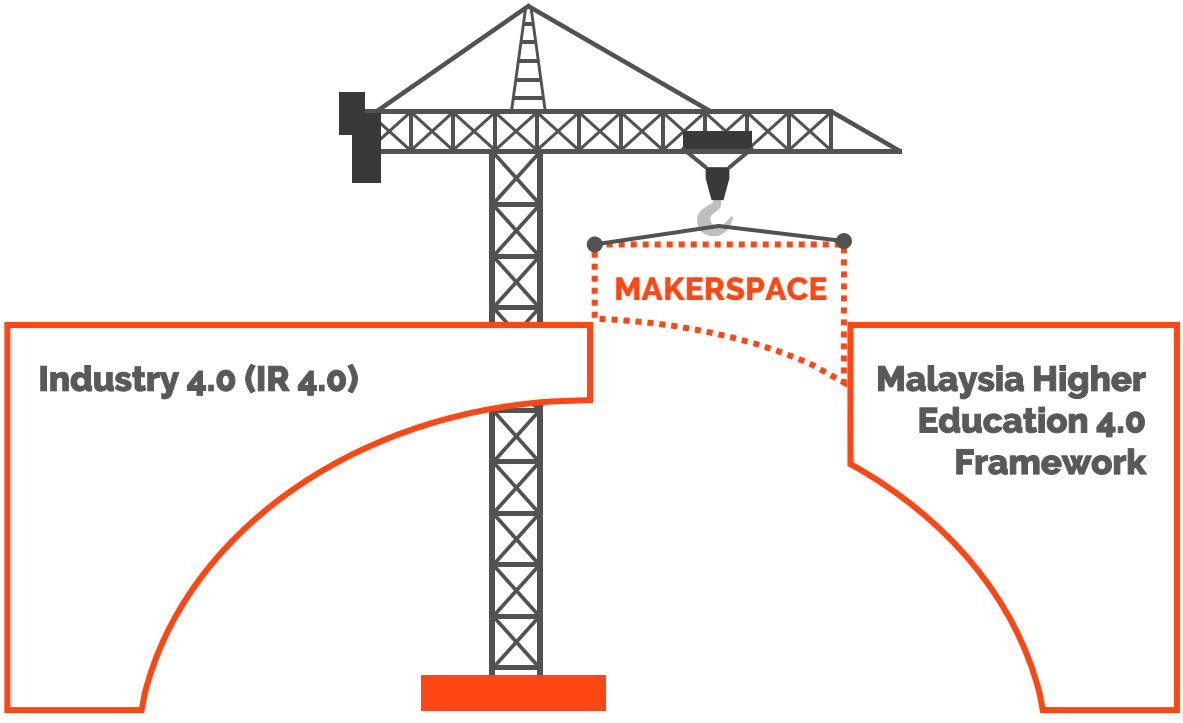
A makerspace, also called hackerspace, innovation lab or fabrication lab is a physical space offering a shared resources, knowledge, and expertise to encourage collaborative project among makers. With the 4th Industrial Revolution (IR 4.0) which synergises physical, digital and biological application, there has been an increase in the number of makerspaces around the world.

In Malaysia, the Ministry of Higher Education (MoHE) has framed the Higher Education 4.0 with the tagline of Values-Infused Future Proof Talents in line with the 4IR. Apart from all the initiatives such as 2u2i, SULAM, Malaysia MOOC, and AI-xChange, MoHE has also organised annual Unimaker, an innovation competition for nurturing and cultivating the maker's movement in Malaysia since 2018. It is believed that innovative curriculum stimulates interest, design and analytical thinking. This maker mindset, in collaboration with the industry and technology leaders, translate knowledge to the community and society.

This Transdisciplinary Makerspace playbook presents the background information on the makerspace, the curriculum, courses, or modules that could be carried out. It also provides some baseline studies on makerspaces in Malaysia, examples of a makerspace setup, and some ideas on sustainability of the makerspace. We hope this playbook would function as a catalyst to transform conventional learning experiences to collaborative learning ecosystems.



INTRODUCTION TO MAKERSPACE



INDUSTRY REVOLUTION 4.0

- Industry 4.0 (IR 4.0) transforms how products are **designed, fabricated, used and operated** as well as how they are maintained and serviced. It will also transform the **operations, processes, supply chain management and energy footprint of factories**.

- The **funding strategies** are aimed at encouraging companies to adopt new manufacturing technologies and processes and invest in R&D, specifically to develop local solutions targeted at Malaysia's needs and priorities.

- The 4th Industrial Revolution (IR 4.0) highlights **Cyber-Physical System where it represents the combination of cyber physical systems, the Internet of System (IoS) and the Internet of Things (IoT)**. Building on the digital revolution of the third industrial revolution, it converges the physical, virtual and biological spheres enabled by digital technology.

Why Makerspace?

Makerspace

Makerspaces are beneficial, good, useful and relevant in todays higher education; because they incubate transdisciplinary skills, marketable proficiencies for students in the 21st century economy.

The Purpose of Makerspace

Having an outlet where you can work with teams, find people with different backgrounds and use this space to turn ideas into reality is really powerful for the students **as both an educational space to complement their courses and a space where they can really dive deep and figure out what their passions are, and what they want to create for the world.**

4 Ways Makerspaces Impact 21st Century Learners

Critical Thinking

Critical thinking and problem-solving skills provide us with the ability to think clearly and rationally to make good decisions. These skills can be cultivated and enhanced by the learning experiences in makerspaces via wide-ranging activities available for students to explore.

Creativity

Creativity is the ability to recognize opportunities, generate original ideas, respond flexibly to changing situations and solve complex issues efficiently. Makerspaces affords students the platform to apply conceptual knowledge learned to solve real-world problems thereby enhancing students' creative thinking skills. Students who spend more time working on projects in makerspaces are found to be more inquisitive and innovative problem-solvers than those who do not. With their high levels of creativity, these students are also more likely to be better at finding solutions to the more challenging real-world problems such as global-warming and cancer.

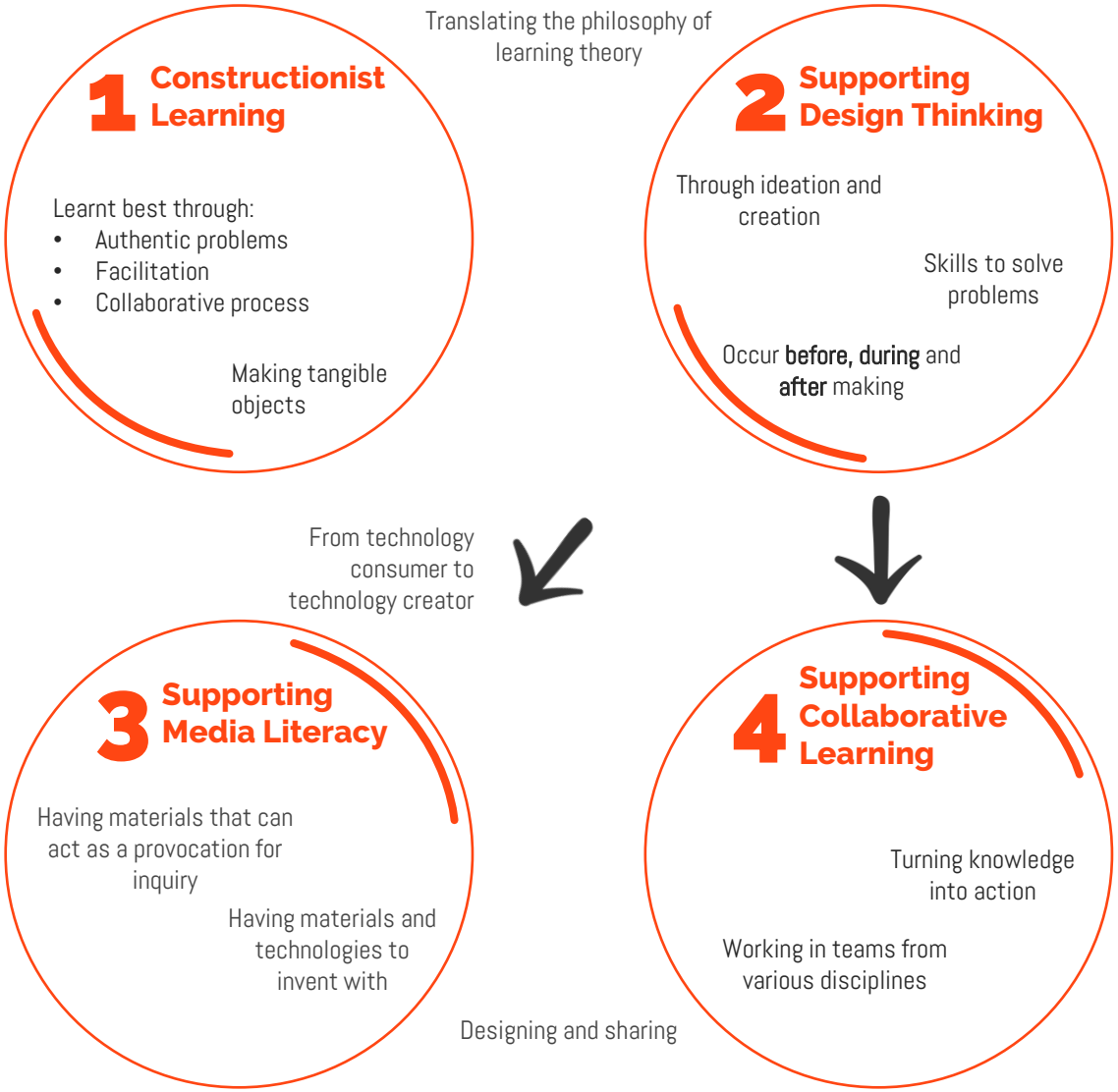
Collaboration

Collaboration involves students working together to complete a task. When students work together efficiently instead of working alone, processes and goals become more aligned, leading the group towards a higher success rate of achieving a common goal. Makerspaces as centers with shared facilities encourages collaborative learning to take place, affording students to effectively share ideas to innovate together.

Communication

Communication is a process of effective listening, understanding, and conveying ideas with each other. Makerspaces enable students to be more confident in translating complex concepts to others.

Makerspace Aspects



Overview of Makerspace

The elements of makerspace that should apply in Malaysia:

Equipment

Consultation

Technical Expert

Entrepreneurship Programme

Mentor-mentee Programme

Development of Creativity

Innovation

Workshop

Online Class

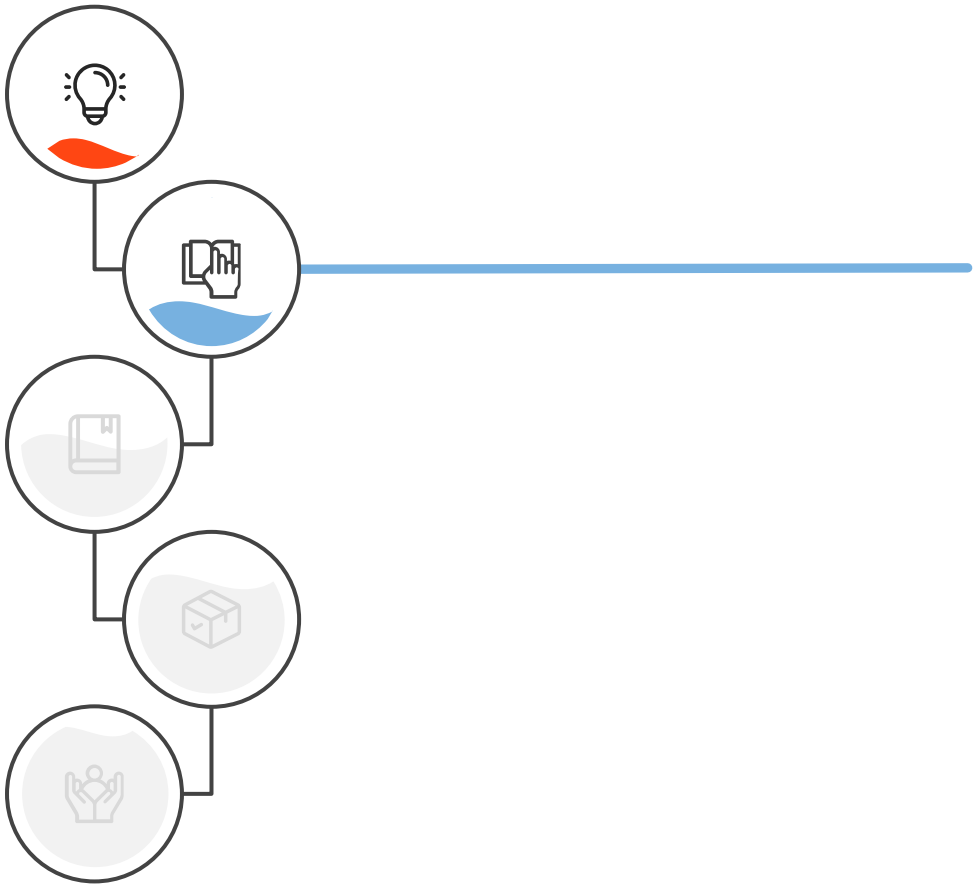
Summary: Makerspace as a Platform Towards Transdisciplinary

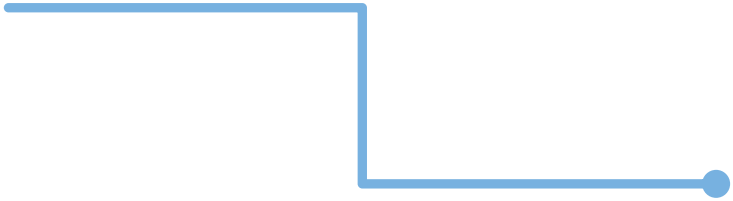
"The Maker Movement is about moving from consumption to creation and turning knowledge into action."
Laura Fleming

Future education should embrace 21st century learning approaches to ensure that students are well equipped with the right skills and values for the future.

The learners' agility to adapt, innovate and perform through change is crucial in enhancing their skills to be adaptable, lifelong learners.

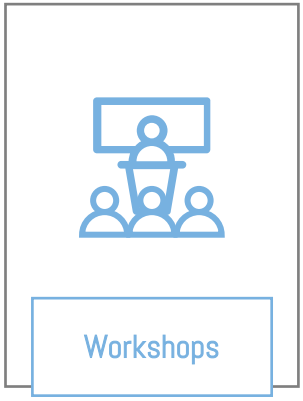
This would generate more creative thinking processes and instil better human values, while preparing the students for the Industrial Revolution 4.0 (IR 4.0).





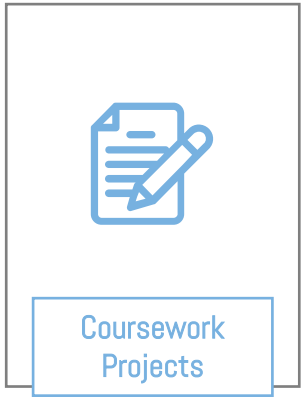
CURRICULUM, COURSES, MODULES

Types of Makerspace Activities



Workshops

Basic Workshop for 3D Printing, Electronics, Programming and etc.



Coursework Projects

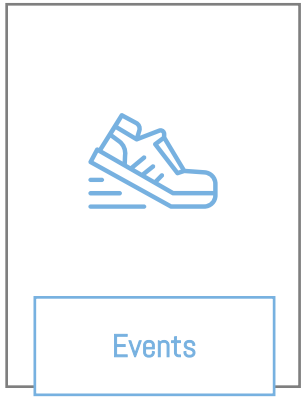
Final Year Project or Capstone Project

Research Projects

Specialised project that involves multidisciplinary research teams in solving complex problems

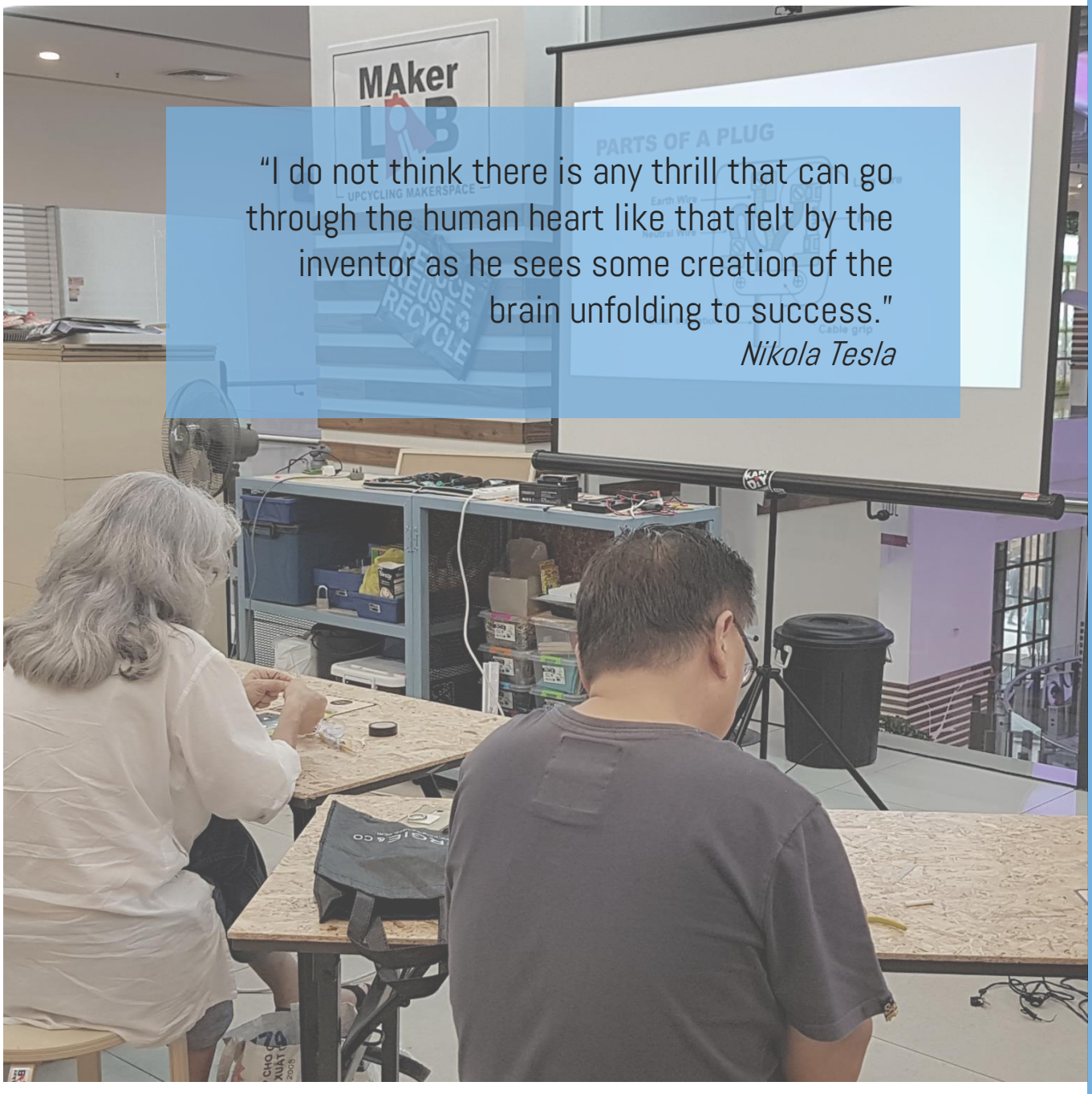
Exploratory Projects

Hobbies or Business Ideas



Events

Community Projects, Hackathons, Makerthons, Carnivals



"I do not think there is any thrill that can go through the human heart like that felt by the inventor as he sees some creation of the brain unfolding to success."

Nikola Tesla

Workshop Examples

Woodworking
- Handheld Tools
- Drill Press
- Sanding
- Milling

Metalworking
- Welding
- Threading
- Grinding
- Heat Treatment

Digital Modelling and Fabrication
- 3D Modelling
- 3D Printing
- CNC Laser Cutting
- CNC Routing

Basic Programming
- Flowcharts and Pseudo-Code
- Coding Environments
- Testing and Debugging
- Algorithms

Electronics
- Electricity
- Circuit
- Components
- Soldering

Design
- Typography
- Software Environments
- Colour
- Layout

Coursework Project Examples

Portable Greenhouse for growing tomatoes (or any other fruits)
Disciplines: mechanical/electrical engineering, computer science, agriculture, industrial design

Build a pizza delivery drone
Disciplines: mechanical/electrical engineering, computer science, food science

An educational adventure game for learning about culture & history
Disciplines: computer science, multimedia & arts, human ecology, language studies, literature, history

Build 3D printer using cake as filaments for 3D printing food
Disciplines: food science, mechanical/electrical engineering, culinary arts

Make an App for gamifying a programme course
Disciplines: computer science, multimedia, mechanical engineering

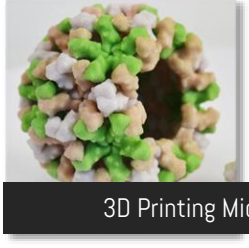
Research Project Examples

The Microbes (Beginner)

Arts & Computer Science

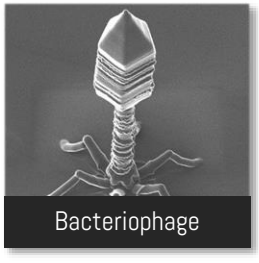
Agar Art

Virus Art



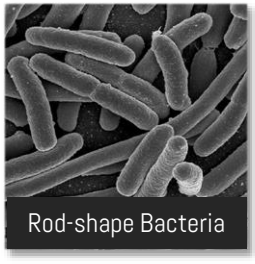
3D Printing Microbial Structure

Biological Sciences

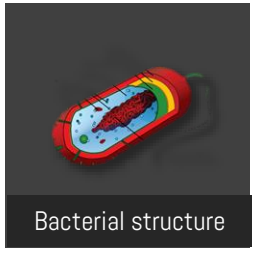


Bacteriophage

Shape of Bacteria



Rod-shape Bacteria



Bacterial structure

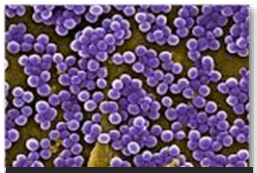
Research Project Examples

Biological Fabric Dye (Beginner)

Arts

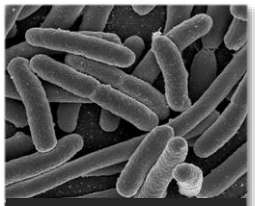
Dyeing the Fabric

Biological Sciences



Coccus-shape Bacteria

Screening of Colour Producing Bacteria



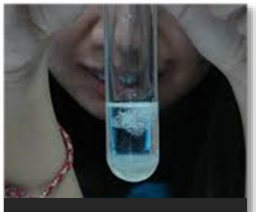
Rod-shape Bacteria

Harvesting the Dye

Research Project Examples

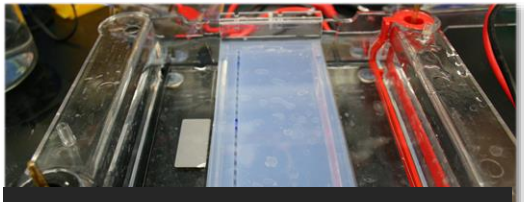
The Secret Code of Life (Intermediate)

Biotechnology



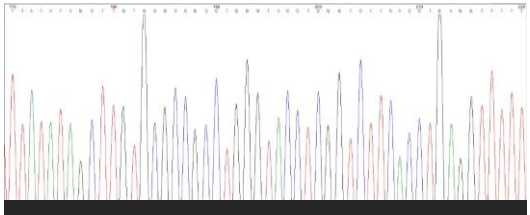
Extraction of DNA

Restriction Enzyme Digestion & Cloning

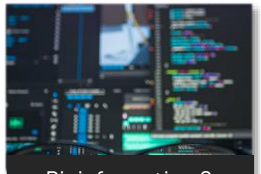


Electrophoresis of DNA

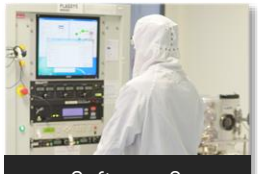
Computer Science



DNA Sequencing



Bioinformatics & Database Searching

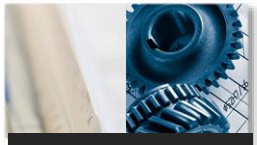


Software & Application

Research Project Examples

The Executional of Living Things (Advance)

Engineering

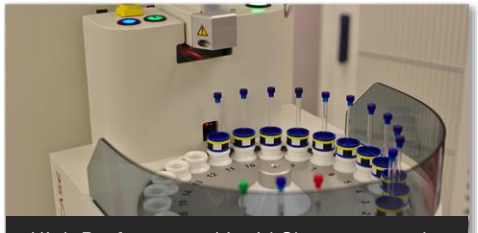


Machine Re-designing, Drawing & Construction

Machine improvement

Biological & Chemical Sciences

Gene regulation



High Performance Liquid Chromatography

Biotechnology

Protein Production in Bioreactor

Research Project Examples
Luminaria (Advance)

Physical Computing

Electronic and Electrical

Logic Circuit

Transducer

Soldering Process

Programming

Computational Testing

Transducer

Final Installation

"The desire to create is one of the deepest yearnings of the human soul."

Elder Uchtdorf

Exploratory Project Examples

Community Project Examples


unimaker
Towards National 4th Industrial Revolution

www.unimaker.my



#mydigitalmaker

www.mydigitalmaker.com



INSPIRING INNOVATION
PENANG
SCIENCE CLUSTER

www.pscpen.com/pisf



YOUNG MAKER CHALLENGE

www.youngmakers.my


Innovate Malaysia 2019

www.innovate.
dreamcatcher.asia


"Creativity is intelligence having fun."
Albert Einstein

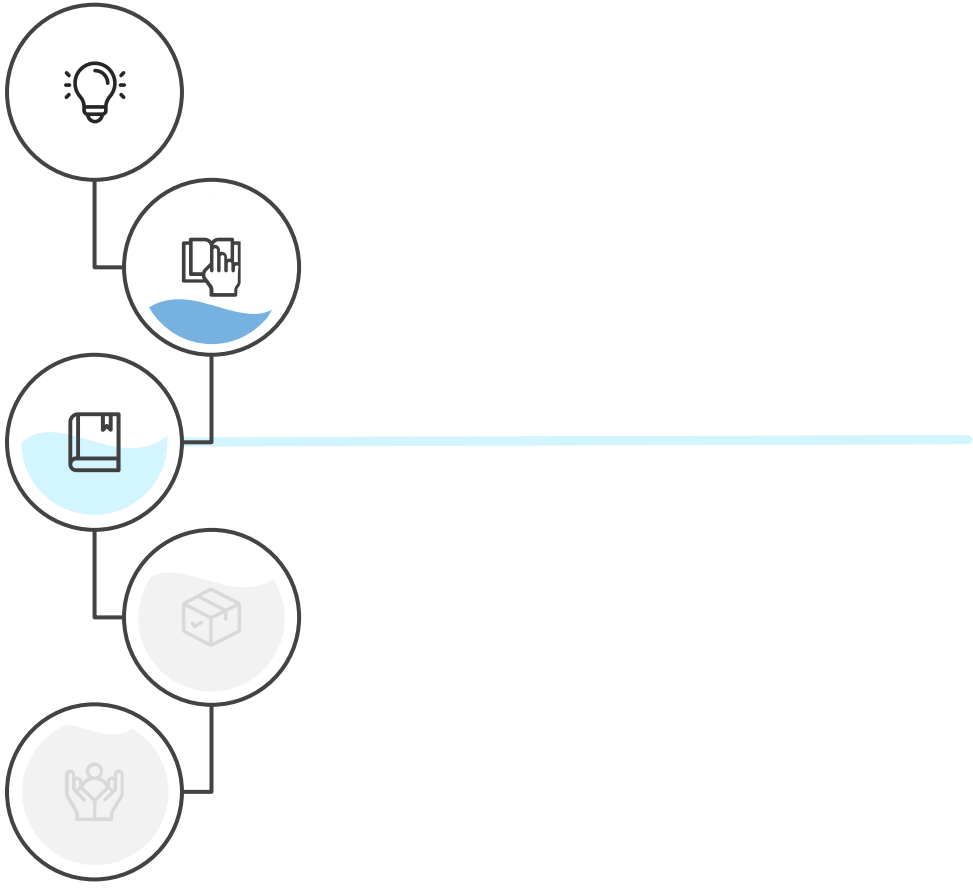
Summary: Curriculum, Courses, Modules of Makerspace

> "Makerspace is a general term for a place where people get together to make things. Makerspaces might focus on electronics, robotics, woodworking, sewing, laser cutting, programming, or some combination of these skills."
> *Roslund & Rodgers*

Future curriculum, courses, modules should embrace the 21st century learning activities to ensure the students are well equipped with the right tools and knowledge for the future.

The makerspace activities include workshop for 3D Printing, electronics, programming, capstone projects, multidisciplinary research project, business ideas and community projects hackathon. These activities enhance learners' agility to adapt, innovate and perform their creativity towards lifelong learning.

The mentioned activities will activate learners' creative thinking towards better human values.

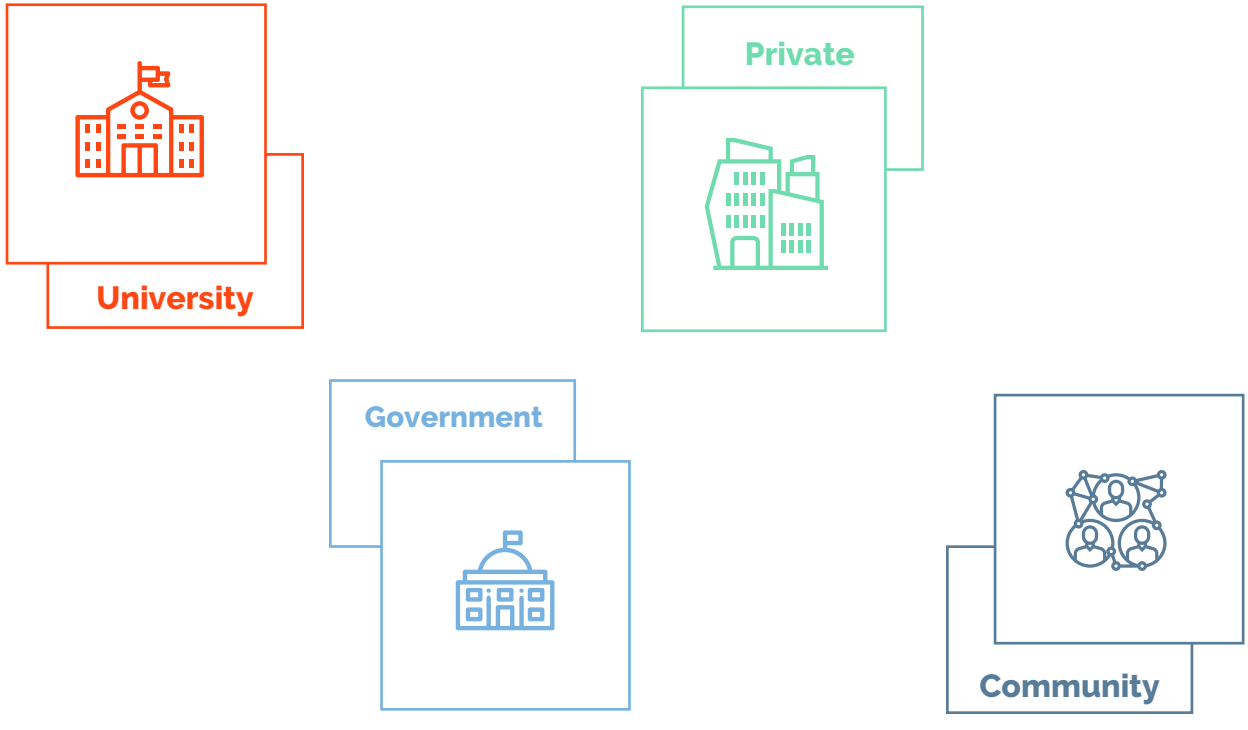


MAKERSPACE BASELINE STUDY

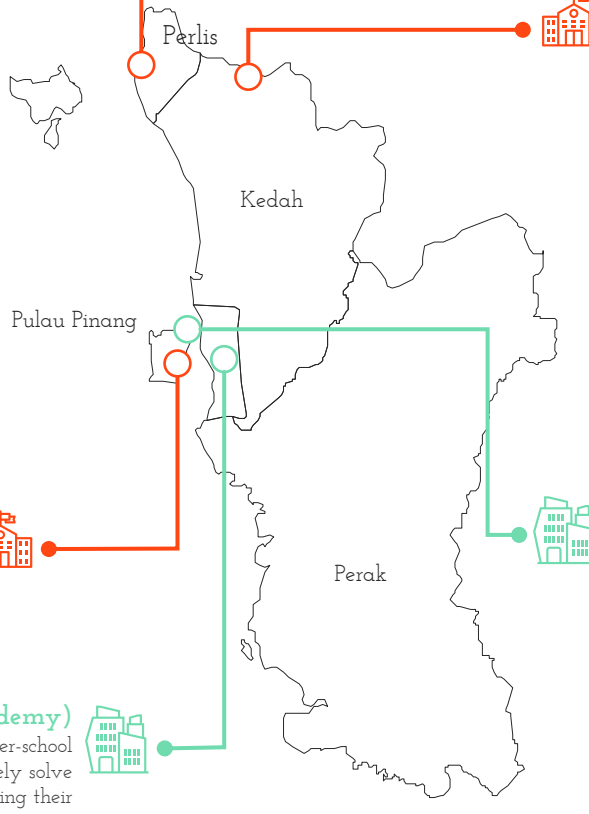
Makerspace Varieties in Malaysia

Makerspaces are collective organisations designed to increase access to physical tools within a collaborative community. It is a space where transdisciplinary learning, thinking, crafting, tinkering and wondering serve as a gathering point between the people and space.

There are four makerspace platforms in Malaysia; University, Government, Private and Community involved. These platforms increased cultural awareness and sensitivity in future education. The accessibility to makerspace will empower the young people and community in engaging their collaboration skills, communication and build creativity.



Northern Region
(Perlis, Kedah, Penang and Perak)



MCMC-Unimap Makerspace
Started since November 2018, received seed funding from MCMC. Focuses on Engineering-related field.

MCMC-UUM Makerspace Laboratory
Started since April 2019, received seed funding from MCMC. Focuses on IoT-related field.

Makers@USM
Spearheading Maker Movement since 2017, received seed funding from MCMC.

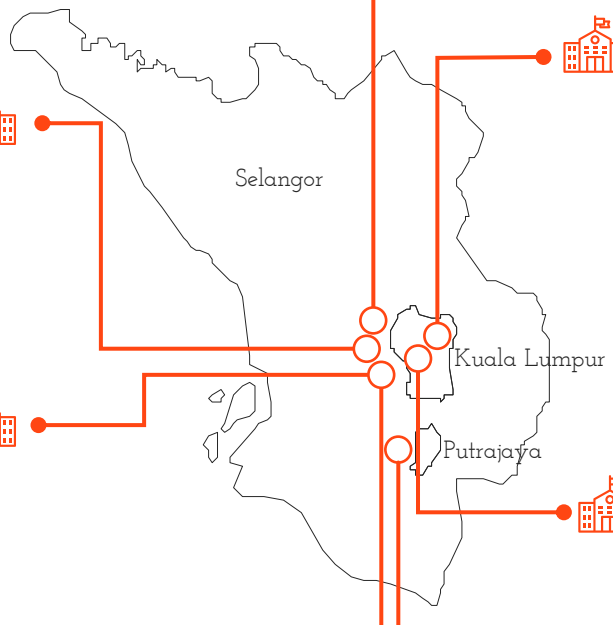
Penang Science Cluster (Makers' Garage)
Industry-led initiative in collaboration with the State Government, initiated since 2012. PSC is a non-profit, tax exempt organisation with a mission to build a healthy pipeline of talent in Penang and Malaysia by sparking interest in science and technology, creating a culture innovation and entrepreneurship among our young in Penang and Malaysia.

Arus@Alma (Arus Academy)
Social enterprise that provides after-school classes where students actively solve problems by building and creating their own physical and digital solutions. Focuses on transdisciplinary education for primary and secondary school students.

University | Government | Private | Community

Central Region

(Selangor, Federal Territories of Kuala Lumpur and Putrajaya)



MakerLab UiTM

Started since 2018, Collaboration with industrial partner (Arus, Pebblereka, 3D Gens, PTAR). Focuses more on tech maker (IR 4.0 Related).

FablabKL (Asia School of Business - IEC)

To offer the best ecosystem for ASB students to engage in, linking them to tinkerers, makers and the local startup scene.

Space Fablab (The One Academy)

Started since January 2017 as a facility for students under the School of Multimedia Design within The One Academy.

MakerLab@Monash (Monash Innovation Lab)

Started since 2018, Collaboration with industry partner (Mycro). Focuses on maker culture awareness.

SandBox Café & Co @UM

Started since 2018, Collaboration with industrial partner (Mycro). Focuses on technopreneur creation.

Sunway iLab Makerspace

Aims to support and foster Sunway University's entrepreneurial ecosystem through self-initiated and collaborative learning that provides hands-on experiences. Focuses on Smart City.

MakerLab @ MMU

Started since 2018, Initiative from Telekom Malaysia and MCMC.

University | Government | Private | Community

Maker Studio @ SDCC (Arus Academy and Cytron)

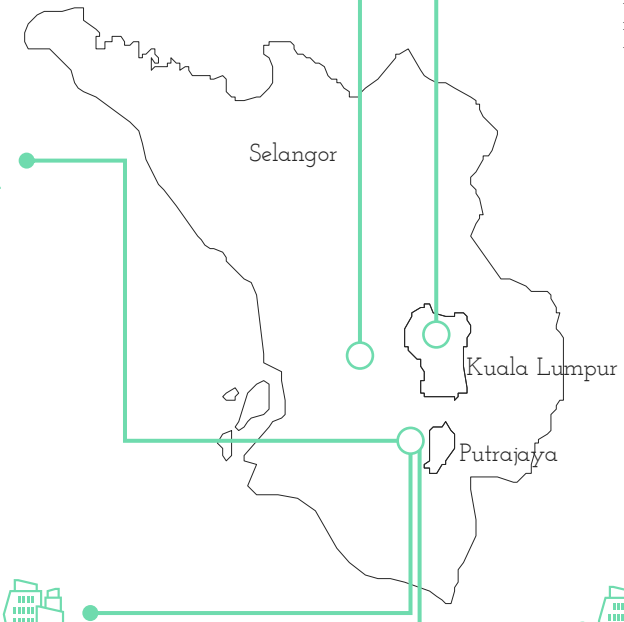
Social enterprise that provides after-school classes where students actively solve problems by building and creating their own physical and digital solutions. Focuses on transdisciplinary education for primary and secondary school students.

ME.reka Makerspce (Biji-Biji Iniative)

Aims to educate would-be innovators and entrepreneurs in developing the tech of tomorrow.

MakerLAB @ MaGIC (KakiDIY and Mycro)

Industry-led initiative in collaboration with MaGIC, initiated since 2015.



MakerLab @ Jayaone (KakiDIY and Mycro)

Mall initiative with some community partners, initiated in 2017. Focuses on Reduce, Recycle, Reuse Programme.

Mymaker IoT Lab @ MCMC

Industry-led initiative in collaboration with the MCMC, initiated since 2016. Focuses on IoT-related field.

University Government Private Community

Southern Region
(Negeri Sembilan, Malacca, Johor)

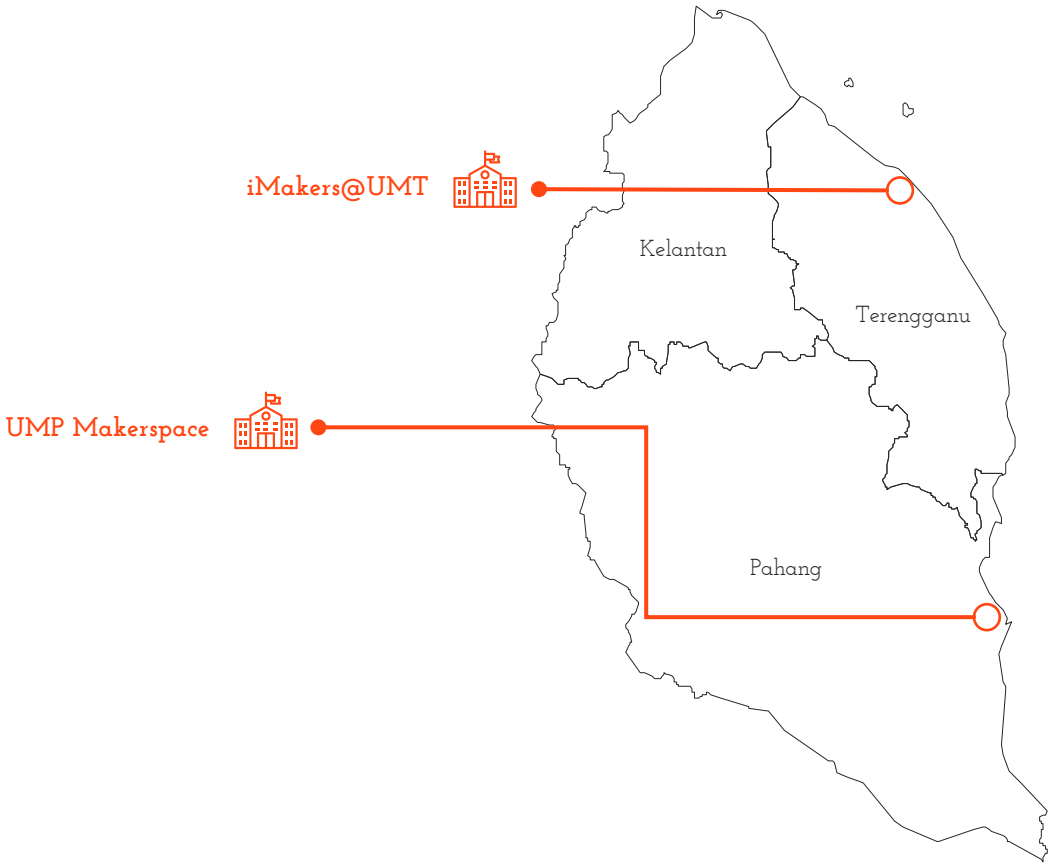
Fast Lab USIM
An initiative of Faculty of Science and Technology (FST) and Universiti Sains Islam Malaysia (USIM) to inspire community in STEM (Science, Technology, Engineering and Mathematics) through STREAM approach.

OneMaker Madini
Providing maker education opportunities (such as learning journeys, workshops and camps) to corporate and learning institutions

mySTEM Digital Maker Lab
To provide every citizen with the opportunity to continue to learn and reach their potential to lead fulfilling and productive lives, and to contribute positively to the nation.

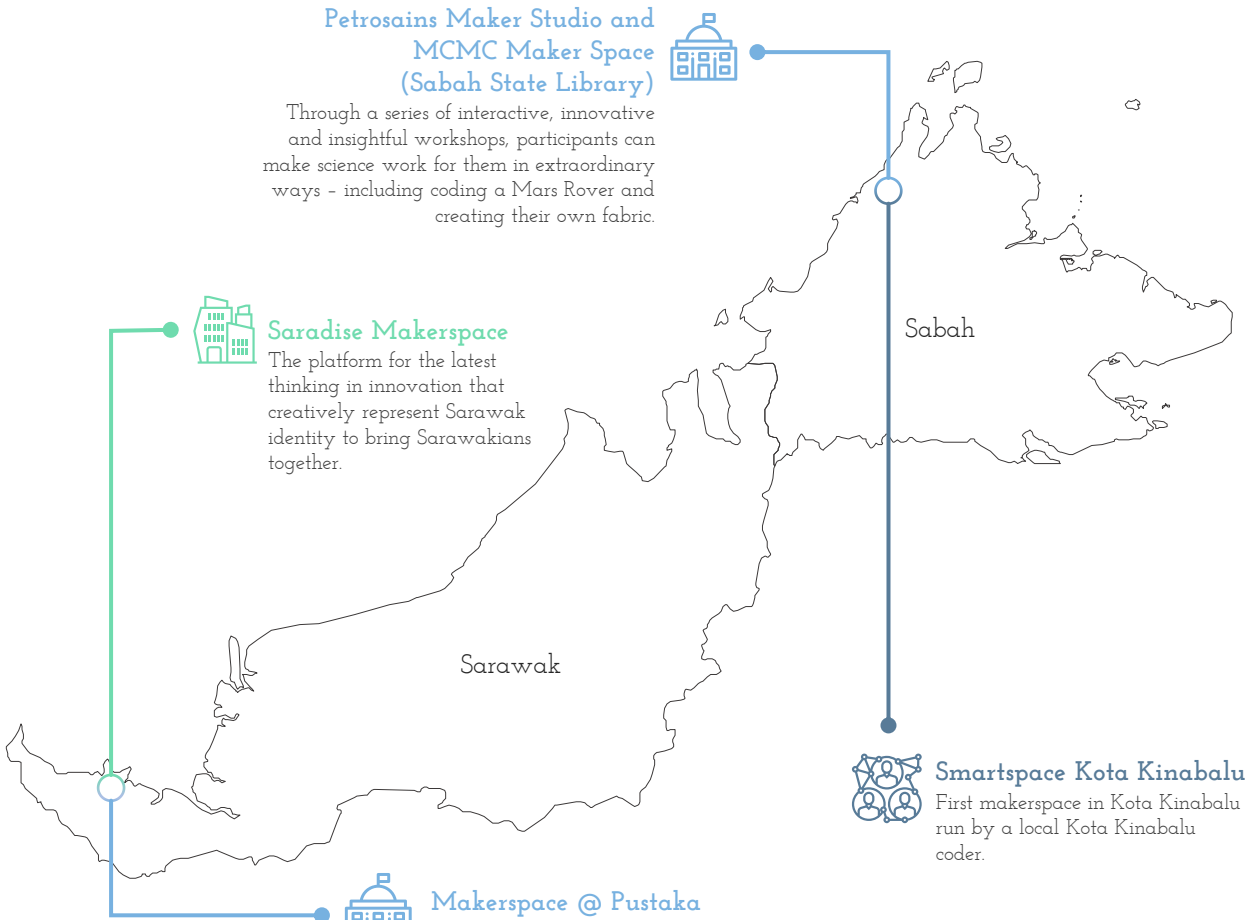
University Government Private Community

East Coast Region
(Kelantan, Terengganu, Pahang)



University Government Private Community

Sabah dan Sarawak

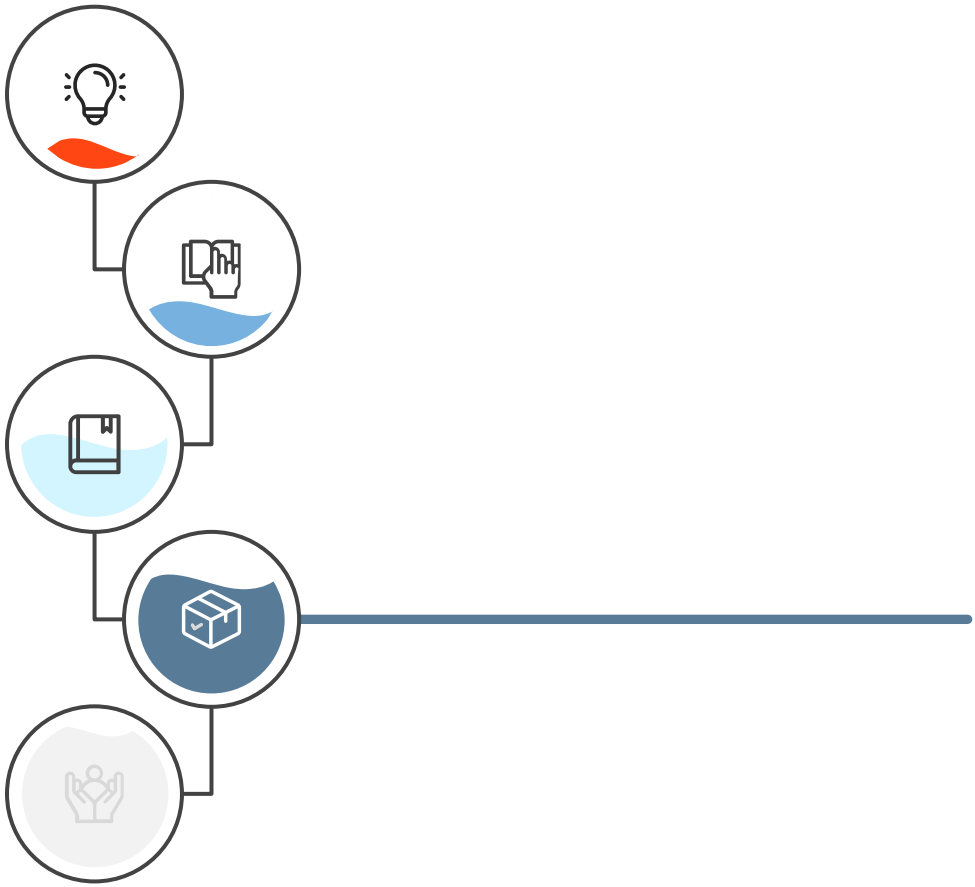


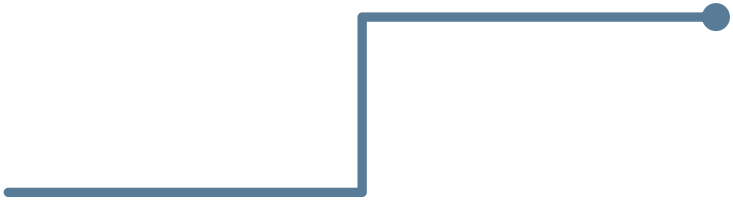
Summary: Makerspace as a baseline study

"You don't have to be great to start,
but you have to start to be great."
Zig Ziglar

Makerspace offers an extreme variety of creative endeavors, tools, demographics and places where making happens. A common goal of empowerment is through learning and facilitating social connections.

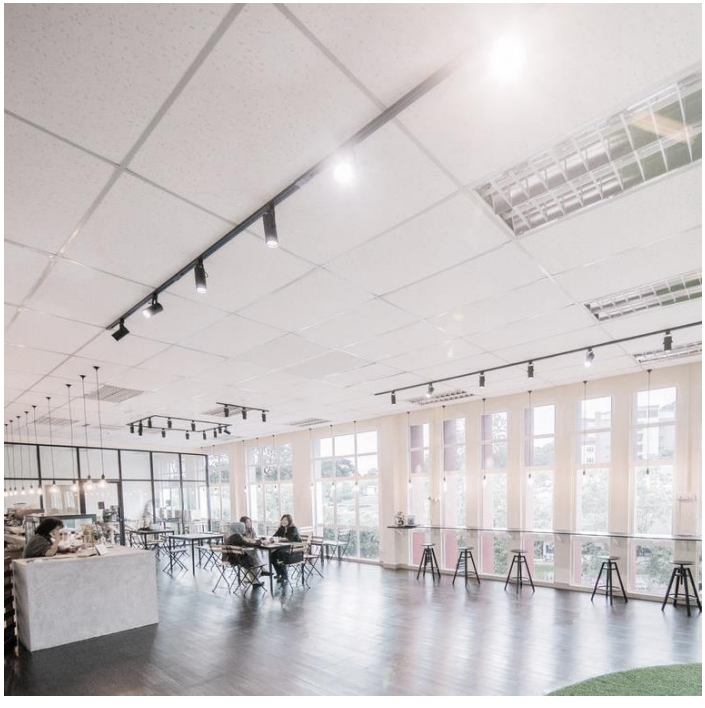
Makerspaces contribute to economic development in four principle ways in creating a cultural change, by encouraging entrepreneurship in the community; providing training, supporting small business growth through the provision of services; and increasing workforce retention.





MAKERSPACE SETUP

Building a Makerspace



How big should it be?

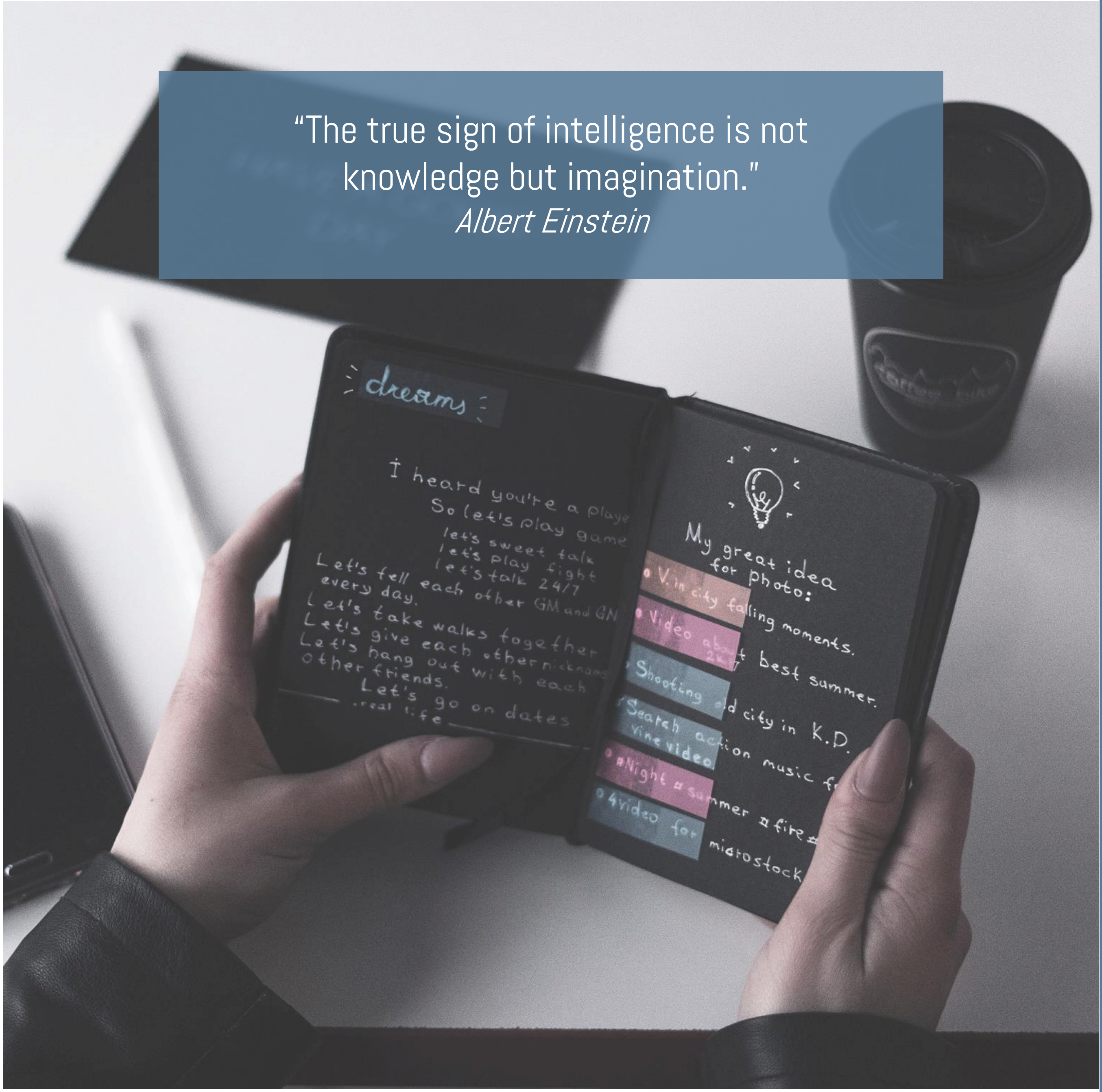
Is it the equipment that is most important?

... Or the people?

Samples of other makerspace types (textile, life sciences, agriculture)

It is true that while at the very core of a Makerspace is about passionate people getting to make things together and not particularly about the equipment, the right space and equipment nonetheless inspires people to work better together to foster creative ideas.

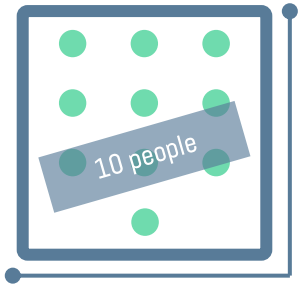
There is no definite blueprint for the 'perfect' makerspace. The equipment, layout and design depend mostly on what is required by its user community.



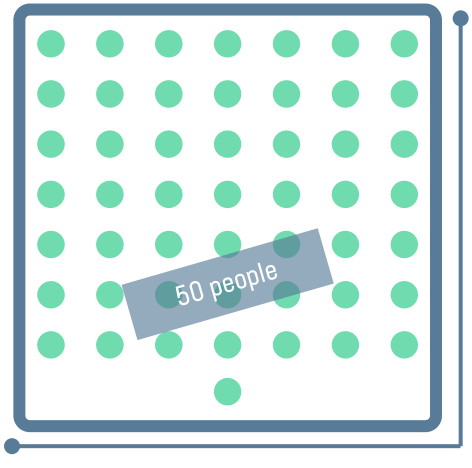
"The true sign of intelligence is not knowledge but imagination."
Albert Einstein

How Big Should Makerspaces be?

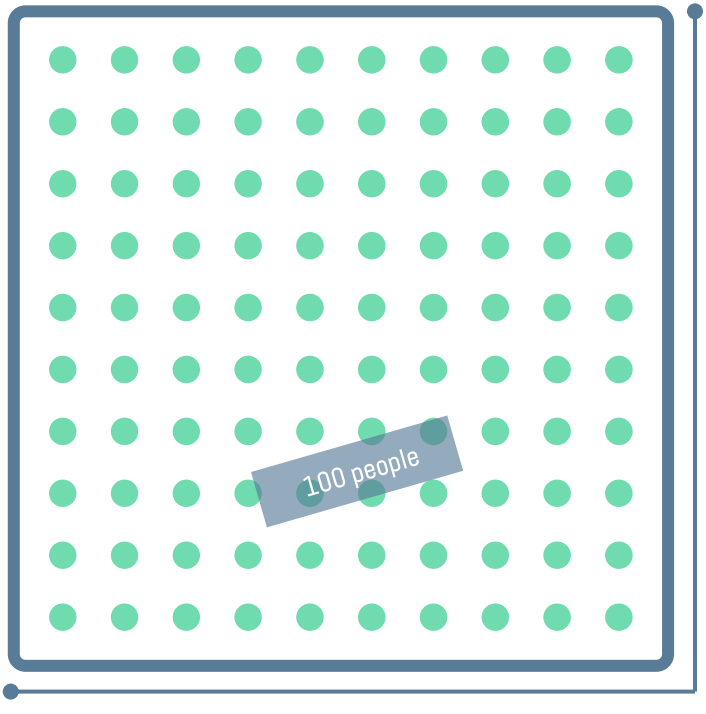
Rule of thumb is 50 sq. ft. per person intended for the space.
For example:



500 sq. ft.

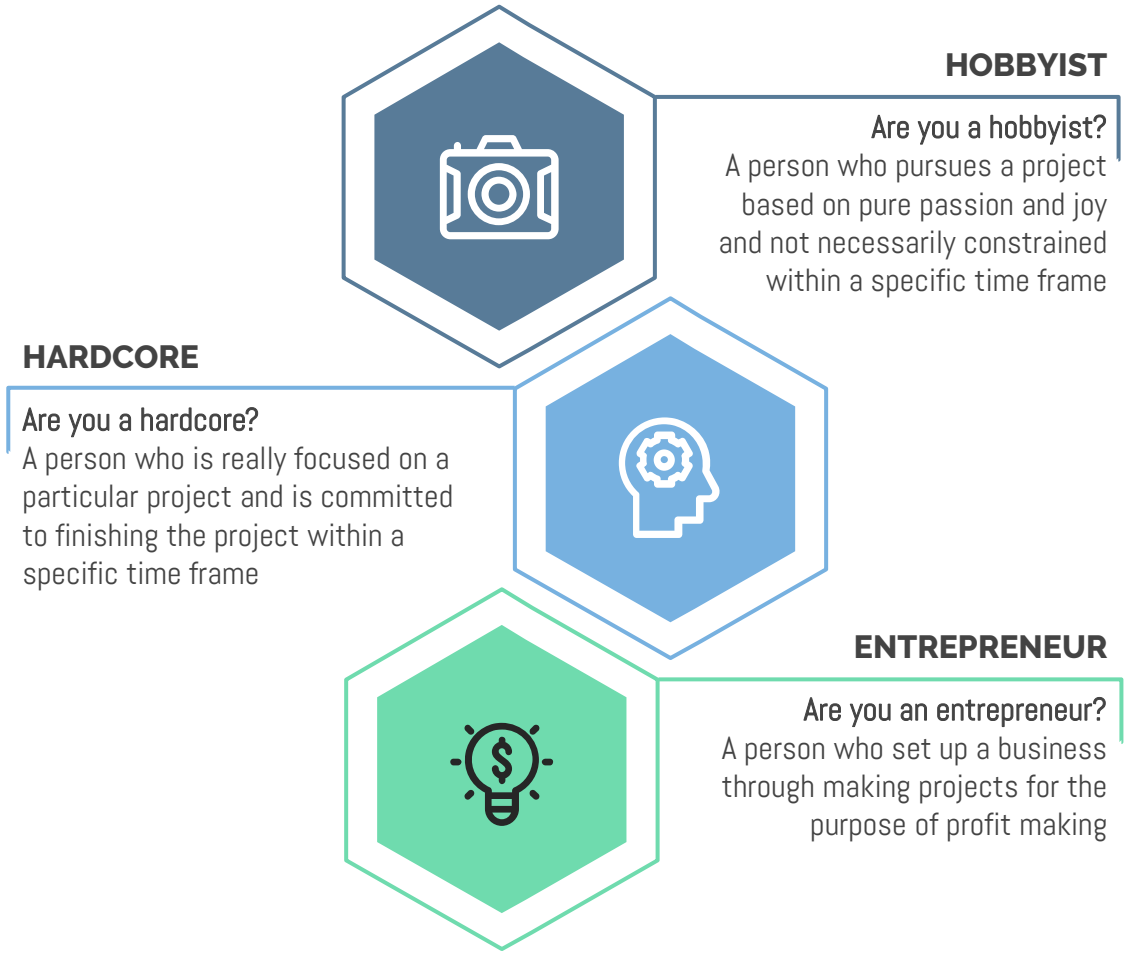


2,500 sq. ft.

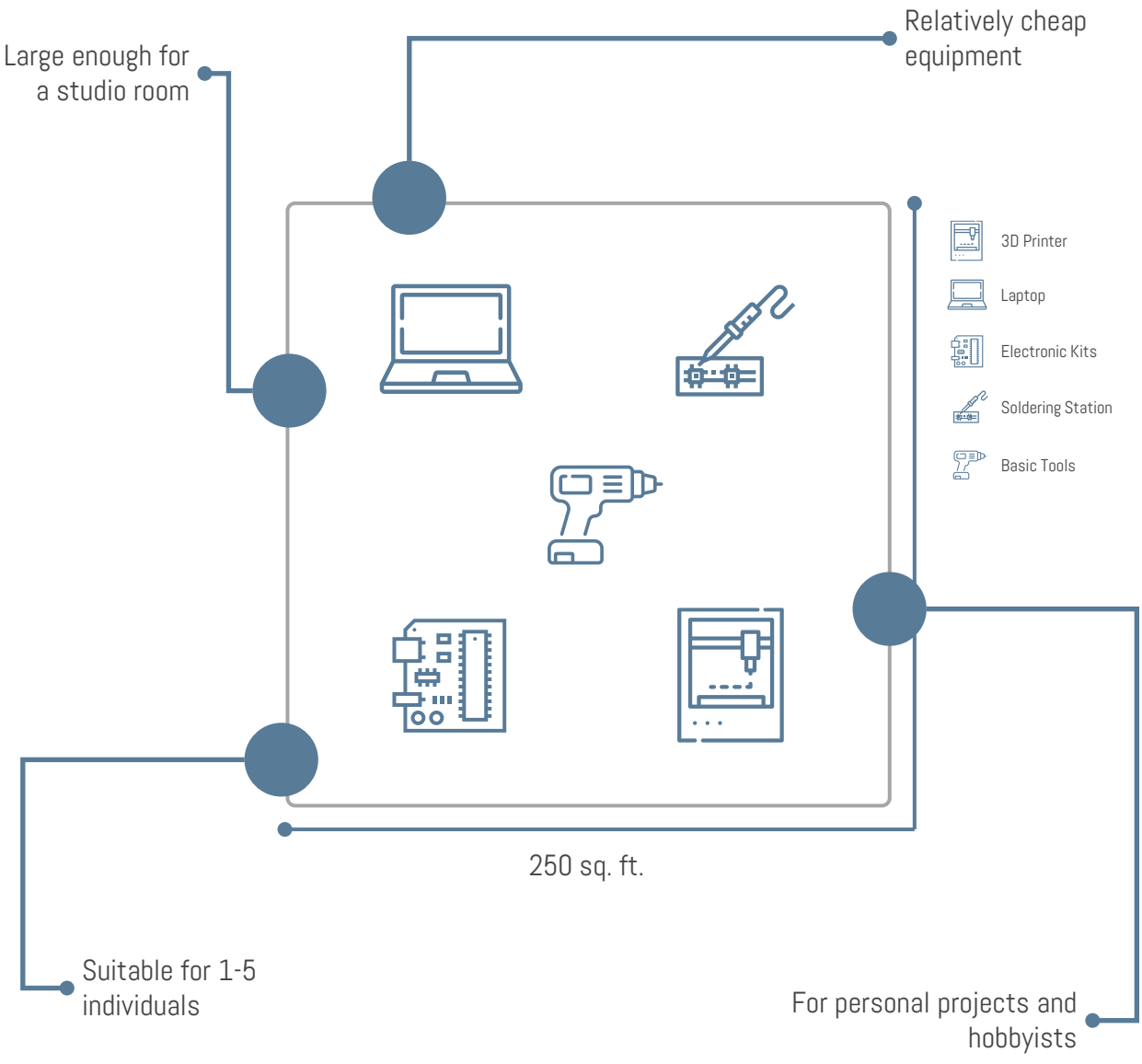


5,000 sq. ft.

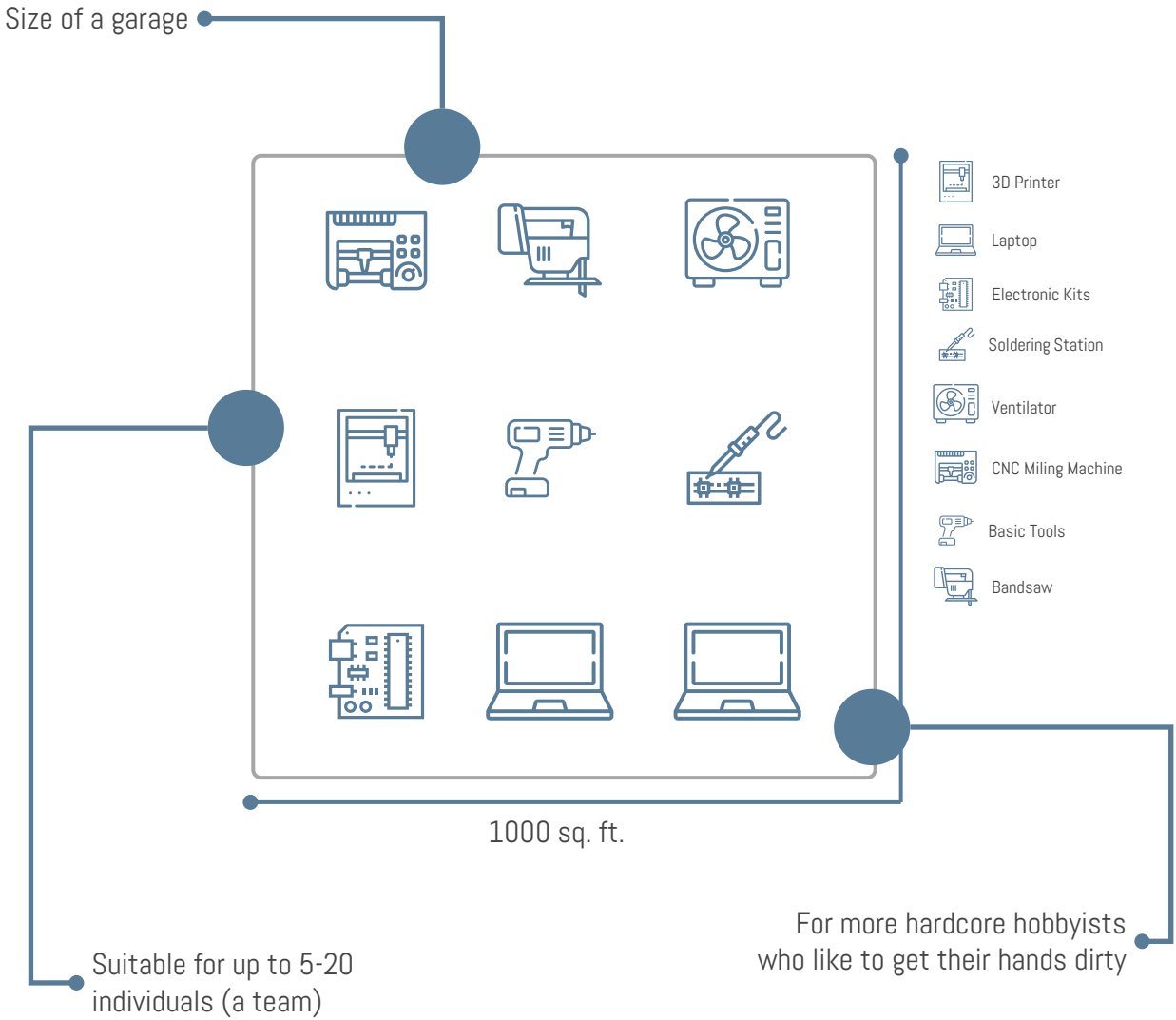
It also depends on what kind of equipment is desired:



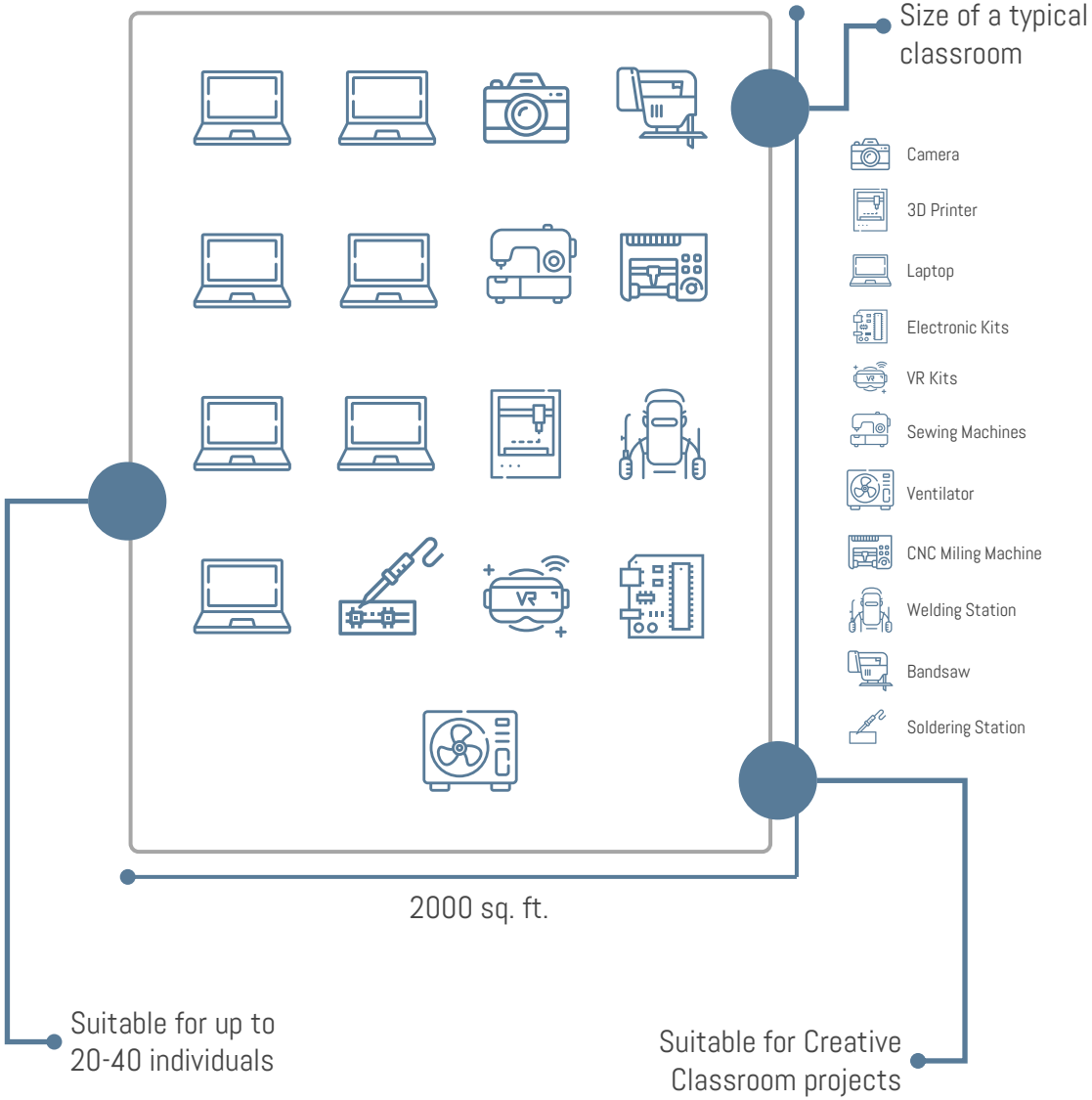
The RM 3000 ‘Personal’ space



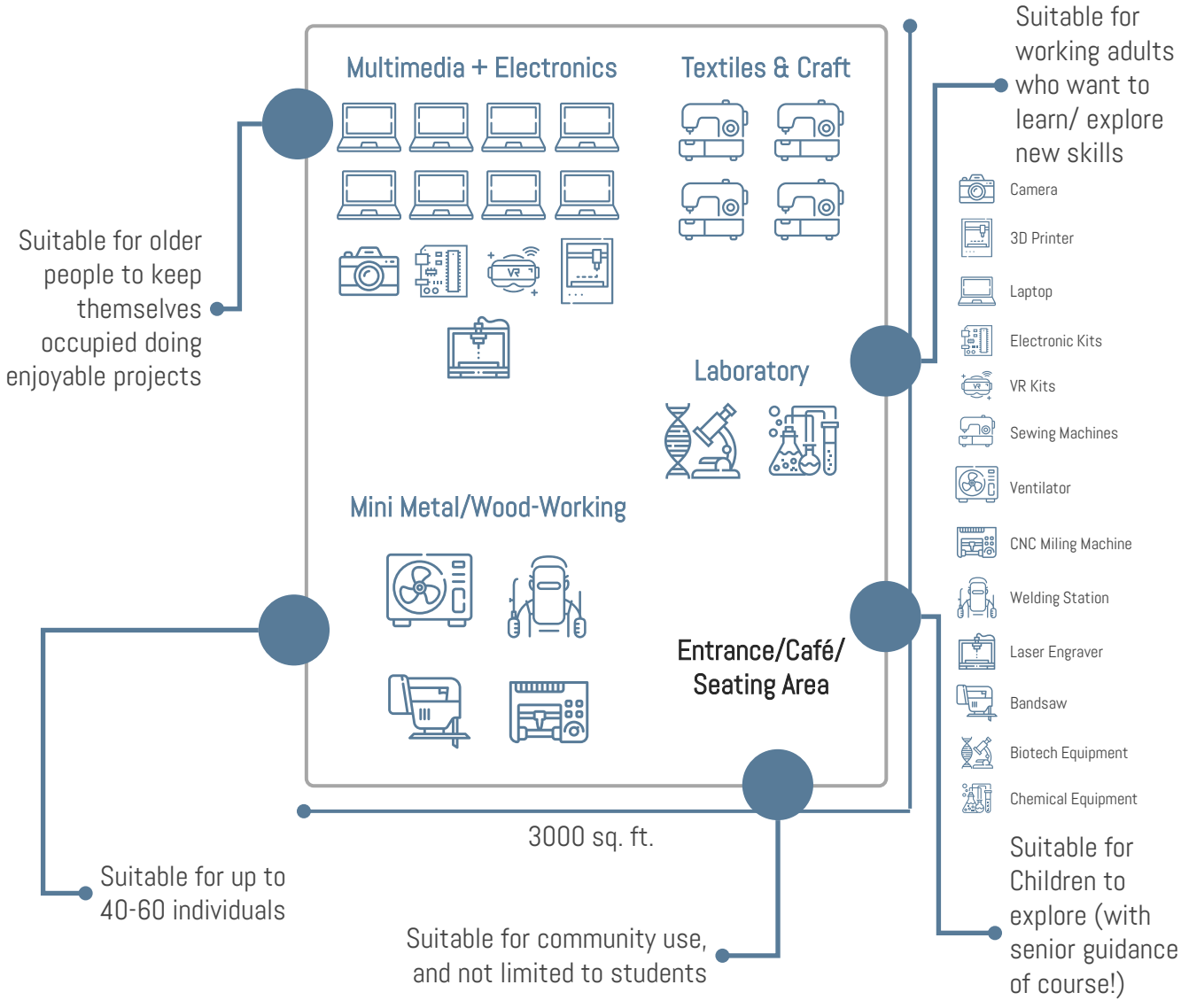
The RM 10,000 'Classroom' space



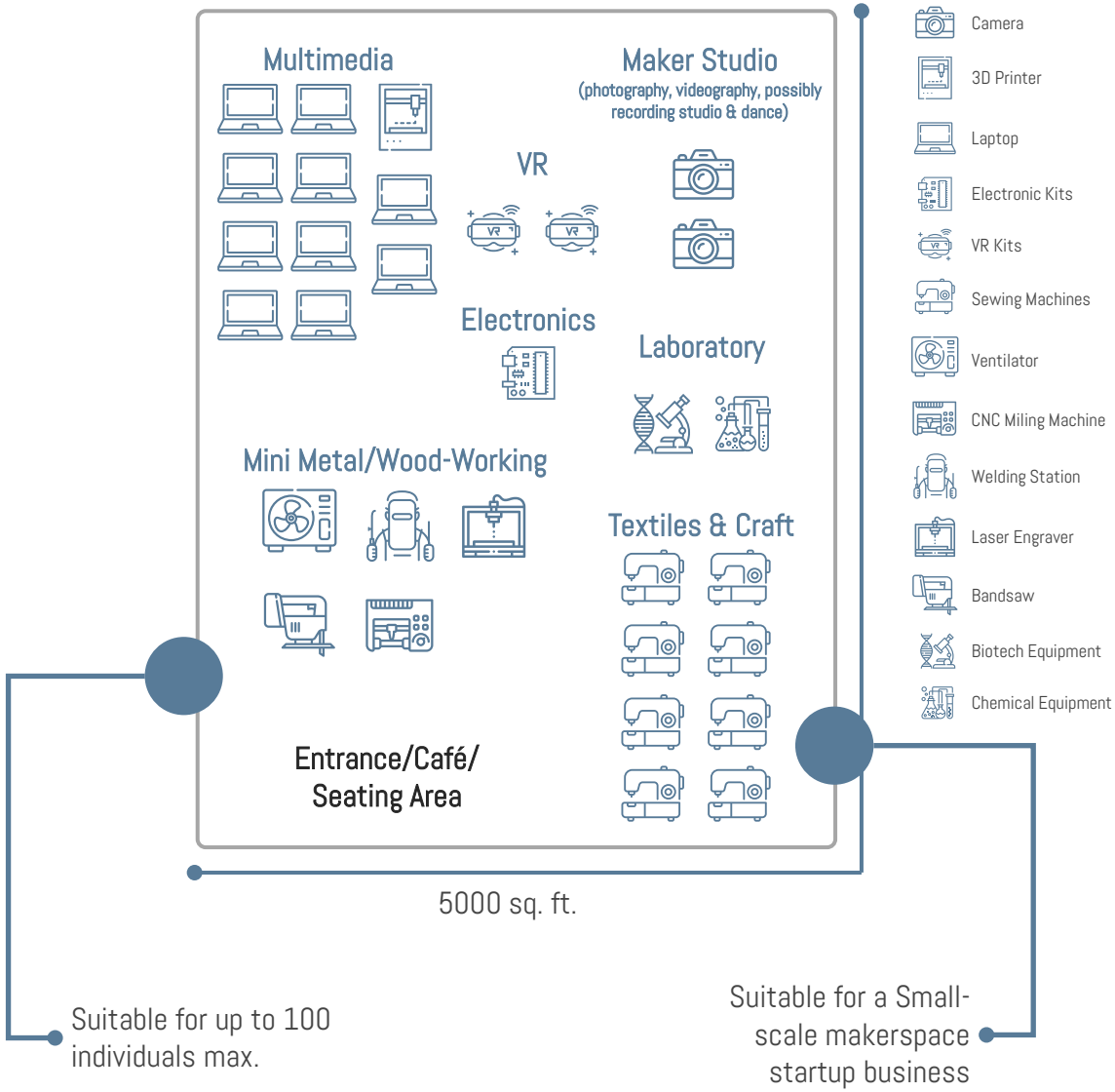
The RM 50,000 'Community' space



The RM 100,000 'University' space



The RM 300,000 'Business' space



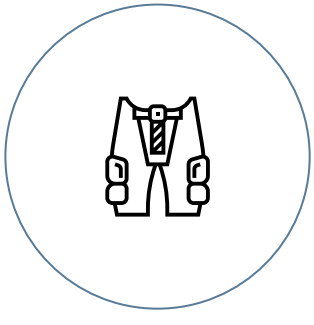
Safety Measures

Symbols in the lab

Symbols of caution and warning should be put up on the wall. Users should understand the meaning of these symbols for everyone's safety in the lab.

Biosafety

Any works related to biological agents should adhere to the rules and regulations in the laboratory. Research involves Genetically Modified Organism should obtain approval from the relevant ministry.



Personal Protection Equipment (PPE)

Personal Protection Equipment should be worn at all time during the conduct of experiments/workshop such as goggle, safety jacket or lab coat, gloves to avoid injuries.

Makerspace Equipment

What kinds of equipment are typically found in a Makerspace?

9:04 am

Are there any specificities?

9:06 am

There are no rules!

9:07 am

A Makerspace can be in any field you like. There are even Agriculture Makerspace, Biology Makerspace, and even Astronomy Makerspace.

9:07 am

Any equipment which can be used to produce anything creative can be included in a Makerspace. In other words, any equipment!

9:08 am

Let's explore the common equipment in a Makerspace.

9:08 am

List of Equipment*

Electronic Hardware Hacking Equipment

Soldering Station
PCB Milling Machine
Pick and Place Machine
Wire Crimper
Electronic Toolkits Set
Digital Oscilloscope
Electronic Prototyping Board

Prototyping Equipment

3D Printer
Laser Machine
Sewing Machine
Embroidery Machine
Scan and Cut Machine for Vinyl
CNC Lathe
CNC Milling
Belt Sander
Air Compressor
Injection Moulding
Thermoforming
UV Printer
Empathy Design Thinking Equipment
Electronic Hand Tool Set
3D Scanning

Art and Craft Equipment

Button Maker
Air Brush
Acrylic Bender

Video, Sound and Recording Equipment

Computer
Adjustable lighting System
Green Screen
Soundboard
Microphones
Camera & Video Camera
AR/VR Equipment
Google AI kit
Robotic ARM

Virtual Equipment

Oculus Rift stations
On-board networking devices
Server application
Monitoring camera
Smart glasses
Smart board

Miscellaneous

Consumable
First Aid
Fire Extinguisher
Safety Gear

**The equipment are not limited to the above, depending on the needs of the community.*

Makerspace Equipment

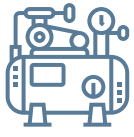

3D Printer


3D Scanner


Laser Engraver


CNC Milling Machine


CNC Lathe


Air Compressor


Ventilation

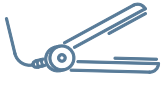

Welding Station


Oscilloscope


Bandsaw


Sanding Belt


Airbrush


Acrylic Bender


Biotech Equipment


Chemical Equipment

Camera

Sound Board

Microphone & Video Camera

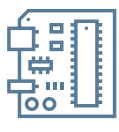
Adjustable Lighting System

Green Screen

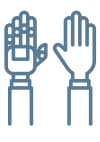
Sewing Machines

Computer

Smart Glasses



Electronic Kits



Robotic Arm

Server System

Monitoring Camera

First Aid Kit

Fire Extinguisher

Safety Gear

Virtual Makerspace

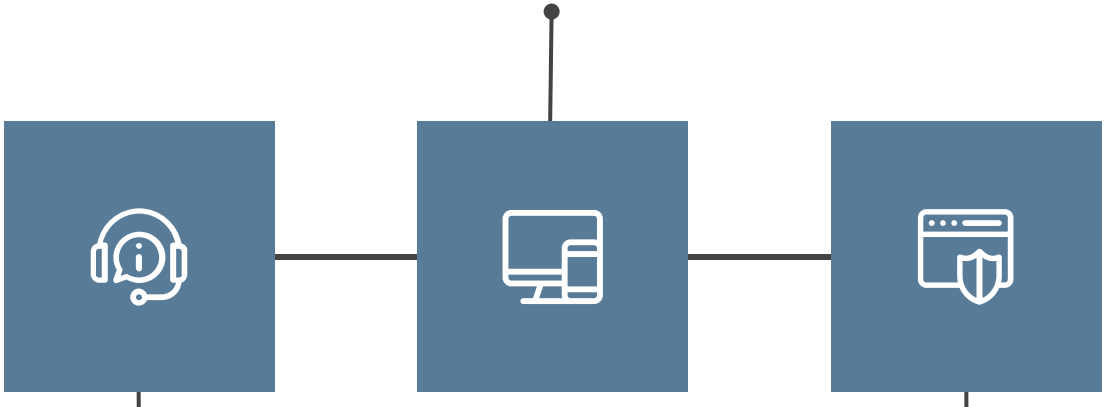
Virtual Makerspaces are spaces that ensure everyone from the community can participate remotely.

Physical Makerspaces are used to build new assistive technology and increase accessibility.

A good Makerspace design must make sure people with special needs can access the spaces and create the products and designs that they planned and proposed.

Ideation, Team, and Meeting Space

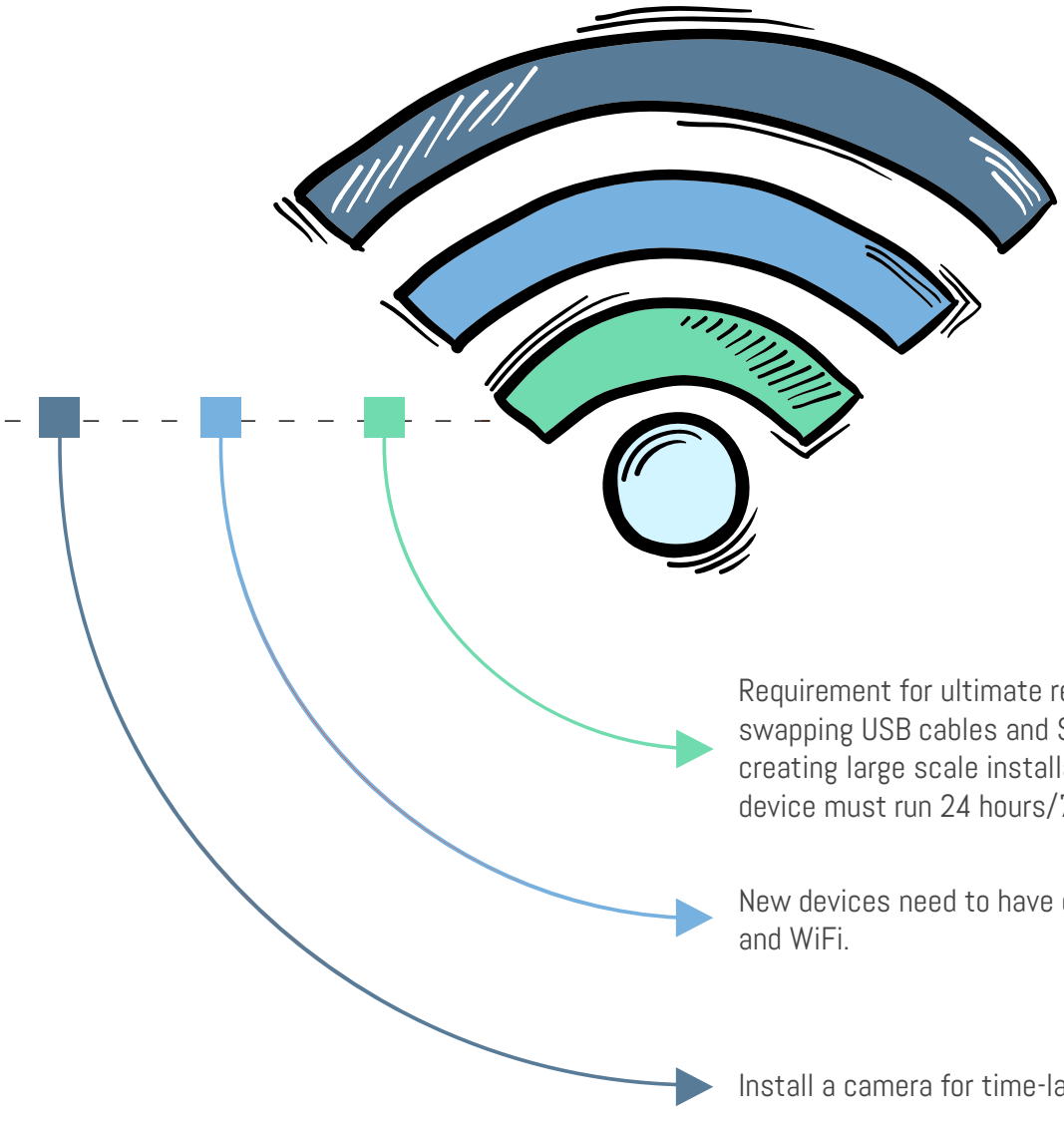
Makerspace communities should have access to making on their own device, anytime, anywhere.



Makerspace needs to create freedom and flexibility for their community such as standing during brainstorm, spread out across the floor or even virtual communication.

There is a need to have Database Management System and Network connection for each devices in the Makerspace.

Adding WiFi to Makerspace Devices

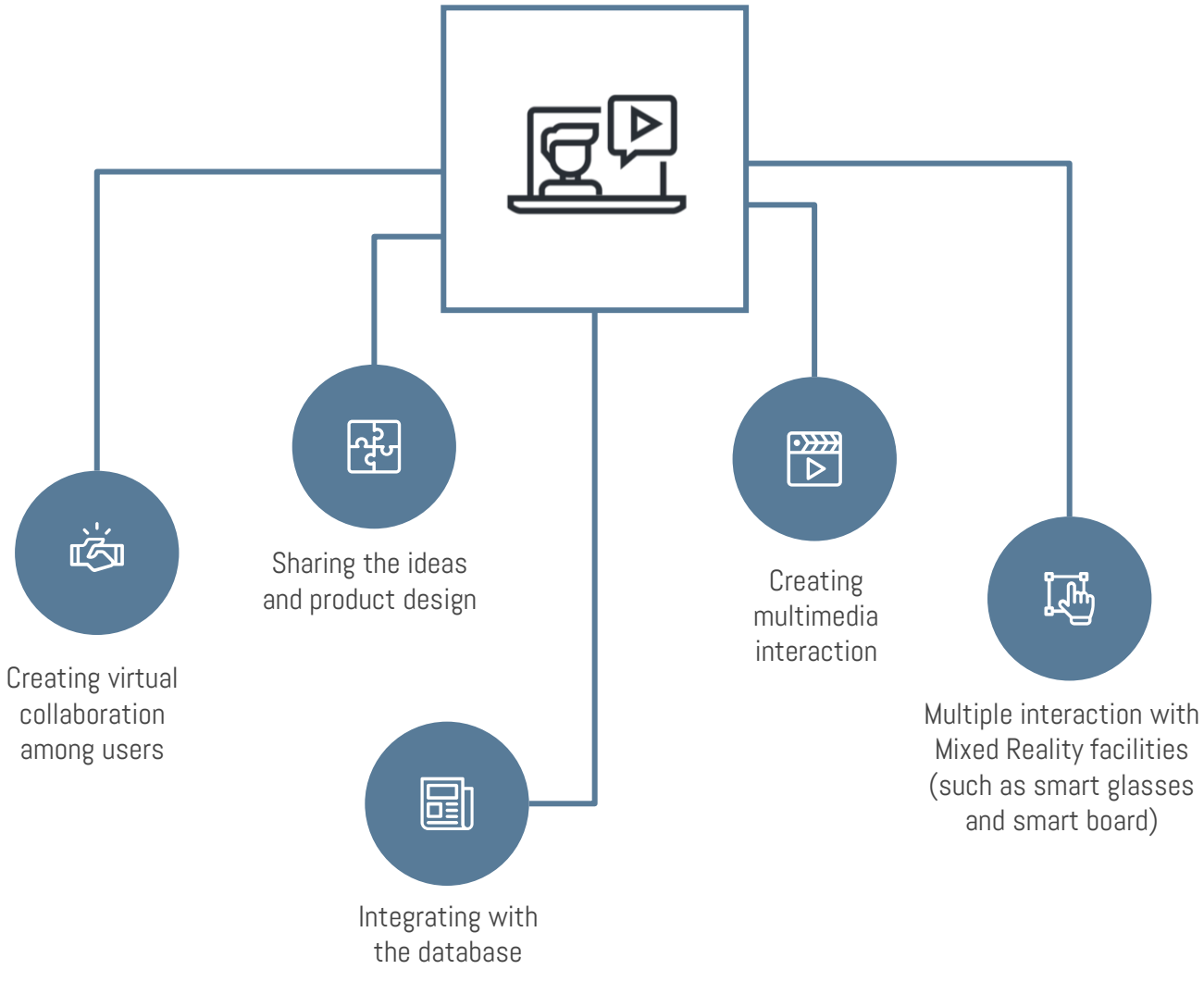


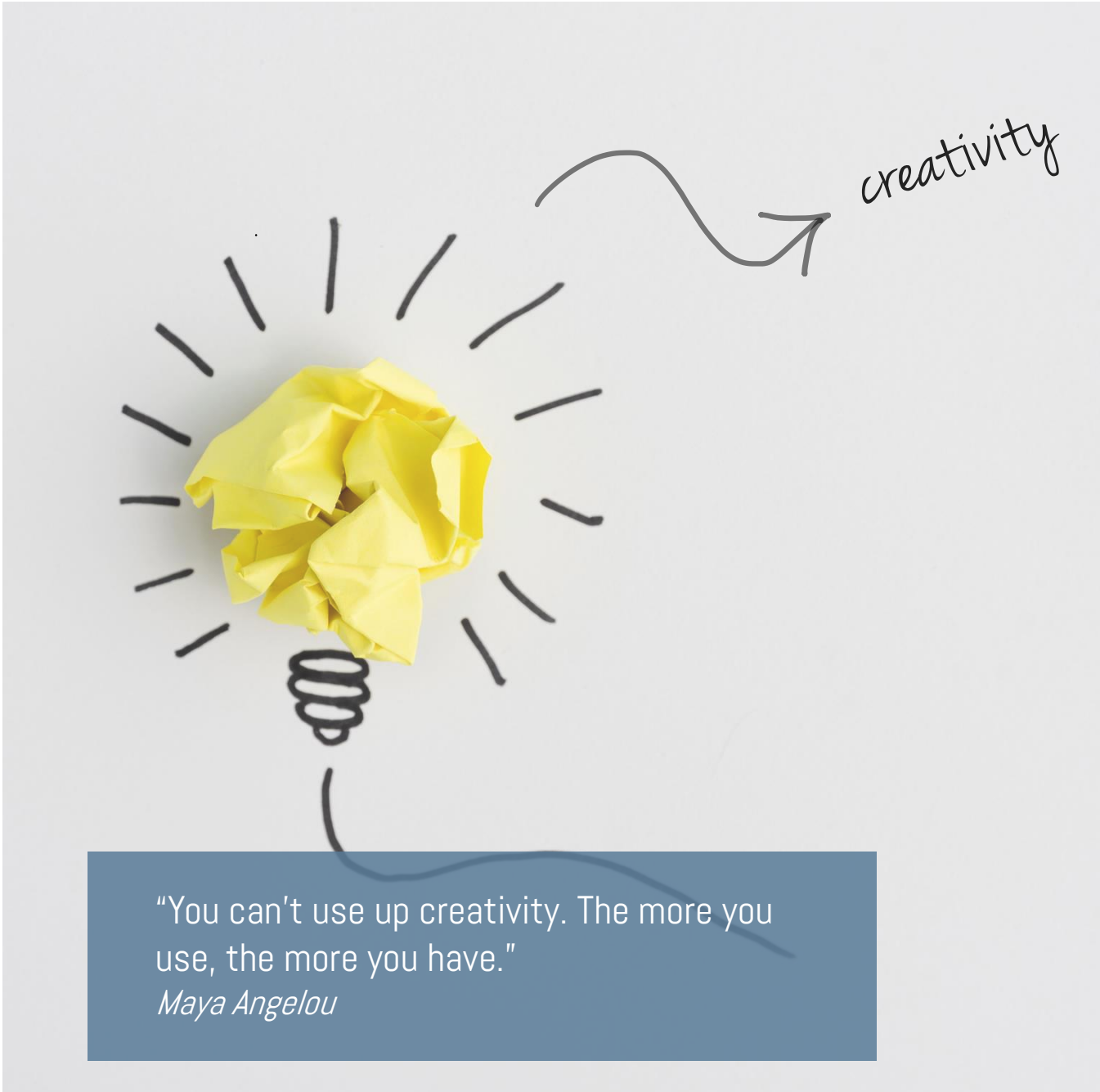
Requirement for ultimate reliability without swapping USB cables and SD cards, especially creating large scale installation or when the device must run 24 hours/7 days a week.

New devices need to have on-board networking and WiFi.

Install a camera for time-lapse and monitoring.

Sharing Interface





"You can't use up creativity. The more you use, the more you have."
Maya Angelou

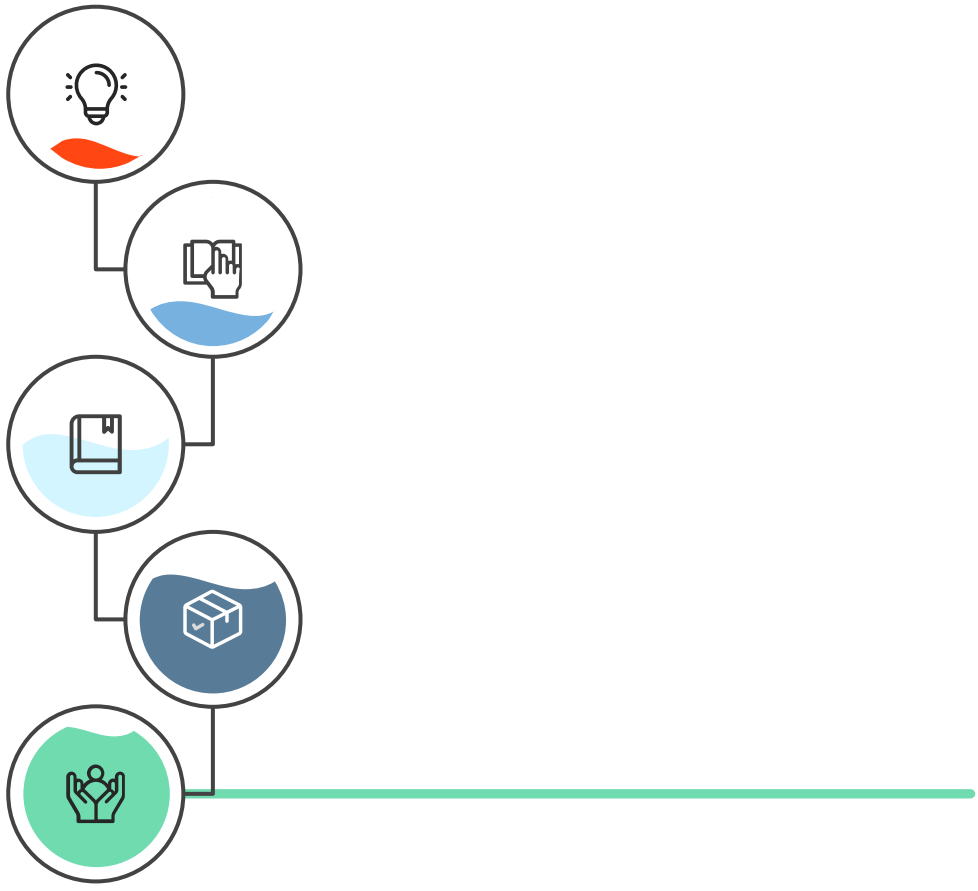
Summary: Virtual Makerspace

"Anyone who stops learning is old, whether at twenty or eighty."
Henry Ford

Virtual Makerspace ensure leaners from the community able to participate and embrace the 21st century learning activities with the assurance that they were well equipped with the right tools and knowledge for the future.

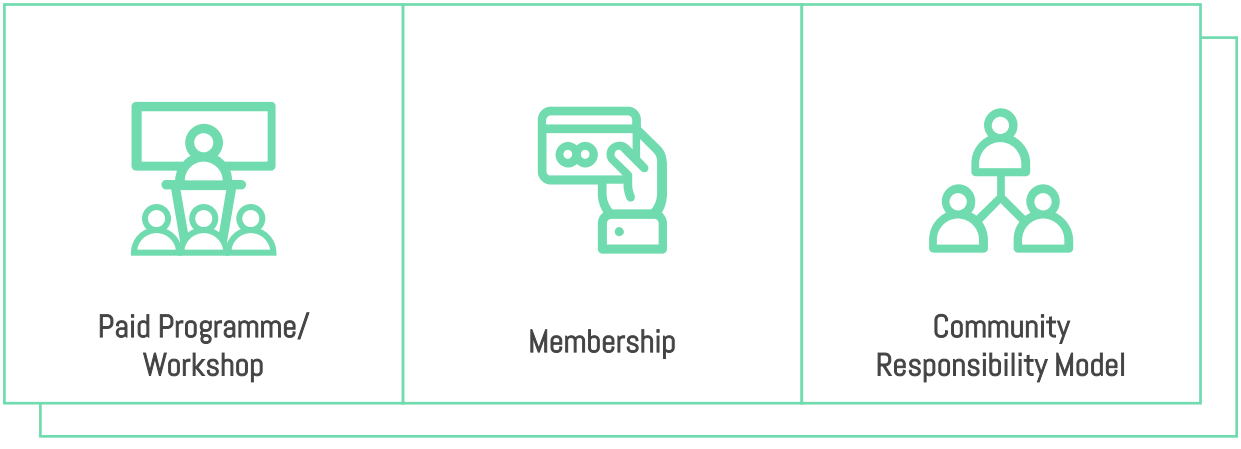
A good makerspace design let disabled learners access the makerspace and create creative products. The designed makerspace will enhance learners' agility to adapt, innovate and perform their creativity towards lifelong learning.

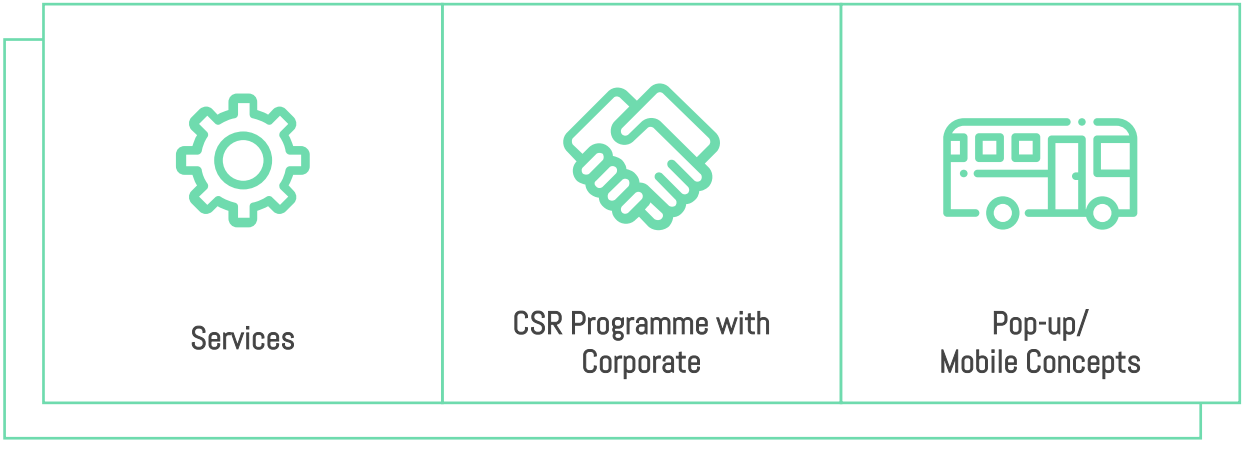
Well designed Makerspaces with multiple interaction via mixed reality will activate learners' creative thinking towards better human values.



SUSTAINING MAKERSPACE

Makerspace Business Model






"Every great advance in science has issued
from a new audacity of imagination."
John Dewey

Paid Programme/Workshop

Paid Programme/
Workshop

- 3D Printing 101/102/103
- Electronic 101/102/103
- Laser Cut 101/102/103
- CNC 101/102/103
- Drone 101/102/103
- Technology Talks and Seminar

Membership

Membership

Community Responsibility Model

Services

Services

- 3D Printing Services
- Laser Cutting Services
- Fabrication Services
- Design & Consultation Services

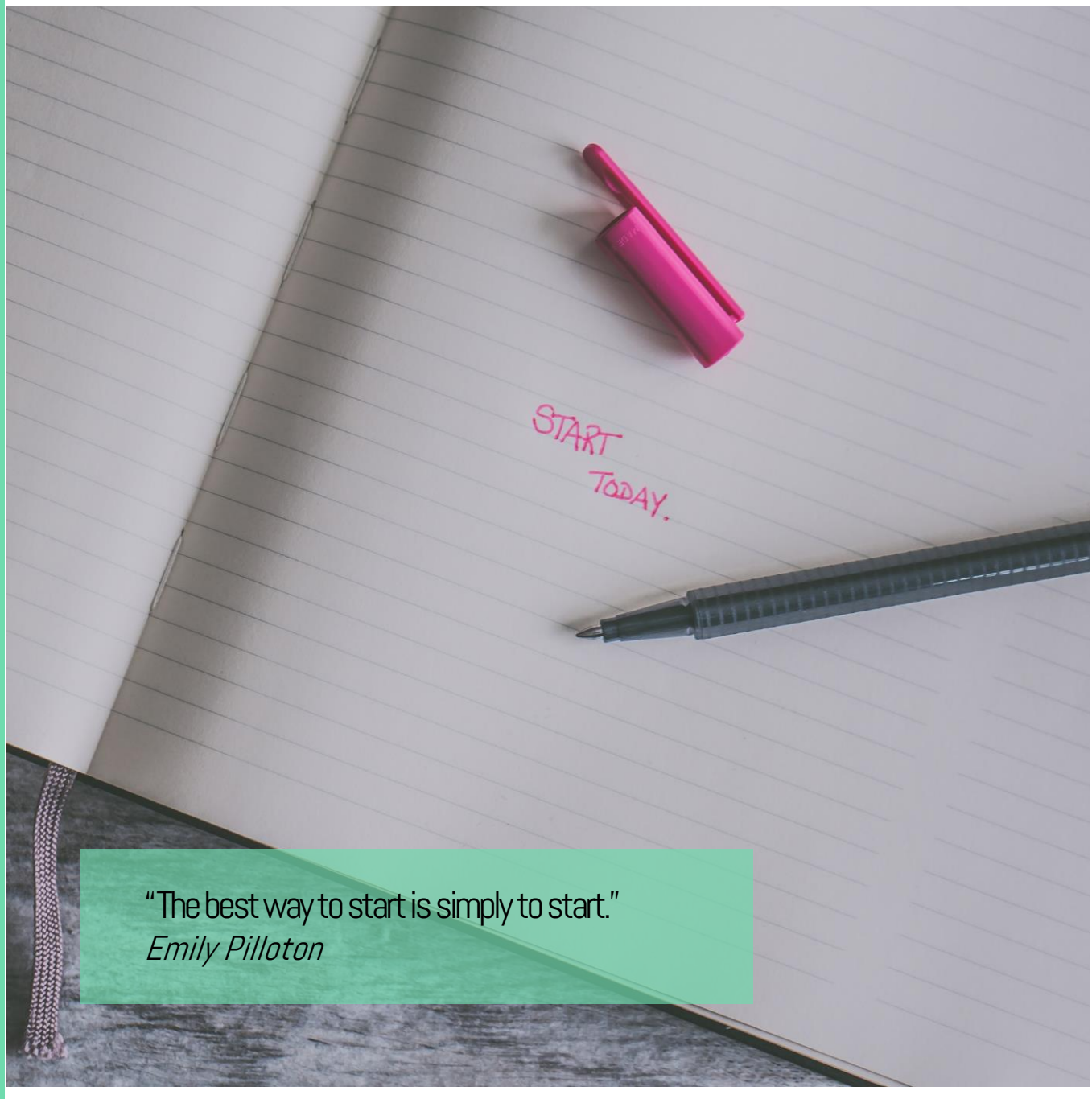
CSR Programme with Corporate

CSR Programme with Corporate

Pop-up/Mobile Concepts

Pop-up/
Mobile Concepts

Makerspace Offroader (Makervan 2.0)
RURAL OUTREACH VEHICLE 2017:
KakiDIY MakerVan 1.0 was created.



"The best way to start is simply to start."
Emily Pilloton

Summary: Sustaining Makerspace

" Imagination is the beginning of creation.".
George Bernard Shaw

Sustainability in the makerspace will lead to success. Theory and practice can be fused through leveraging the innovative aspects of a makerspace.

There is no limit to creating a sustainable and successful makerspace.

EVERYONE IS A MAKER

GLOSSARY

Glossary	Definition
3D Printer	A machine that can take a digital 3D model and turn it into a tangible 3D object via additive manufacturing.
3D Scanner	A device which 3D analyse a real-world object or environment to collect data on its shape and possibly its appearance (e.g. colour). The collected data can then be used to construct digital 3D models.
Acrylic Bender	A heat bending machine allows thermoplastic sheets to be re-molded or formed.
Air Compressor	A device that converts power either using an electric motor, diesel or gasoline engine, etc. into potential energy stored in pressurised air.
Airbrush	A machine that spreads paint using air pressure, used for painting or for delicate improvement work on photographs.
Algorithms	A process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer.
Augmented Reality	An enhanced version of reality created by the use of technology to overlay digital information on an image of something being viewed through a device (such as a smartphone camera).
Bandsaw	A power saw with a long, sharp blade consisting of a continuous band of toothed metal stretched between two or more wheels to cut material such as wood, metal, etc.
Bioinformatics	The collection, classification, storage, and analysis of biochemical and biological information using computers especially as applied to molecular genetics and genomics.
Bioreactor	A device or apparatus in which living organisms and especially bacteria synthesise useful substances (such as interferon) or break down harmful ones (as in sewage).
Biotech Equipment	Apparatus or machines that are commonly used to carry out experiments in the field of biotechnology.
Biotechnology	The manipulation (as through genetic engineering) of living organisms or their components to produce useful usually commercial products (such as pest resistant crops, new bacterial strains, or novel pharmaceuticals).
Capstone Project	A project (normally done in group) that involves the process of devising a system or component to meet desired needs for real life application.

Glossary	Definition
Chemical Equipment	Apparatus or machines that are commonly used to carry out experiments in the field of chemistry.
CNC	Computer Numerical Control is a method for automating control of machine tools through the use of software embedded in a microcomputer attached to the tool. It is commonly used in manufacturing for machining metal and plastic parts.
CNC Lathe	Computer numericl control (CNC)s typically designed to utilise modern versions of carbide tooling and processes.
CNC Milling Machine	Computer numerical control milling, is a machining process which employs computerised controls and rotating multi-point cutting tools to progressively remove material from the workpiece and produce a custom-designed part or product.
Coccus-shape	A spherical-shape.
Constructionist Learning	Constructionism advocates student-centered, discovery learning where students use information they already know to acquire more knowledge.
Corporate Social Responsibility	A self-regulating business model that helps a company be socially accountable—to itself, its stakeholders, and the public.
Database	A usually large collection of data organised especially for rapid search and retrieval (as by a computer).
Debugging	A process of finding and resolving defects or problems within a computer program that prevents correct operation of computer software or a system
Digestion	An enzymatic process of cleaving DNA (in Biotechnology context).
DNA	Abbreviation for Deoxyribonucleic acid; any of various nucleic acids that are usually the molecular basis of heredity.
Dye	Colouring.
Electronic Kits	A package of electrical components used to build an electronic device.
Electrophoresis	The movement of suspended particles through a medium (such as paper or gel) under the action of an electromotive force applied to electrodes in contact with the suspension.
Flowcharts	A diagram of the sequence of movements or actions of people or things involved in a complex system or activity. In computer programming, flowchart is a graphical representation of a computer program in relation to its sequence of functions (as distinct from the data it processes).
Gene regulation	A process of controlling a gene for its expression.

Glossary	Definition
Green Screen	A green background in front of which moving subjects are filmed and which allows a separately filmed background to be added to the final image.
Hackathons	An event, typically lasting several days, in which a large number of people meet to engage in collaborative computer programming.
High Performance Liquid Chromatography	Liquid chromatography in which the degree of separation is increased by forcing a solvent under pressure through a densely packed adsorbent.
Human Ecology	An interdisciplinary and transdisciplinary study of the relationship between humans and their natural, social, and built environments.
Industry 4.0	An Industrial Revolution that focuses heavily on interconnectivity, automation, machine learning, and real-time data.
Internet of System (IoS)	When the IoT things become systems, the term of IoT becomes Internet of System.
Internet of Things (IoT)	When the IoT things become systems, the term of IoT becomes Internet of System.
Laser Engraver	A subset of laser marking and using lasers to engrave an object surfaces.
Light Emitting Diode	A semiconductor diode which glows when a voltage is applied.
Logic Circui	A circuit for performing logical operations on input signals.
Makerthons	A design sprint-like event where makers are involved in product and software development.
Microbe	Microorganism; an organism (such as a bacterium, a fungus, or protozoan) of microscopic or ultramicroscopic size.
Mixed Reality	A merging of real and virtual worlds to produce new environments and visualisations, where physical and digital objects co-exist and interact in real time.
Monitoring Camera	A video camera used for the purpose of observing an area. They are often connected to a recording device or IP network
Oscilloscope	A device to display and analyse the waveform of electronic signals.
Pop-up/ Mobile Concept	A graphical user interface (GUI) display area, usually a small window, that suddenly appears ("pops up") in the foreground of the visual interface.
Pseudo-Code	A notation resembling a simplified programming language, used in program design.
Restriction Enzyme	Any of various enzymes that cleave DNA into fragments at specific sites in the interior of the molecule.

Glossary	Definition
Robotic Arm	A type of mechanical arm, programmable, with similar functions to a human arm; the arm may be the sum total of the mechanism or may be part of a more complex robot.
Safety Gear	Protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter.
Sanding Belt	An electric motor used in shaping and finishing wood and other materials to get smooth surfaces.
Server System	A computer program or a device that provides functionality for other programs or devices.
Smart Glasses	A wearable computer glasses that add information alongside or to what the wearer sees. Alternatively, smart glasses are sometimes defined as wearable computer glasses that are able to change their optical properties at runtime.
Sound Board	A thin sheet of wood over which the strings of a piano or similar instrument are positioned to increase the sound produced.
Tinkering	Expresses the creation and understanding of concepts and physically engage with things.
Transducer	A device that converts variations in a physical quantity, such as pressure or brightness, into an electrical signal, or vice versa.
Typography	Art and technique of arranging type to make written language legible, readable, and appealing when displayed.
Ventilation	Flow of air in any space to provide high indoor air quality.
Ventilator	A machine that provides mechanical ventilation by moving breathable air into and out.
Virtual Reality	A computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.
Welding Station	Welding space for fabrication or sculptural process that joins materials, usually metals or thermoplastics.

IMAGE CREDITS

EVENTS

KAKIDIY, KAKIREPAIR PROGRAM
MYCRO SDN BHD, WORKSHOP ACTIVITIES
MYCRO SDN BHD, COMMUNITY PROJECT
MYCRO SDN BHD, SANDBOX CAFÉ & CO
MYCRO SDN BHD, #THISABILITY MAKEATHON 2017
MYCRO SDN BHD, THE GREAT LAB CHALLENGE MEDICAL CLUSTER
MYCRO SDN BHD, PETROSCIENCE AFTER HOUR WORKSHOP
MYCRO SDN BHD, THE MAKERSPACE OFFROADER, MYDIGITALMAKER FAIR 2018

STOCK PHOTOS

UNSPLASH.COM
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MEET THE AUTHORS

"Working on creative projects activate the reward system of the brain, we get bursts of dopamine levels naturally."
Aini Marina Ma'rof

"Communities are the basic unit of sustained innovation and a makerspace is the centre that make it possible."
Darween Reza Sabri

"Don't limit your idea space. Challenge your idea with makerspace!"
Makhfudzah Mokhtar

"There is no box."
Muhammad Hafiz Wan Rosli

"Creativity is the power to connect and border less."
Nazlina Shaari

"A good team is just like a flock of bird flying together towards their destiny"
Rahmita Wirza O.K. Rahmat

"Dream is just a dream if you don't work on it."
Suet Lin Chia

A maker mindset ignites a culture of innovation."
Wan Zuhainis Saad

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ASMAH SHUKRI

TRANSDISCIPLINARY MAKERSPACE

“

LET’S BUILD THE
CHANGE WE WISH TO SEE

9 789672 828136