

Learning through Making: The role of the Maker mindset in cultivating innovation and creativity in students

Dr. Kiruthika Ramanathan
Science Centre Singapore



Objectives

- To understand about the Maker movement and the maker mindset
- To get some hands on experience on creating a makerspace at a school
- To get some inspirations on the kinds of activities that can be hosted at a makerspace



I AM A MAKER

With my own two hands
I forge the future
From my imagining,
my work my sweat
With these tools
I can build worlds
Here

I put wire and foam
Transistor and plastic
Rubber
Metal and wood
Together to make

Something new
What does it do
Where will it take us
New places
New worlds
All from my workshop



What is the Maker movement?

MAKE

The maker movement is a global platform for connecting Makers with each other, serving a growing community of Makers who bring a DIY mindset to technology. Whether as hobbyists or professionals, Makers are creative, resourceful and curious, developing projects that demonstrate how they can interact with the world around them.



“What you see in Singapore is an exercise of desperate imagination. It's not about innovation because it's sexy, but because it's survival.”

**–Dr Vivian Balakrishnan,
Minister for the Smart Nation**



singapore



What is the Maker movement?



Collaborative

Small businesses will dominate

Work will be organized based on projects and not titles

Broader definition of value creation

Disruptive

R&D moving out of the corporate environment

Resources are available to individuals

Ethos of the Maker movement

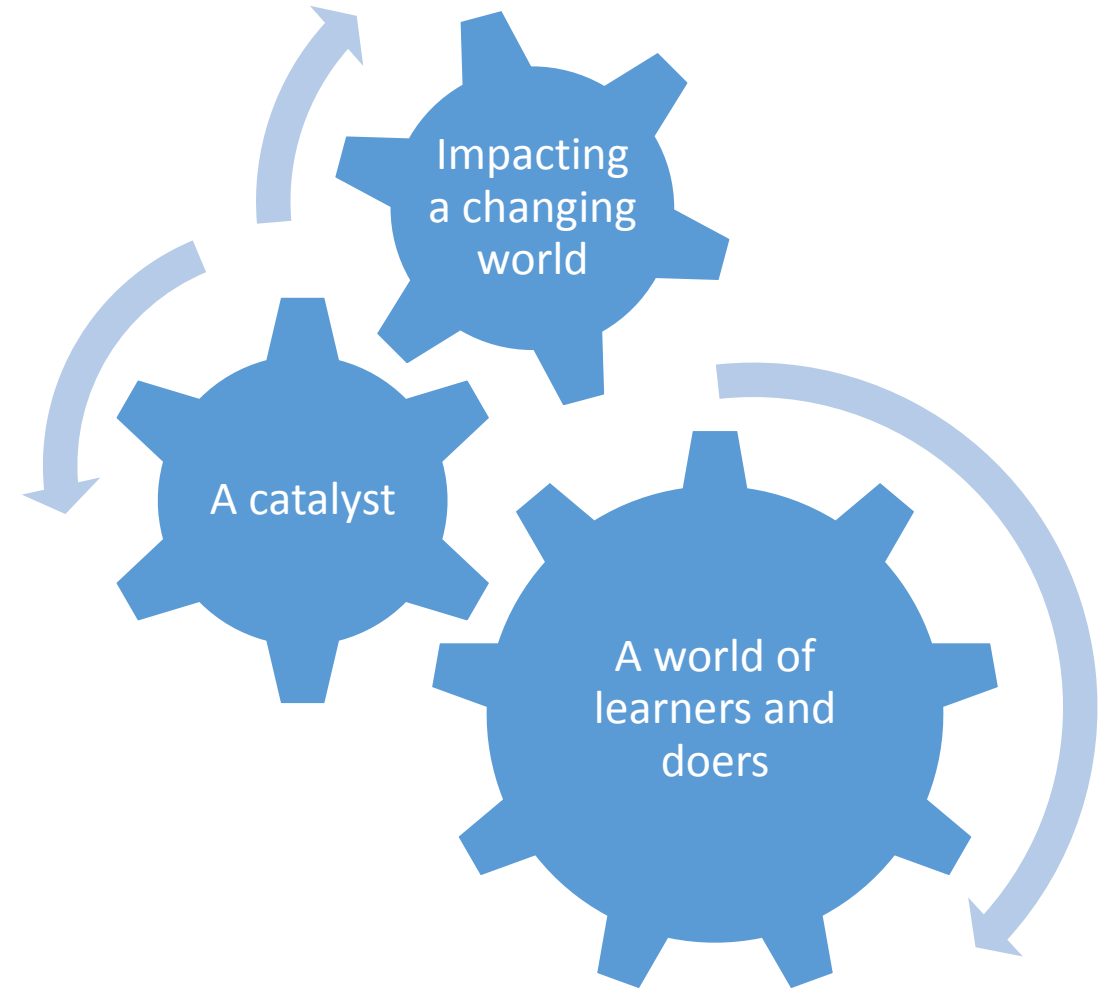
Tinkering and
Experimenting

Building platforms for
collaboration and
communities for learning

Acting upon the most
vexing problems in our
daily life



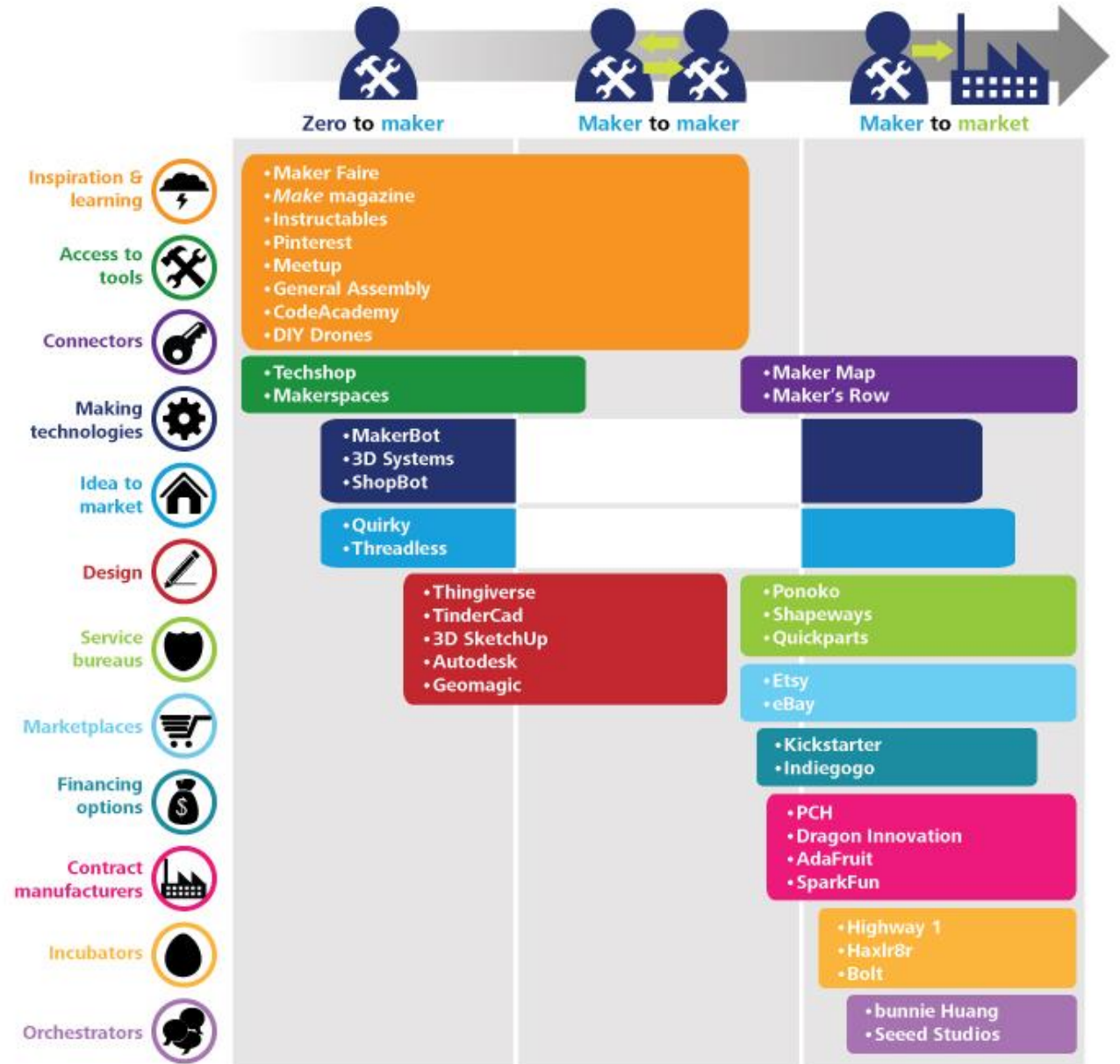
What is the Maker movement?



STEM is a skillset.
Maker is a mindset

What is the Maker movement?

The advantage of being able to leverage on a wide plethora of resources and support available at every stage of the journey



So how does all this apply to
my classroom??



"Education is something that other people do to you. Learning is something you do for yourself."

- Joi Ito, Director, MIT Media Lab



Maker experiences that you can craft



Pop up makerspaces
Bee sized Making for absolute beginners, pop up maker spaces are set up at various locations around Singapore. With many booths and activities, ranging from electronics, repair and crafting, there is something for everyone to get their hands dirty.



Maker workshops
These workshops target a wide range of audience, to get the idea of making and pick up the basics of tool usage and maker mindset in a safe environment.



Maker Camps and immersion programmes
Children (and adults) have the chance to spend an extended amount of time in a makerspace. They become self directed learners and are exposed to a wide range of maker skills, such as design, electronics, craft and more, learning to work confidently with real tools.

MAKER MINDSET

No matter where your starting point, the maker ecosystem in Singapore can develop your skills and provide the right opportunities

Maker Residency

Residencies and apprenticeship programmes offer opportunities for Makers to learn from and teach others specialized skills and also interact with other makers, resulting in interdisciplinary creations.

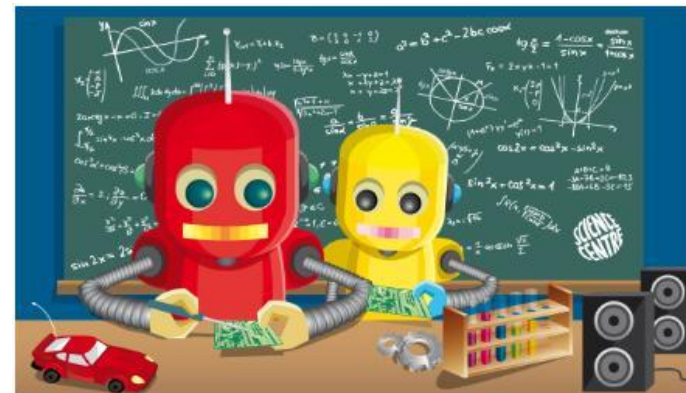


Maker Faire
is the Greatest Show and Tell on Earth—a family-friendly showcase of invention, creativity and resourcefulness, and a celebration of the Maker movement. It's a place where people show what they are making, and share what they are learning.



Lets Make

- Build the tallest Free Standing Structure with
 - 20 spaghetti sticks, string, tape
- The entire marshmallow must be on top
- You have 18 minutes





Finding sweet spots for learning



How? By making *tangible objects* and by *learning as you make*



The power of experience

The more experiences you have, the more connections you can make – The better you learn



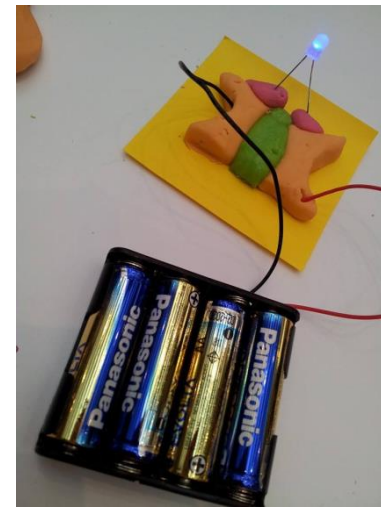
Methods

Materials

Combining experiences



LED + paper



LED + clay

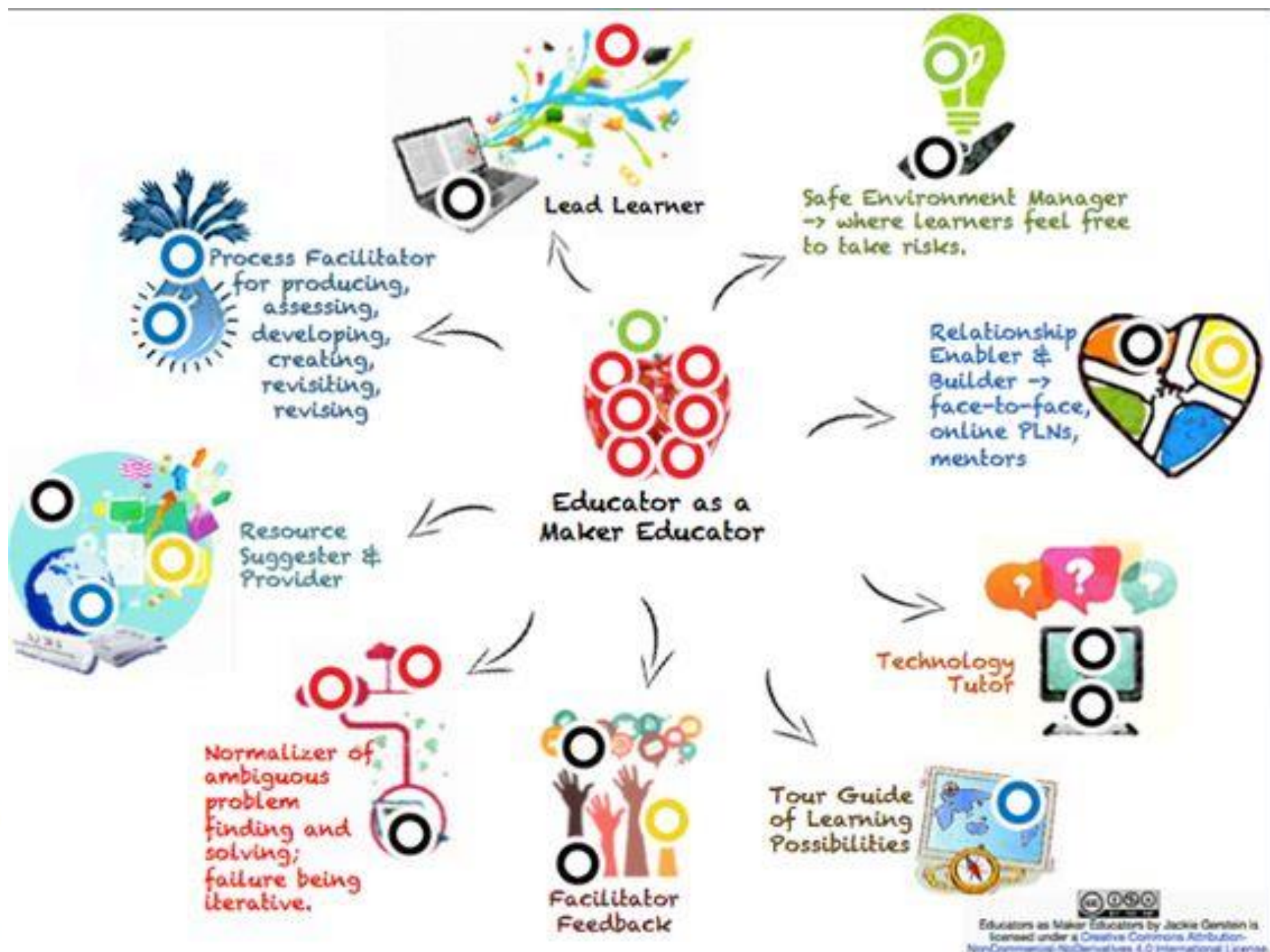


Motor + cardboard

Fabric +
electronics +
coding



Creating a makerspace in a school



Creating a makerspace in a school

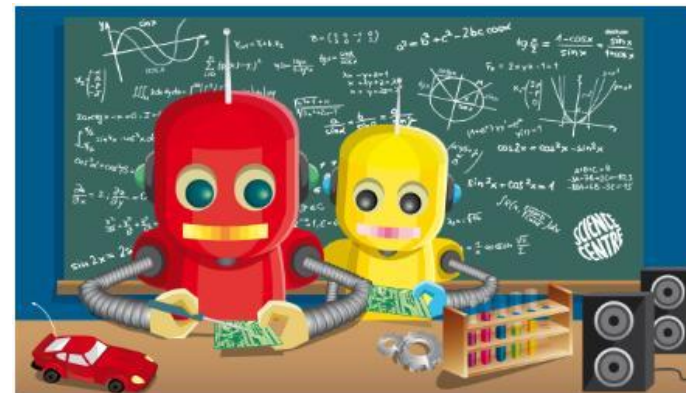


Learning what you want to learn, when you want to learn and how you want to learn

Setting up an authentic learning environment and challenges to facilitate learning by Making

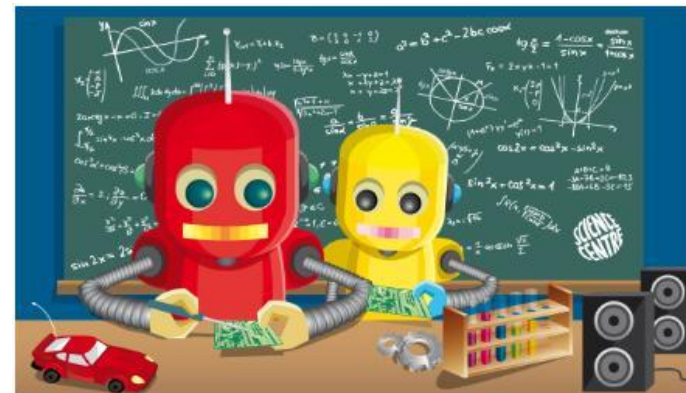
Lets Make: Makey makey

Basics



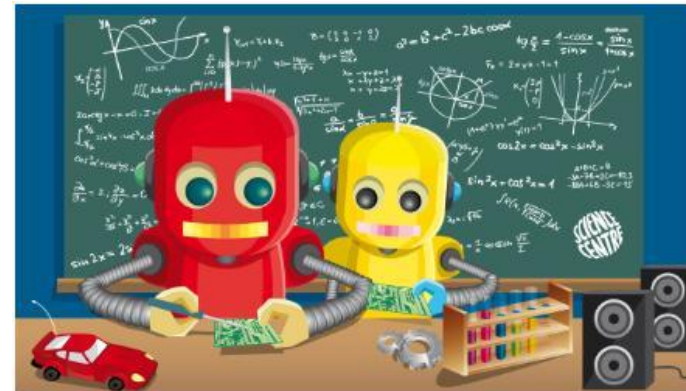
Lets Make: Makey makey

Challenge 1: Make a Musical Instrument



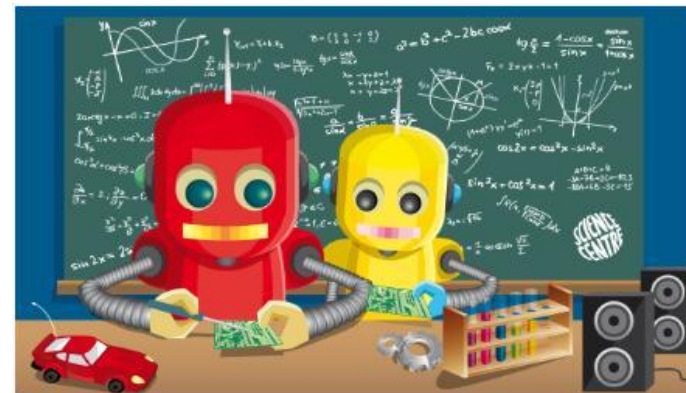
Lets Make: Makey makey

Challenge 1: Make a Steady Hand buzzer game

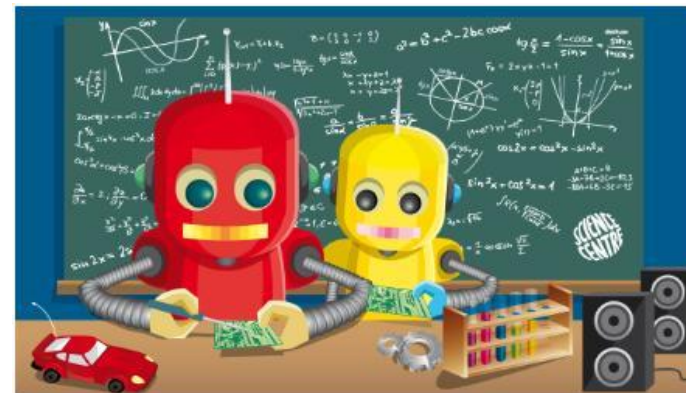


Lets Make: Makey makey

Challenge 1: Make a fencing game

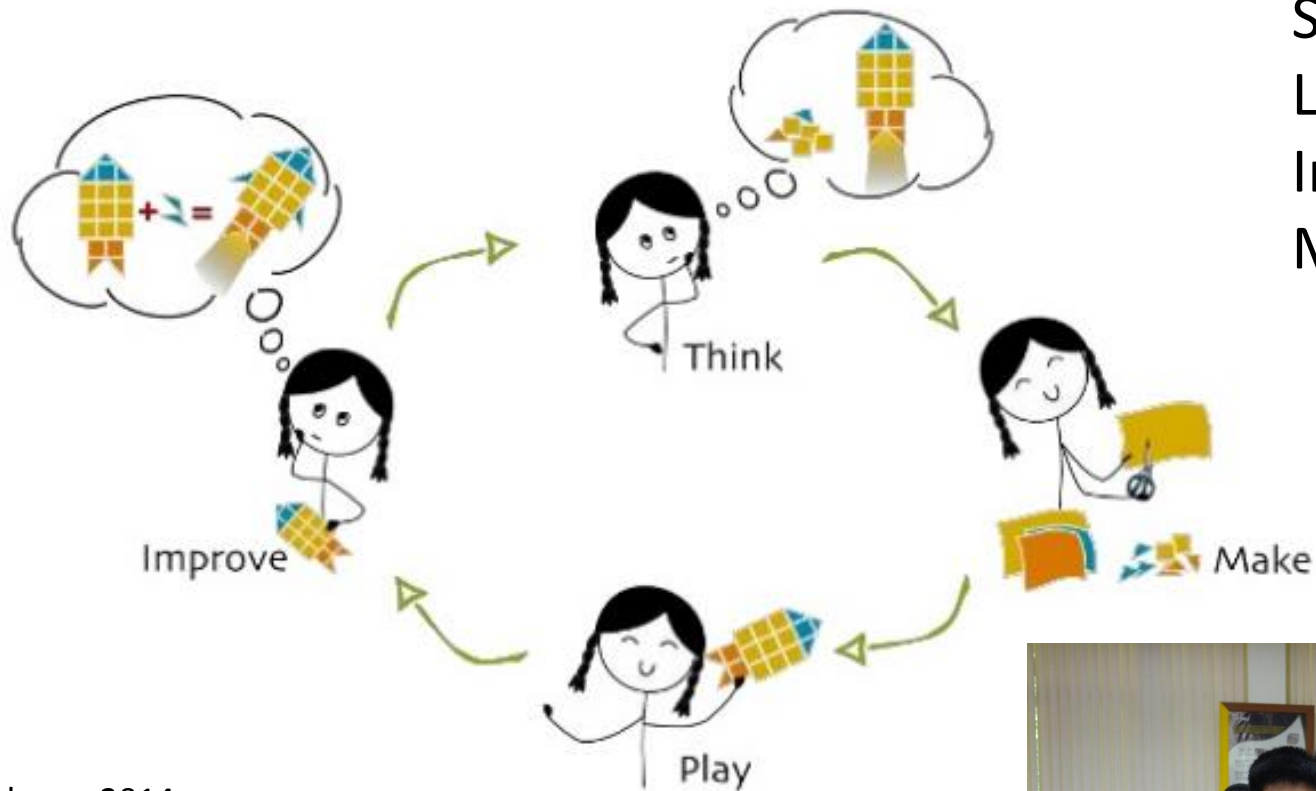


Lunch



Experiences for the Maker child

Student led
Learn only the skills needed
Incremental progress
Makers as mentors



Karkhana, 2014



A word on tool usage

Typical tools in a makerspace

⇒ Computer

⇒ 3D printer

⇒ Laser Cutter

⇒ Microcontrollers

⇒ Solder Stations

⇒ Glue guns

⇒ Hand tools

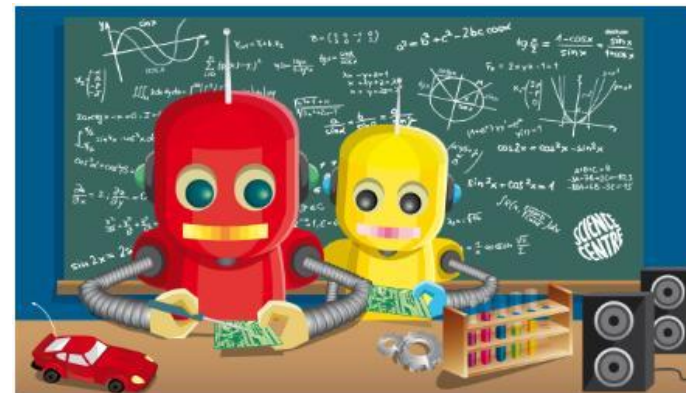


The gaming approach to tool usage



Lets Take apart: A toy

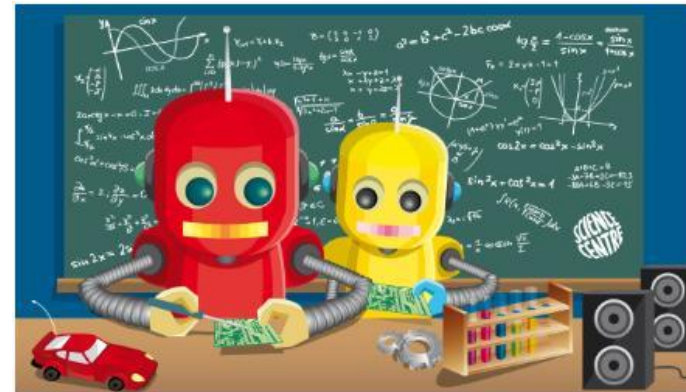
How do you think the toy works?



Take the toy apart

While keeping it still alive for as long as you can

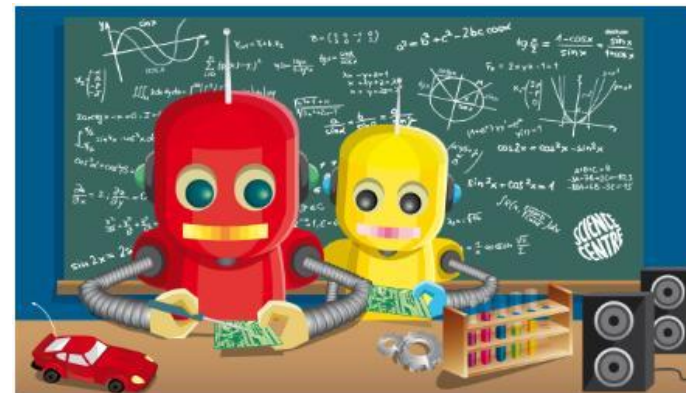
Does it work the way you thought it would?



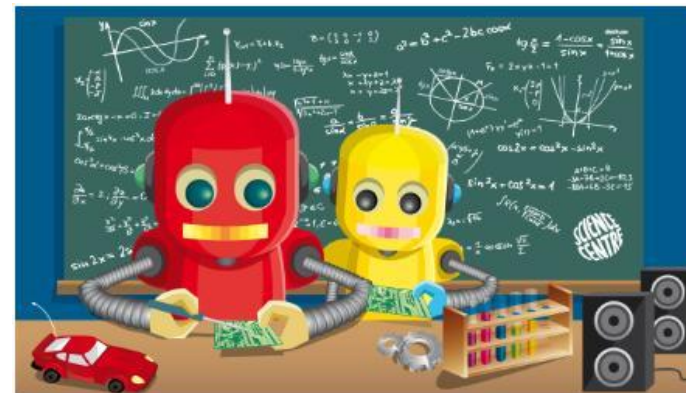
Lets Make: Booby Traps

Make an intruder detection alarm

⇒ Must light up/ make a sound when an intruder is detected



Lets Make: Marble Games!



“Creativity is just connecting things.
Creative people...were able to connect
experiences they've had and synthesize
new things.”

- *Steve Jobs*



CTA Digital iPotty



Useful contacts

