Pedagogical Considerations

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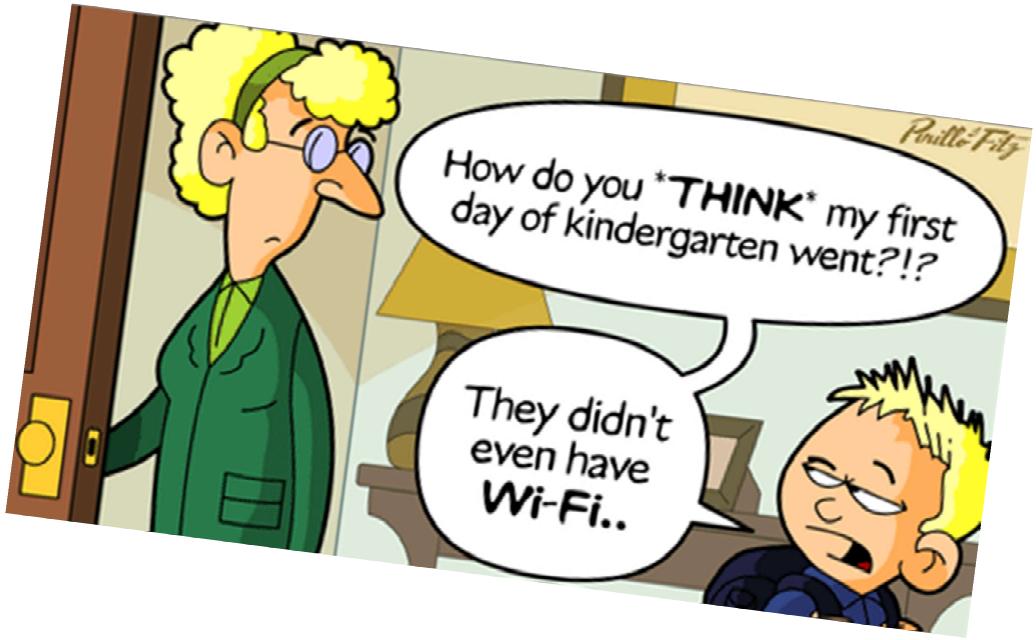
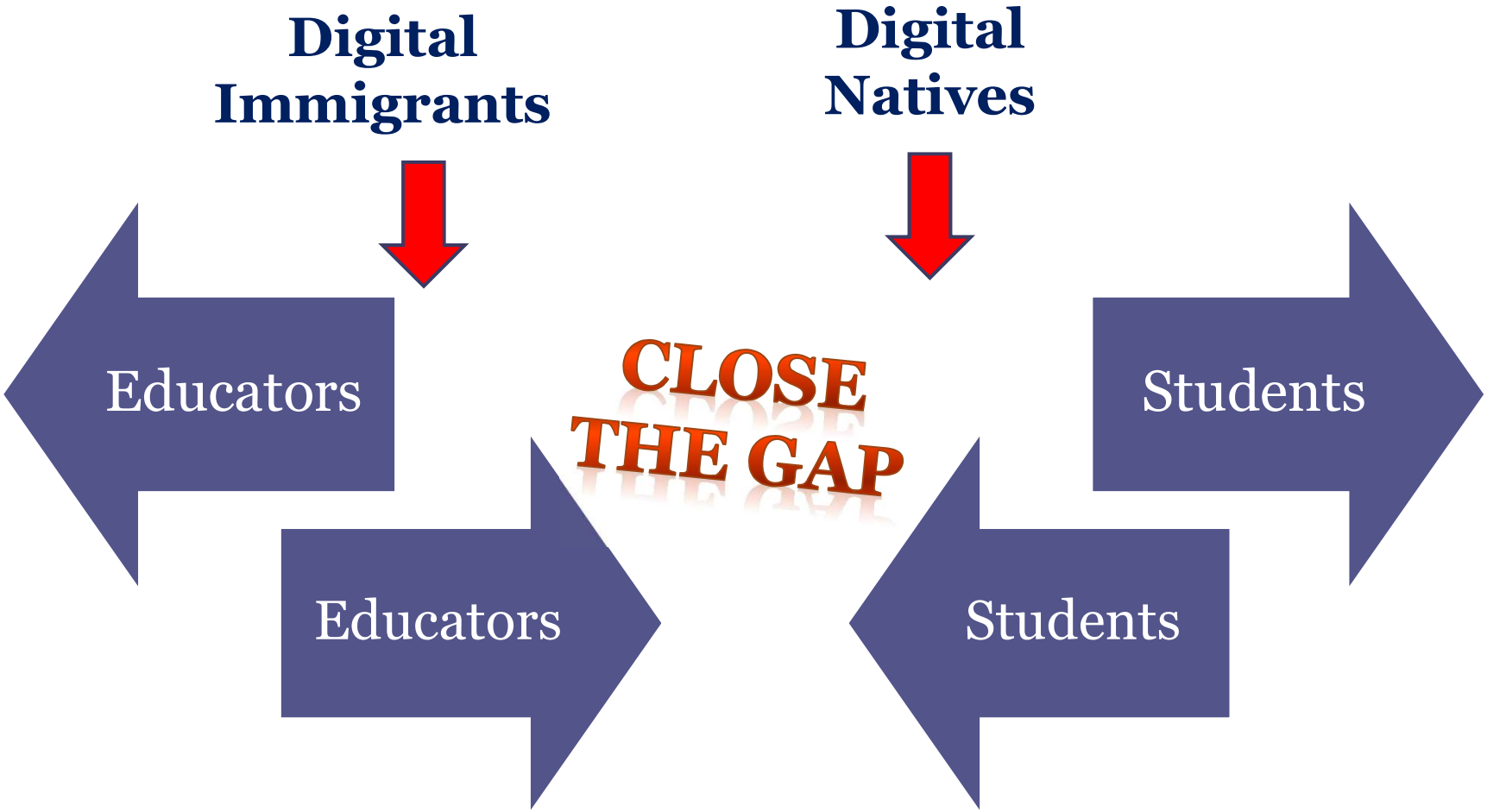
Geez Grandma! It's not that hard! Go into Settings... select wi-fi... Select it! Tap it with your finger... OMG any finger!! Grrrrrrr


How do you *THINK* my first day of kindergarten went?!?
They didn't even have Wi-Fi..

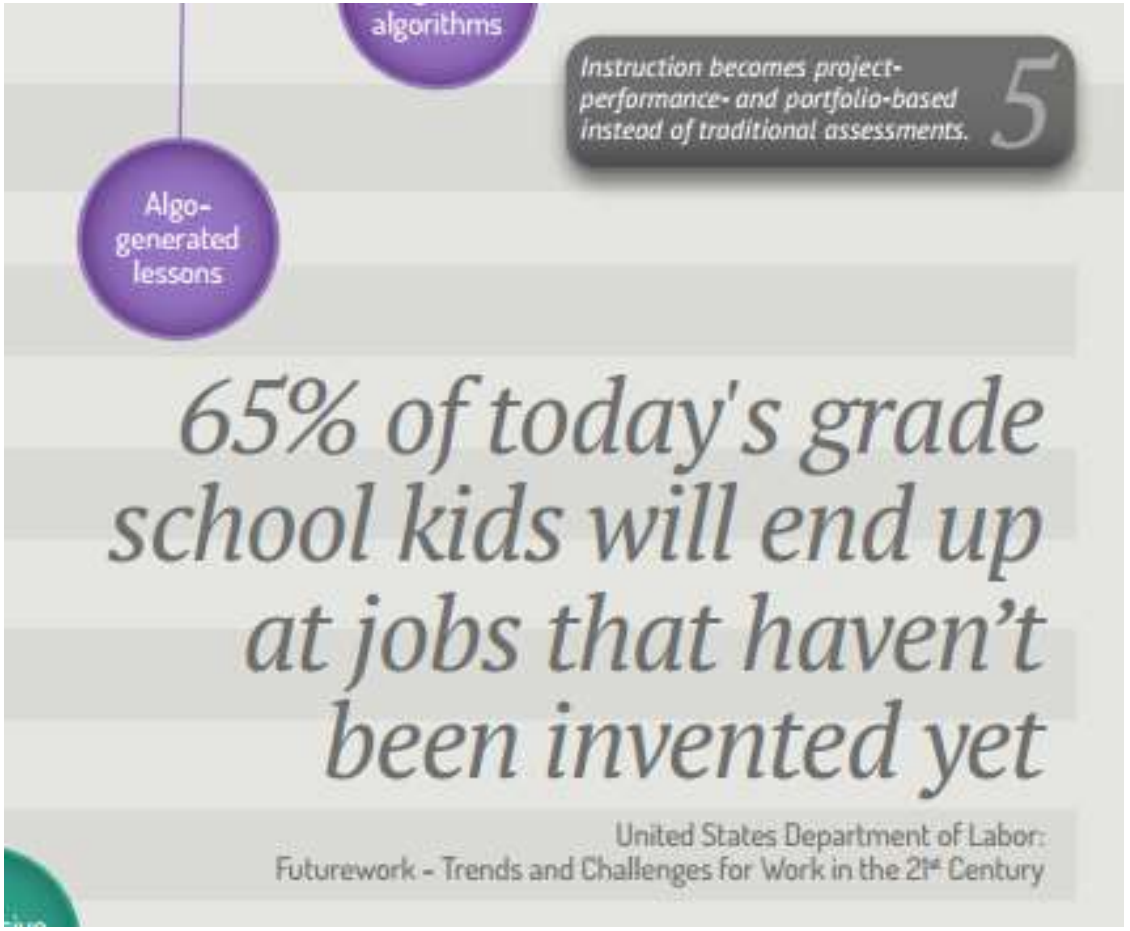
Children 2-5 years old:
the most rapidly developing age group that uses the Internet

Digital Natives



Being part of our students' digital world, it might be more possible to raise their interest, motivate them, transform the classroom environment, and properly prepare them for the society needs and demands.

Future Professions (I)



Future Professions (II)

- Productivity Counselor
- Personal Digital Curator
- Microbial Balancer
- Corporate Disorganizer
- Curiosity Tutor
- Digital Death Manager
- Digital Detox Therapist
- Drone Driver
- Garbage Miner
- Weather Counselor
- Alternative Currency Speculator

Developing 21st century skills

The 21st century skills have been outlined and described by various researchers and reports *(e.g. Bybee & Fuchs, 2006; Ananiadou & Claro, 2009; Trilling & Fadel, 2009; Mojika, 2010; Rotherham & Willingham, 2010; Griffin & Care, 2015)*

- Communication, collaboration, critical thinking, problem solving, knowledge construction, creativity, innovation, self-directed learning, global citizenship and digital literacy.

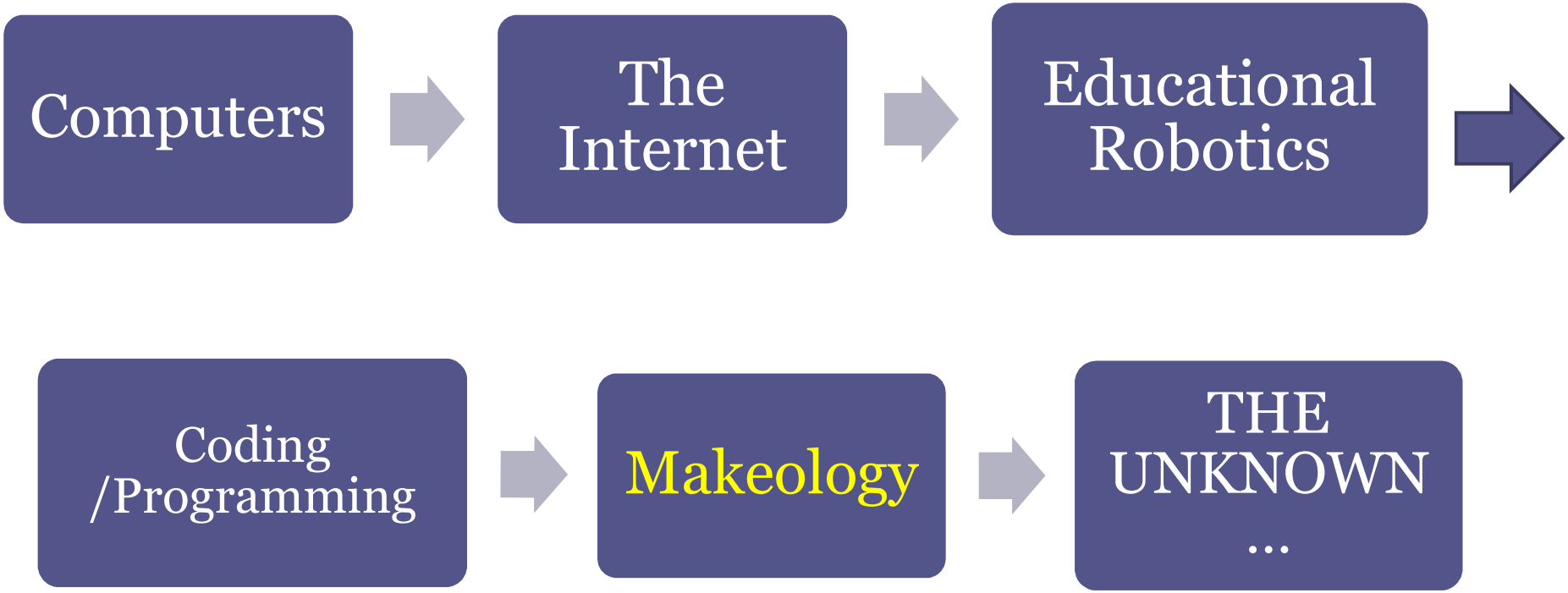
The importance of developing 21st century skills

- The workforce needs have changed, the job tasks and type of work are changing and consequently the required skills are changing.
  - The development of 21st century & transversal skills is important because of the changes in the global competition and collaboration, the focus on service economy, as well as the information growth.
- Students - as the future citizens of the Information Society need to be equipped with various 21st century skills.
- Challenge emerges in response to how best to cultivate students' creativity in the 21st century.

- It is our duty to provide youth with those opportunities and experiences that will adequately prepare them to successfully survive in this competitive, ever-changing Hi-Tech, globalized, and rapid-changing society AND become culturally responsible, active, and competent leaders for themselves, and their communities.

- "Information society"
  - New forms of work, communication and economic growth have emerged
- ICT is an important aspect of employability

The evolution in the Educational Technology field



Educational Technology - Technology as a Cognitive-Learning Tool

- Technology integration as a cognitive-learning tools in the teaching and learning practice can be defined as:
  - The ***exploitation*** of ***technology by students*** as tool that enhances their learning experience, promotes and supports the achievement of ***specific learning objectives***.

The newest trend in Education around the Globe …

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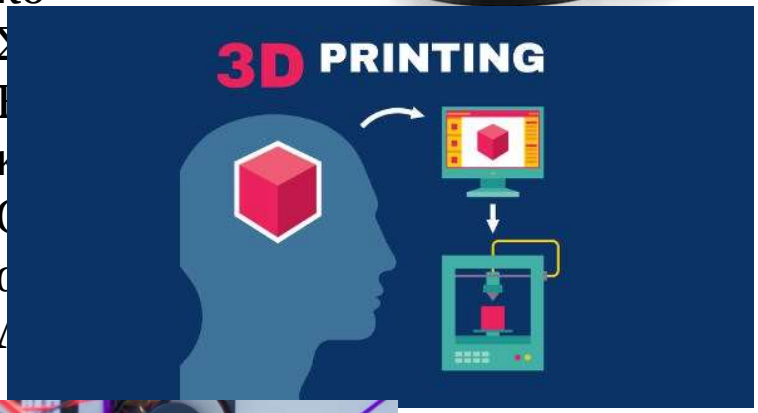
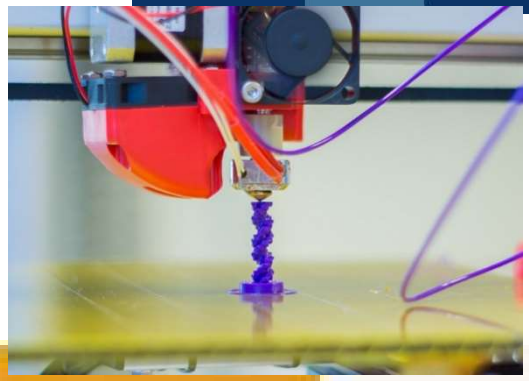




MakerSpace

TinkerLabs

HackLabs

FabLabs

MakerLab

HackerSpaces

MakerEducation

Fabrication

Tinkering

Making

D.I.Y.

Fabrication
Fab-Learn

Artefacts

Makeology

The beginning of the idea…!

- On a practical perspective:
  - The seeds of the maker space movement have been in existence forever.
  - The official idea emerged in 2005 after Make: magazine launched.
  - The magazine was founded by Dale Dougherty, and is published bimonthly on their website, which serves as an online community of DIY "makers."
- On a theoretical perspective:
  - It has its roots on constructivism and constructionism
  - Long before the label "maker" was given, the researchers were setting the theoretical foundation for it: constructivism, constructionism, critical pedagogy, project-based learning.
  - And technologists were creating the technologies that made it possible:

    Logo, Scratch, LEGO robotics, open source computing, low cost digital fabrication.

MakerSpace (I)

- *A makerspace is a collaborative work space inside a school, library or separate public/private facility for making, learning, exploring and sharing that uses high tech to no tech tools. These spaces are open to kids, adults, and entrepreneurs.*
- A maker space is a community space in a school or other gathering place where **students** are able to take part in **hands-on learning in creative ways**.
- They are called maker spaces because they provide opportunities for **students to design, create, manufacture, and invent new things.**
- Important in a maker space: the **accessibility of materials, resources, and supplies–and the opportunity that comes with that access—to all.**
- A true makerspace offers student-driven opportunity for open-ended exploration for everyone.
- *Makerspaces are shared spaces; facilities dedicated to providing a safe, secure environment that encourages hands-on learning and experimentation.*

MakerSpace (II)

- The underlying purpose of a makerspace is an **educational experience** that allows **students to lead and extend their learning** in whatever direction and way they choose.
- It moves them to **identify problems and find solutions**.

- **Makerspaces**, sometimes also referred to as hackerspaces, hackspaces, and fablabs **are** creative, DIY spaces where people **can** gather to create, invent, and learn.
- **Makerspaces** provide hands-on, creative ways to encourage students to design, experiment, build and invent as they deeply engage in science, engineering and tinkering.
- A **makerspace** is not solely a science lab, woodshop, computer lab or art room, but it may contain elements found in all of these familiar spaces.

Seven key attributes of a GREAT MakerSpace

- A great makerspace has seven key attributes:
  - It is personalized,
  - Deep (allowing deeper learning),
  - Empowering,
  - Equitable,
  - Differentiated,
  - Intentional
  - Inspiring.

- Also…:
  - To keep up the good work
  - Have it for the future
  - Sustainability
  - Reevaluation

Makeology, Maker Movement & Maker Education

Maker Movement

- Suitable for all ages from kindergarten to lyceum – primary and secondary education.
- Putting power in the hands of people from all backgrounds.
- **The Maker movement:**
  - The **teachers** were the driving force behind the change.
  - Informal nature of the change – it has not been driven by large, well-funded initiatives from foundation or governments.
  - Relied on **resourcefulness** and initiative of teachers and librarians – see the opportunity to engage youth in new ways.

Makeology

- *Makeology* introduces the **emerging landscape** of the Maker Movement and its connection to interest-driven learning.
- Adults and learners work together to develop designs and products involving science, technology, engineering, mathematics and arts.
- Inspire individuals and groups to find ways to work together.
- Create makerspaces and specific programs that engage children as makers.
- Makeology is a mindset, is a culture. It's about the pedagogy.
  - Making Sense of Making
  - Revolution in Education
  - Renovated Learning

Maker Education

- **Maker** education (a term coined by Dale Dougherty in 2013) closely associated with STEM **learning**, is an approach to problem-based and project-based **learning** that relies upon hands-on, often collaborative, **learning** experiences as a method for solving authentic problems.
- It is happening
  - Bottom up fashion
  - "Open source" strategies
- Maker-centered learning build around student interests as developed through projects that support learning new skills and capabilities.
- Provide open access to tools, materials and expertise that help children become makers.

Teaching Approaches related to Maker Education

Problem – Based Learning

Project – Based Learning

Interest – Based Learning

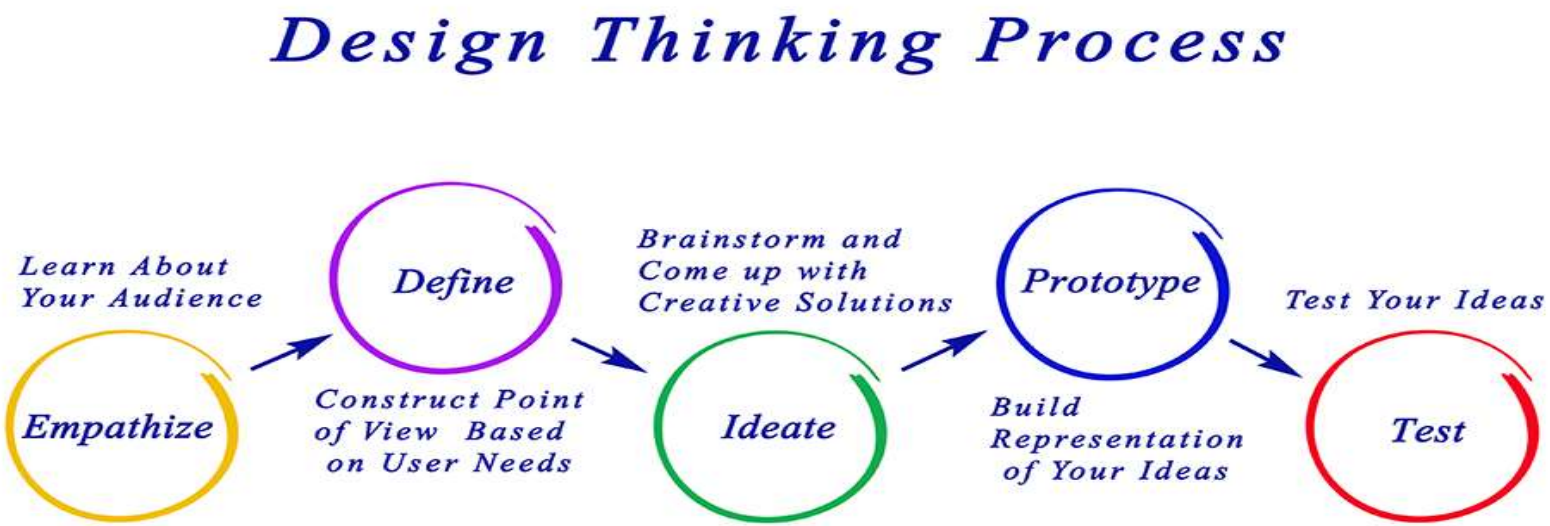
Maker – Based Learning

Important concepts to remember:

- Makers
- Making
- Design and construct their own products
- Every product is different
- Problem –based learning
- Project – based learning
- Interest – driven learning
- Maker-centered learning
- Real-life problems
- D.I.Y.
- Non-formal and informal educational settings
- Mentorship
- Individual and teams work together
- Children and adults, kids and parents, kids and grandparents, kids and community members
- Development of transversal skills
- Spaces: garages, libraries, museums, schools, school libraries, community spaces
- Various resources & Materials

Design Thinking and Design Thinking Process

- The **five** stages of Design Thinking, are as follows: Empathise, **Define** (the **problem**), **Ideate**, **Prototy pe**, and **Test**.



Educators' Role

- Mentor
- Facilitator
- Coach
- Not clear directions
- Implications for policymakers, universities and professional bodies offering professional development training to educators
- Brining different fields to work together

Engaging Students as Makers

Students' Skills Development (I)

- Empowerment and Learning is achieved
- Students' self-confidence and self-efficacy is promoted
- Students learn by playing through educational engagement
- Students can demonstrate not only what they know but what they can do
- Opportunities for self-expression
- Through maker-centered learning
  - Students discover creativity in themselves
  - Students develop ability to solve problems using science and technology

Students' Skills Development (II)

- Increasing students' creativity and academic performance in science, technology, engineering, art, and mathematics
- Enhance Computational thinking
- Help students see themselves as good learners, as life long learners
- Identify their own emerging talents as makers
- Development of transversal skills

Equipment, Materials & Possible Activities

Equipment & Materials (I)

- Most maker spaces are equipped with a variety of tools that can be used for designing and creating things.
- Some of these tools can include arts and crafts supplies like clay, pipe cleaners, paint, popsicle sticks, cardboard, paper, glue, nuts and bolts, circuits, robotic work.
- Some maker spaces are equipped with 3D printers and computers.
  - *On the computer, students are able to use software like Tinker CAD or other programs to design a three-dimensional object and print it from the bottom up in hard plastic*
- *Maker spaces are also committed to recycling and reusing as many materials as possible, so try to utilize donated items as often as you can.*

Equipment & Materials (II)

- A Variety of maker equipment including 3D printers, laser cutters, cnc machines, soldering irons and even sewing machines, software, electronics, craft and hardware supplies and tools, and more.
- A makerspace however doesn't need to include all of these machines or even any of them to be considered a makerspace.
- **If you have cardboard, building blogs, cicruits and art supplies you're in business.**

- **27 Makerspace Materials & Supplies**
  - https://www.makerspaces.com/27-makerspace-materials-supplies/
  - https://www.makerspaces.com/makerspace-materials-supply-list/

Equipment & Materials (III)

- Electronics prototyping and soldering equipment
- Computer Numerical Control (CNC) routers and mills
- Computer Aided Design (CAD)/Computer Aided Manufacturing (CAM) software stations
- Printed Circuit Board (PCB) mills
- Plasma cutters
- Vinyl cutters
- 3D Scanners
- Welding equipment
- Sewing or quilting machines
- Virtual Reality (VR) equipment and green screen video backdrops
- Materials for Arts and Crafts

Possible Activities

- Every makerspace is unique and the projects that are worked on inside of them are also very diverse. Some of the things you can do in a makerspace :
  - Coding
  - 3D modelling
  - 3D printing
  - Laser cutting
  - Soldering
  - Electronics / Arduino
  - Robot building / Robotics
  - Learn Circuits and Electricity with paper circuits
  - Sewing
  - Wood working
  - Take-a-part sessions
  - Inventing

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Embraces & Brings Together

MakerSpace

Designing & Developing Robotic Models/ Artefacts

Various Tools, Equipment & Materials

STEAM

Crafting

Engineering Design Process

Coding

Maker Education

Students as Makers

21st century skills

Makeology

Possible Activities (II)

- Cardboard construction
- Prototyping
- Woodworking
- Electronics
- Robotics
- Digital fabrication
- Building bicycles and kinetic machines
- Textiles and sewing

THANKS!

Any Questions!

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