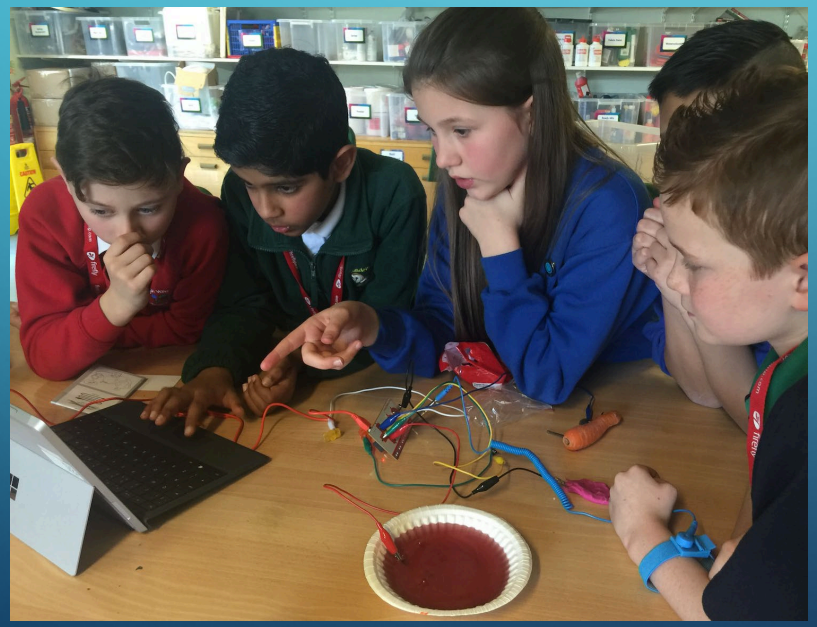
STEM TO STEAM

HOW CAN STEAM EDUCATION HELP CHILDREN TO BECOME STEAM LITERATE?



Objectives

- To reinforce understanding of STEAM teaching and learning
- To think about the purpose of STEAM education
- To consider how to build STEAM literacy
- To identify ways to engage girls in STEAM

What is STEM Education?

- STEM describes science, technology, engineering and mathematics, and related disciplines and applications.
- In primary schools, science, mathematics, computing, and design and technology (D&T) are usually distinct subjects and engineering rarely features.
- But In the workplace science, technology, engineering and mathematics are used together to solve practical challenges.
- STEM education is concerned with raising awareness of the importance and relevance of STEM in our everyday lives.
- The purpose of STEM education is to develop **STEM literacy**

How can we define STEM education?

STEM education is a means of offering coherent learning experiences that make connections between the individual curriculum subjects explicit and enhances learning in all of them.

A STEM approach puts children at the centre of learning, helping them to use and develop skills across the curriculum in meaningful ways.

What are STEM skills?

Be creative	Ask questions	Test hypotheses
Refine strategies	Recognise patterns	Analyse data
Work cooperatively	Research information	Construct arguments
Communicate effectively	Use tools safely	Evaluate work

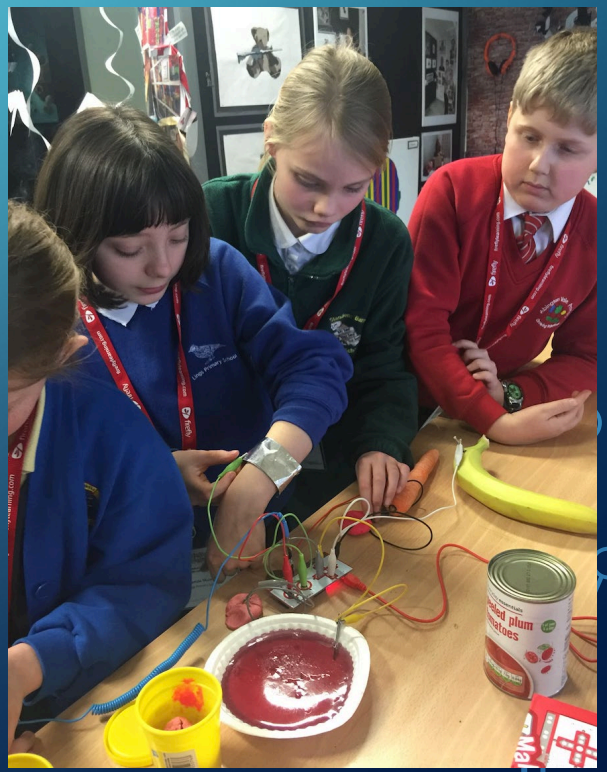
Any more?

Things to consider:

discuss

The teacher's role is changing in relation to knowledge:

- factual information is available at the touch of a button
- contemporary scientific knowledge can change rapidly



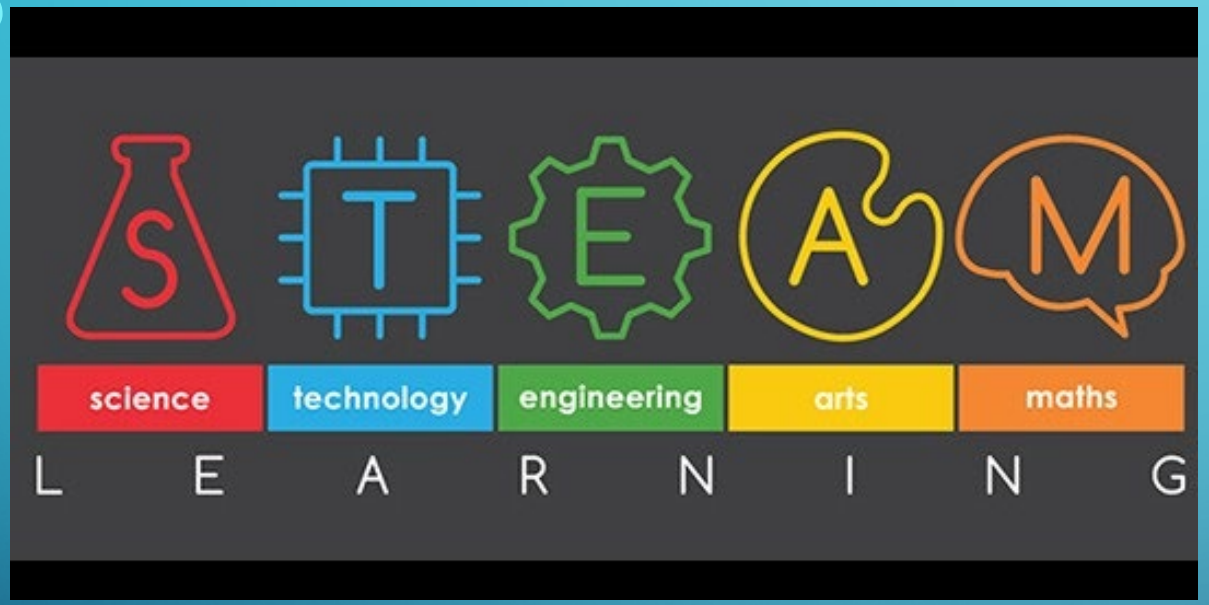
Things to consider:

discuss

The relationship between STEM and other holistic approaches such as:

- Guy Claxton's Building Learning Power (focusing on resilience, resourcefulness, reflectiveness and reciprocity)
- Neil Hawkes' Values-led Education
- Matthew Lipman's Philosophy for Children.
- Dweck's Growth Mindset

Why add the Arts?

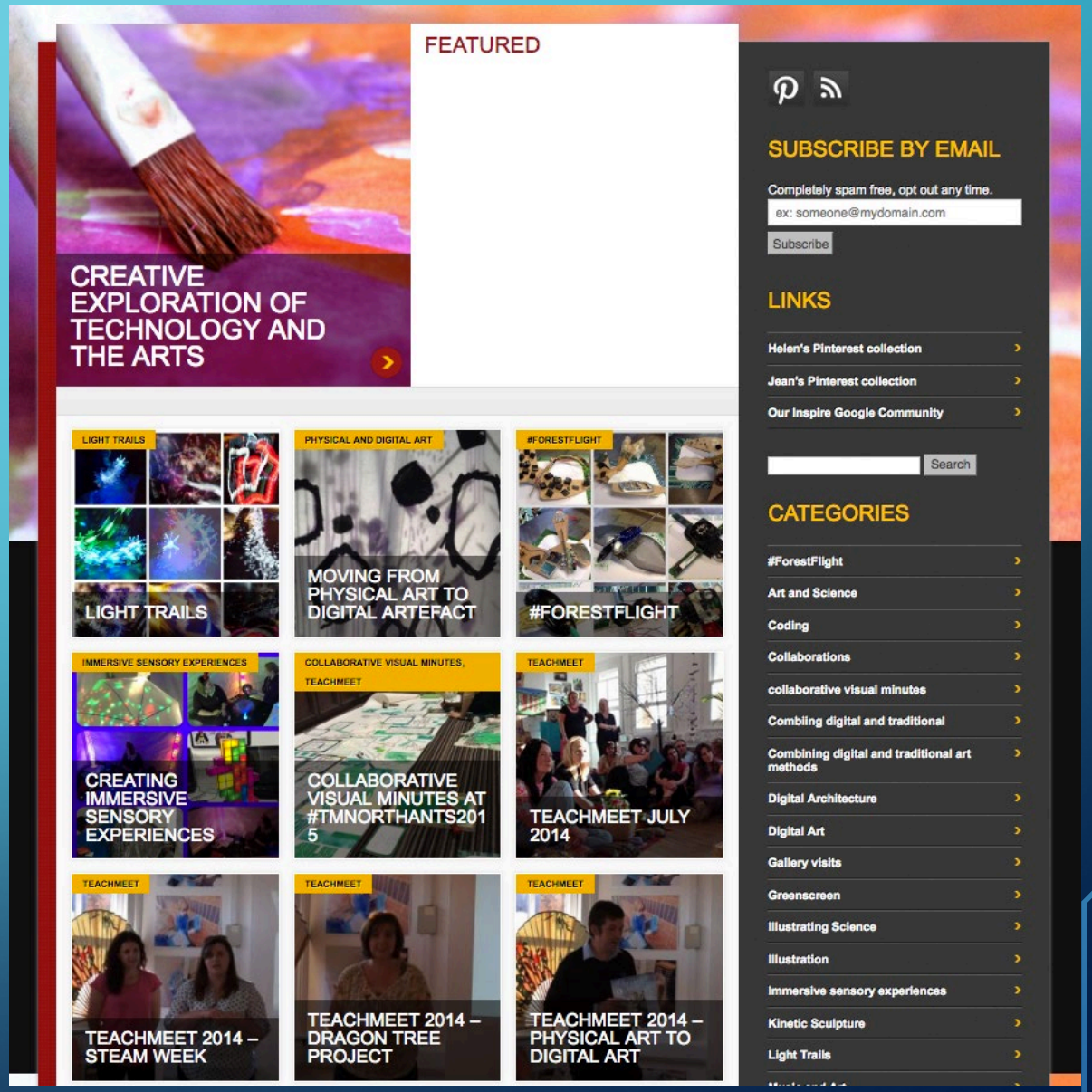


STEAM is a way of bridging the conventionally-held disconnect between the science and arts and leveraging on the principles of arts to maximise the output from STEM learning. Creativity, wonder and imagination, which lie at the heart of the arts, blended with the critical thought and enquiry of STEM. It allows students to connect their learning in these critical areas together with arts practices, elements, design principles, and standards to provide the whole pallet of learning at their disposal.

https://yourstory.com/read/c098d663c3-steam-learning-why-add-the-arts-to-stem-

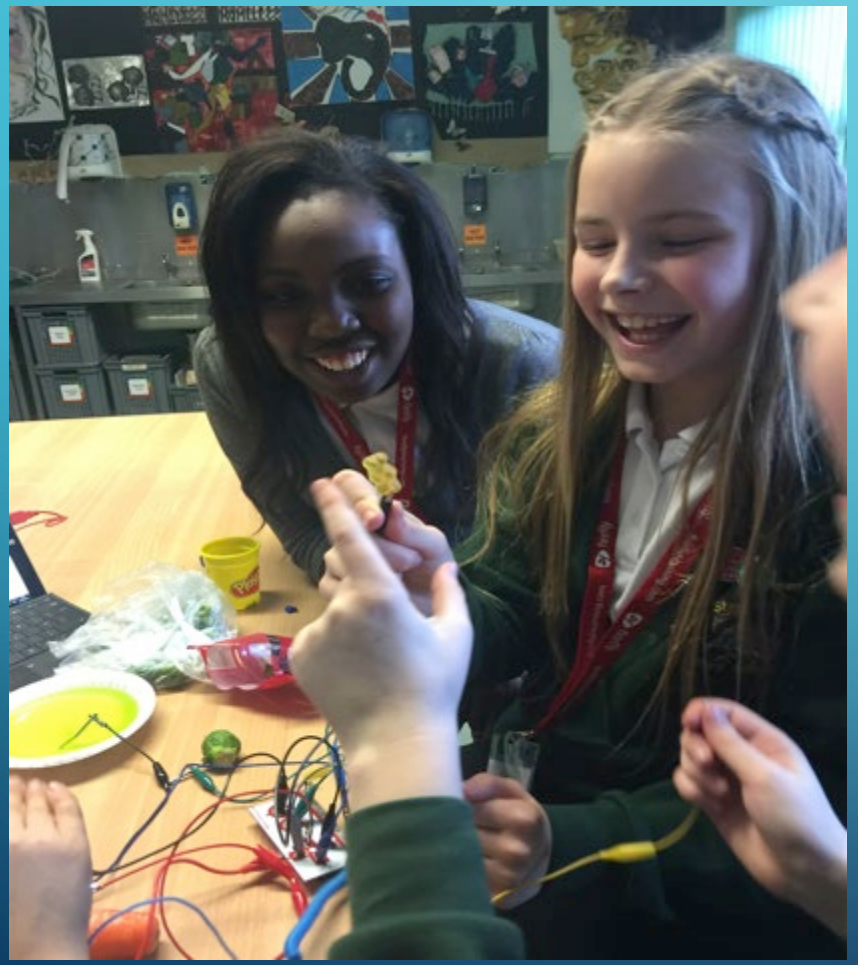
Northampton Inspire project blog

https://mypad.northampton.ac.uk/inspire/



Rescue Robots

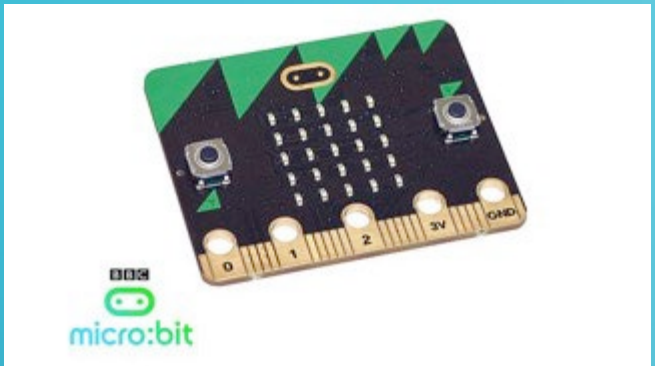
Makey Makey playdate

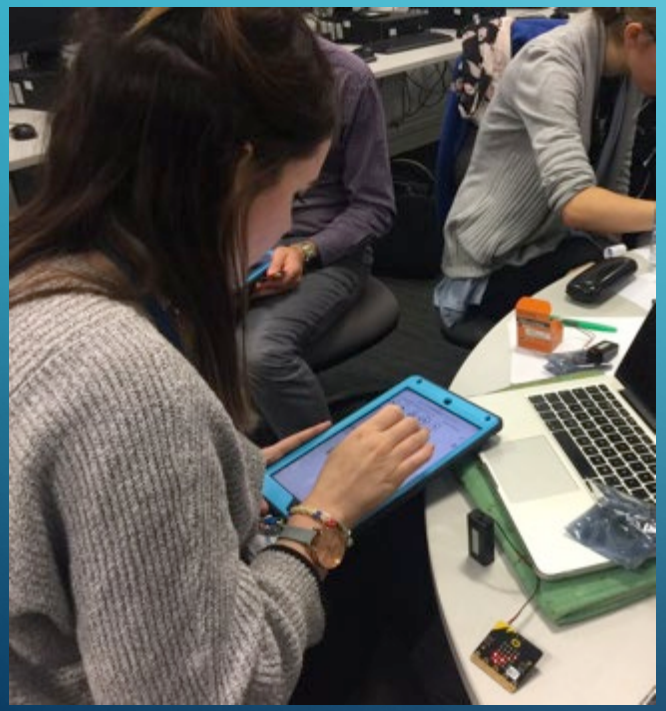


Deconstructing Tech

…STEM to STEAM inspired by art

Wearable Tech





…inspired by computing and performance

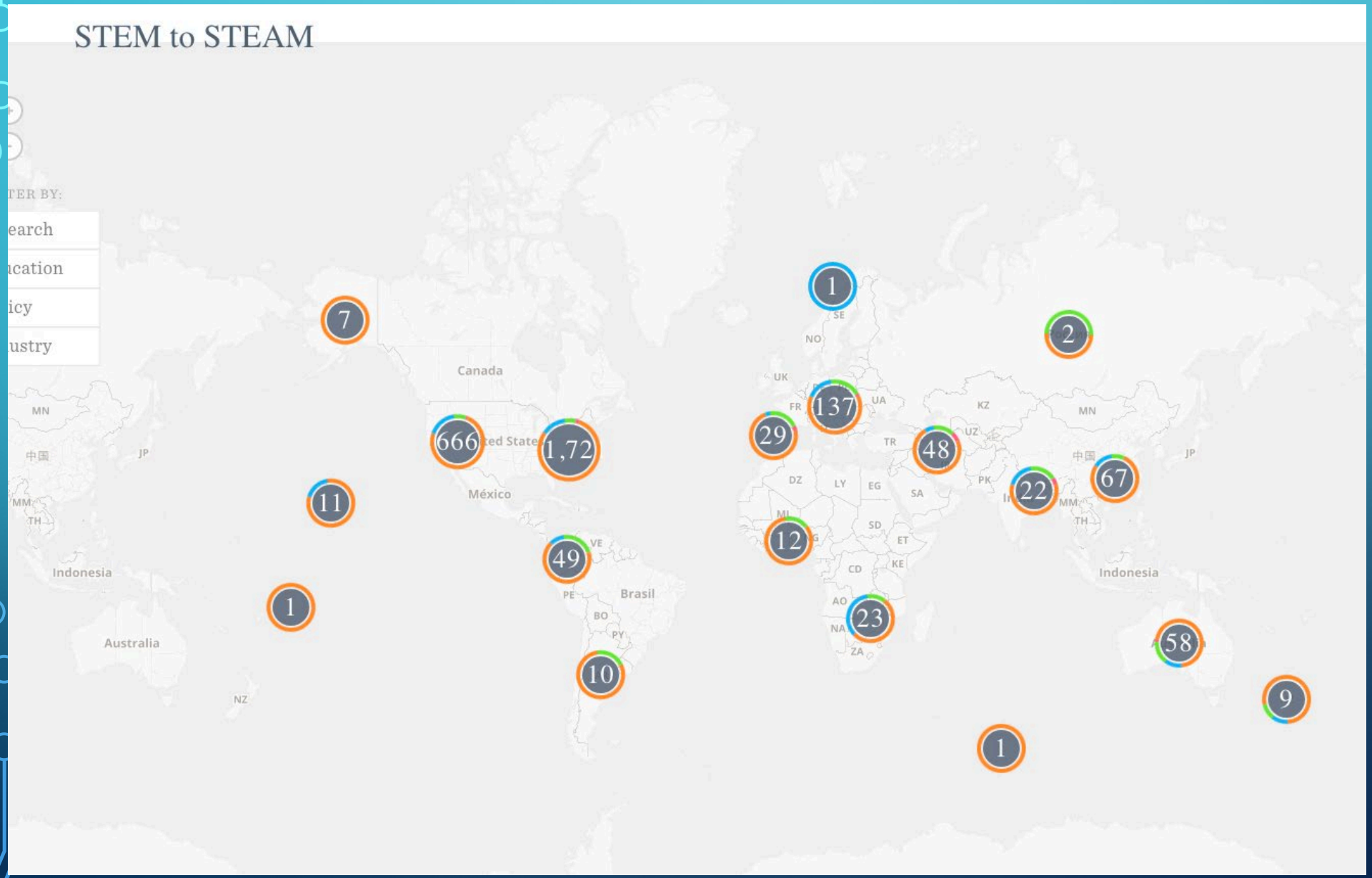
Ephemeral art and science

The Maker Movement

How can we build STEAM literacy?

- Use rich starting points and explore imaginative questions
- Nurture children's confidence and critical literacy skills
- Use questions to challenge children's thinking and provoke explanations
- Design tasks that require children to experiment, collaborate and talk
- Establish a secure and supportive learning environment where children can take intellectual risks
- Suggest tasks that have real world relevance that children can 'own'
- Draw on expertise outside the school through digital leaders or find ways to work offsite

Interactive map



http://map.stemtosteam.org/

Also see: http://stemtosteam.org/

Engaging girls in STEM

- In 2015 only 12.8% of the UK STEM workforce were women (WISE, 2014).
- Across the 34 OECD countries, less than 5% of girls think about pursuing a career in engineering and computing, and boys are four times as likely to consider STEM careers (OECD, 2015).

Can we teach girls to be brave?

Reshma Saujani, founder of Girls Who Code, in her recent TED talk titled 'Teach girls bravery, not perfection' (Saujani, 2016) points out that girls are often taught to play it safe and suggests that this may be why they gravitate towards careers that they know they will succeed in.

In contrast, boys are taught to; 'play rough, swing high, crawl to the top of the monkey bars and then just jump off headfirst...and by the time they are adults they're habituated to take risk after risk' (Saujani, 2016).

What can we do to achieve gender parity in STEM?

Engaging girls in STEM

A national outreach program in the US, SciGirls, combined a variety of research to suggest seven principles to engage girls in STEM (SciGirls, 2013):

1.Girls benefit from collaboration, especially when they can participate and communicate fairly.
2.Girls are motivated by projects they find personally relevant and meaningful.
3.Girls enjoy hands-on, open-ended projects and investigations.
4.Girls are motivated when they can approach projects in their own way, applying their creativity and unique talents.
5.Girls' confidence and performance improves in response to specific, positive feedback on things they can control, such as effort, strategies, and behaviours.
6.Girls gain confidence and trust in their own reasoning when encouraged to think critically.
7.Girls benefit from relationships with role models and mentors.

A STEAM curriculum with girl appeal:

- builds upon relevant real world contexts and interests
- makes the most of opportunities to add in aspects of the arts
- emphasises ways in which technology can support creative making and inventing

DLaB Stem to SteAm sub-themes:

1. Learning STEM through creative expression

Broader linking of STEM and the creative arts (music, dance, drama, crafts, creative writing, photography). Exploring explicit art/science connections

2. The maker movement

Craft and computing, electronics, 3d printing, lasercutters, sensors, robots, D&T

3. Inquiry driven STEAM

Pedagogical approaches, challenge or problem based learning, real world problems

Finding good questions, being inspired by other STEAM projects

Discuss:

What is our definition of STEAM?

What do we know already/need to know?

What expertise do we have?

Can we suggest some unit titles across the sub-themes?

Further browsing:

STEM Learning website
https://www.stem.org.uk
Learning Through Tinkering in STEM Education
http://stemecosystems.org/resource/learning-through-tinkering-in-stem-education
ABCs of STEM
https://www.gensler.com/research-insight/research/abcs-of-stem
STEM vs STEAM
http://www.independent.co.uk/student/student-life/Studies/stem-vs-steam-how-the-sciences-and-arts-are-coming-together-to-drive-innovation-a7047936.html
KIKS project: Kids Inspiring Kids in STEAM UK
https://prezi.com/jnd6nez1oz11/kiks-kids-inspiring-kids-in-steam-uk/?webgl=0
I am Sci Art
https://iamsciart.com/