

# **Exploring digital strategies for inclusive learning**

Helen Caldwell  
University of Northampton





# Helen Caldwell

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@helencaldwel

## Books

- Caldwell H. & Cullingford-Agnew, S. (2017 publication pending). *Technology for SEND in Primary Schools: A good practice guide*. London: Sage.
- Caldwell, H. & Smith, N (2016). *Computing Unplugged: Exploring primary computing through practical activities away from the computer*. London: Sage.
- Wise, N. & Caldwell, H. (2016). *Help with Homework: Coding Essentials*. Chichester: Igloo Books.
- Caldwell, H. & Bird, J. (2015). *Teaching with Tablets*. London: Sage.
- Caldwell, H., Heaton, R., Whewell, E. & Grantham, S. (2015) *Switched on iPads Science*. London: Rising Stars.
- Bird, J., Caldwell, H. & Mayne, P. (2014). *Lessons in Teaching Computing in Primary Schools*. London: Sage.

## MOOCs

- Let's Teach Computing 2015
- Teaching with Tablets 2016
- Technology Outdoors 2017

## Current Project

- **Digital Learning Across Boundaries** International Erasmus project: <http://dlaberasmus.eu>

## Teaching

- **Postgraduate Certificate in Primary Computing:**  
<https://www.northampton.ac.uk/study/courses/postgraduate-certificate-primary-computing-pgce/>



# Exploring digital strategies for inclusive learning

What does a supportive classroom look like?  
What technologies, tools and apps are available?

- Key assistive technologies supporting pupils with SENDs
- Multisensory approaches supporting inclusion
- Bringing together physical and digital learning
- Planning to teach computing across the ability range



# Key assistive technologies supporting pupils with SENDs



# An inclusive approach

All learners want to control, create and have an impact

Most are confident with technology

But many are challenged by issues of attention, pace, accessibility, handwriting

There are individual issues and individual solutions, and there are some universally useful tools

An inclusive approach also takes into account student and parental views



# Convergence of assistive and mainstream technologies







# Technology offers choice

- choices of access methods
- visual and auditory support
- ways of handling print
- ways of recording ideas
- separate mechanics from ideas
- keep pace with ideas

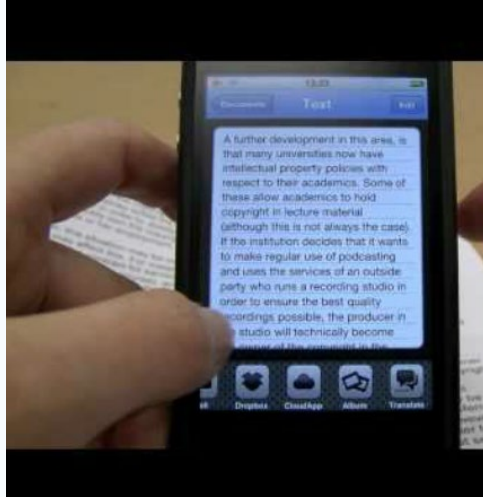


# Key tools supporting literacy

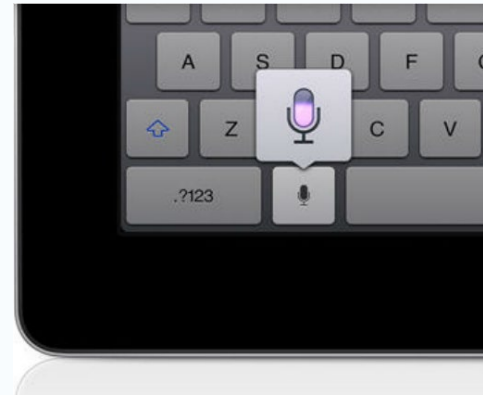
- Text to speech (TTS)
  - Voice Dream Reader app, Prizmo app, Natural Reader
- Voice recognition
  - Siri, Dragon, Dragon Dictate, digital assistants: Alexa, Siri, Google Voice
- Note-taking
  - Livescribe pen, Notability, Audionote & Soundnote apps, MyScript apps,
- All-in-one tools
  - Clicker 7, WriteOnline, Read & Write Gold, ClaroRead, GoQ, Widgit software
- Online tools:
  - Doorway Online, Popplet, Let Me Type, Purple Mash, Dance Mat Typing, Readability, ViewPure, Evernote, XMind
- Software
  - Englishtype Junior and Senior, WordShark and NumberShark, Kidspiration and Inspiration mindmapping, inbuilt Word features
- Chrome and Firefox browser plugins
  - text to speech, colour changing, page de-cluttering, speed reading, mind mapping, time management and voice recognition



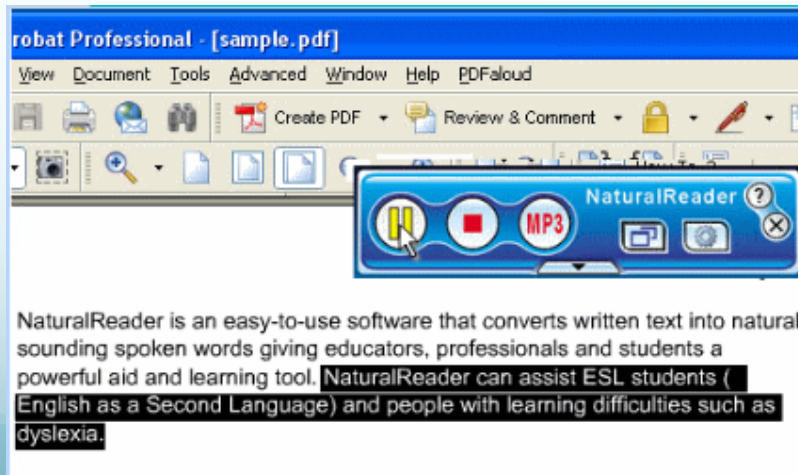
# Voice recognition and TTS



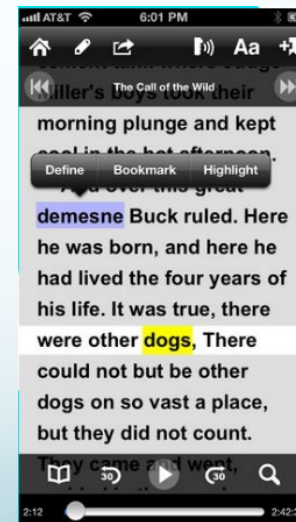
Prizmo app £6.99



Siri (free)



Natural Reader (free)

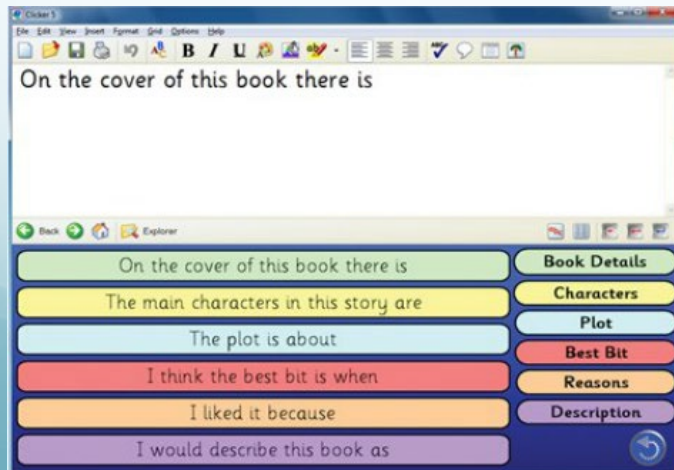
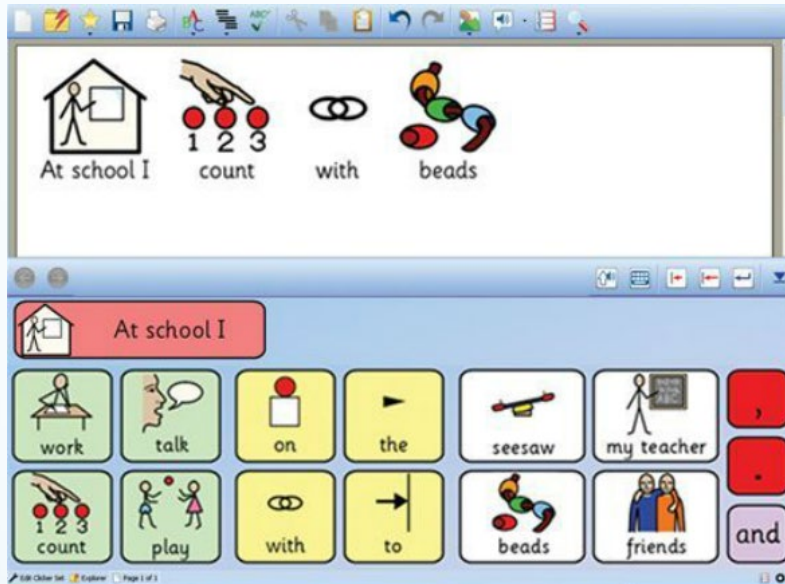


Voice Dream Reader app £6.99

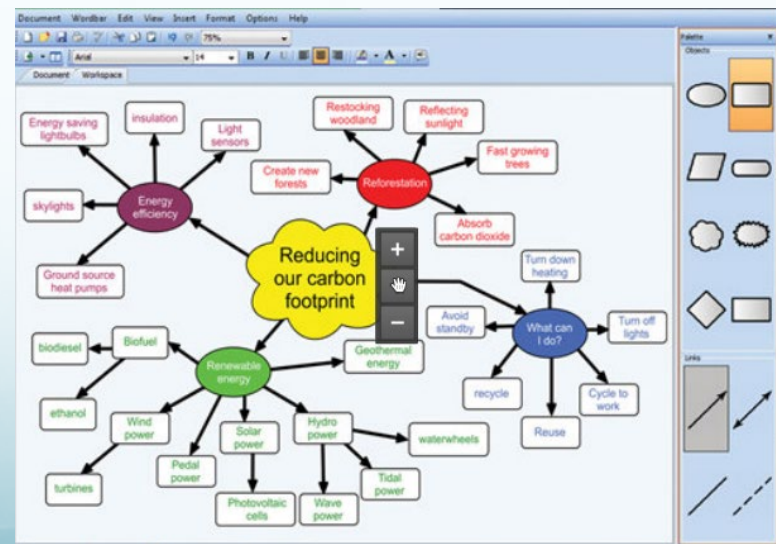
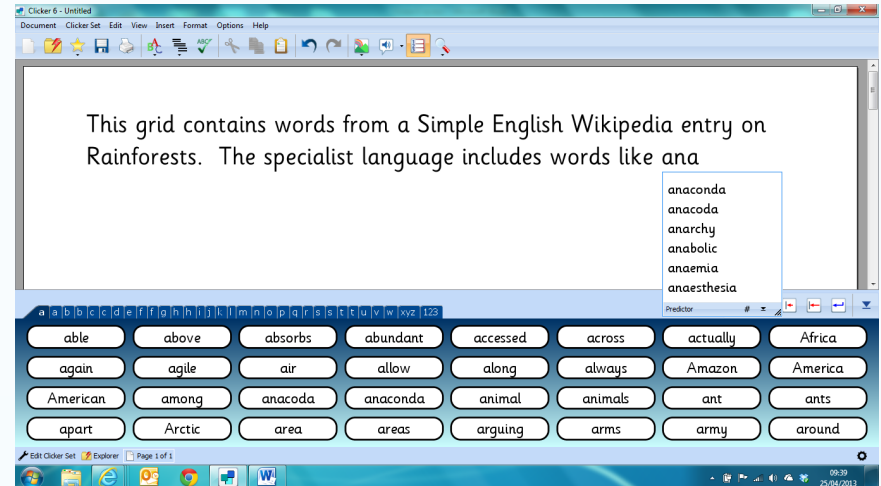


# All-in-one tools

## Clicker 7



## WriteOnline







# Mobile devices

- Inbuilt features: sound recorder, video and still images supporting productivity
- Accessibility options
- Apps for content creation, specific skills and productivity

## **Specific Skills**

Hairy Letters  
Pocket Phonics  
Spellosaur  
AcceleRead AcceleWrite  
Dexteria  
Bitsboard (Grasshopper.com)  
Quizlet

## **Content Creation**

Book Creator  
iMovie  
PuppetPals  
Greenscreen by DoInk  
PicCollage  
Explain Everything  
Thinglink  
Madpad  
Strip Designer  
Adobe Voice  
Shadow Puppets  
Scan and Scan.me

## **Productivity**

Prizmo  
Voice Dream Reader  
Soundnote  
MyScript apps  
MindMeister  
Readability  
Writepad  
IntoWords  
Clicker apps  
Office Lens





# Apps to explore

## **Math support:**

Myscript mathpad  
Myscript calculator  
Modmath

## **Content creation:**

Book Creator  
Shadow Puppet  
Adobe Voice  
Explain Everything  
Thinglink  
Strip Designer  
Greenscreen by DoInk

## **Writing support**

Spellosaur  
Letter School lite  
Sentence maker  
Myscript memo  
Myscript smartnote  
Things that go together  
Siri  
Dragon Dictation  
Pocket phonics  
Bitsboard

## **Ideas organisation:**

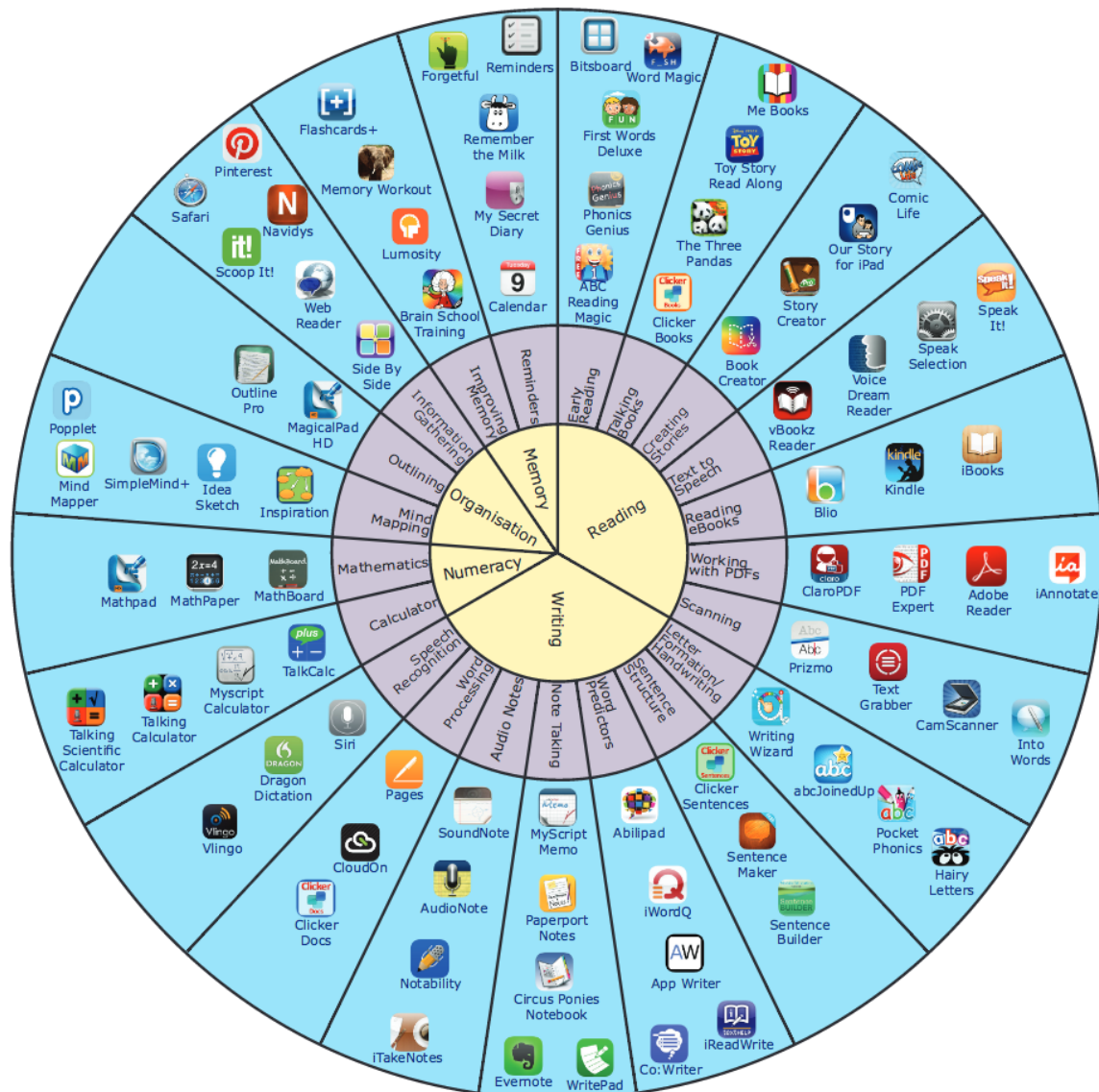
Popplet  
Visual planner  
Quizlet

## **Reading support:**

Readability  
Collins Big cat playing  
Collins big cat cold dark night

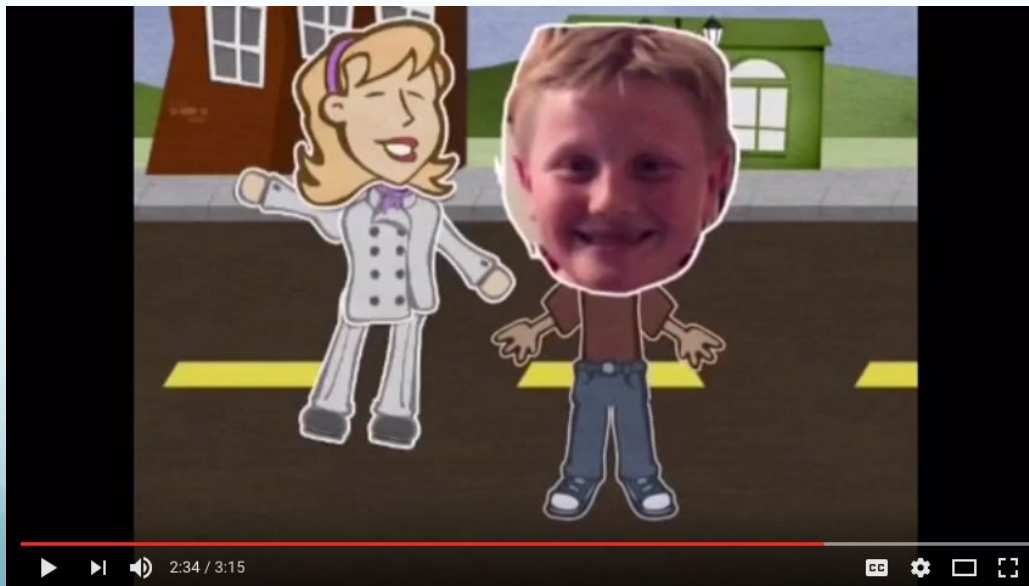


[www.callscotland.org.uk](http://www.callscotland.org.uk)





# Digital Social Stories





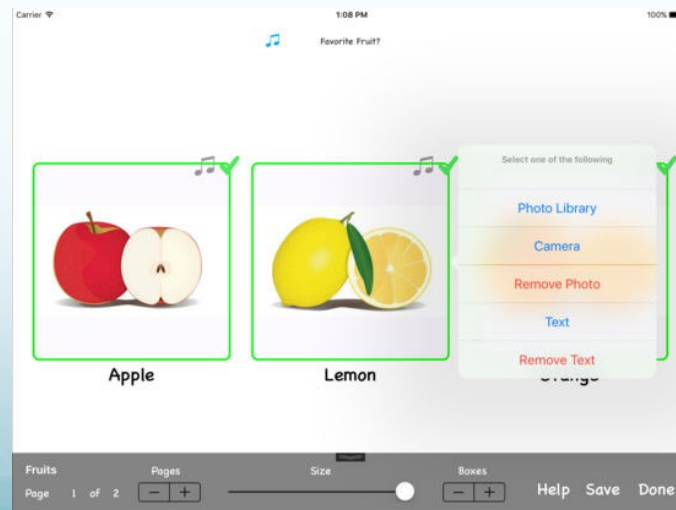
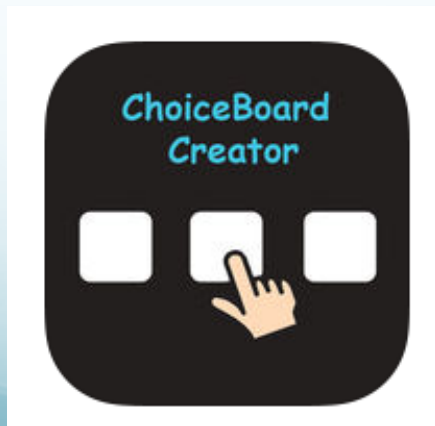
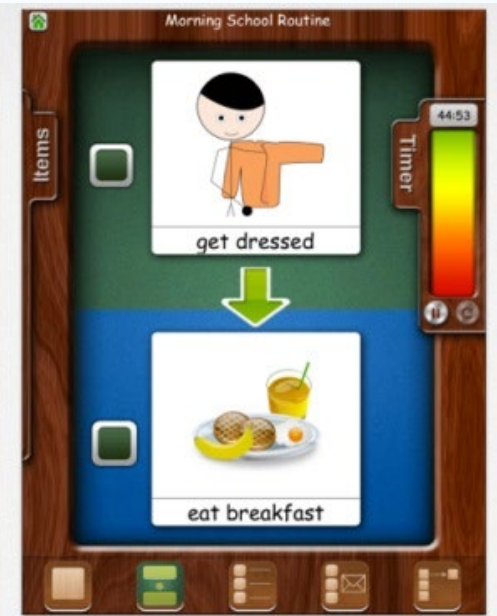
# Making digital social stories

Trailer on first page of the Social Skills ebook





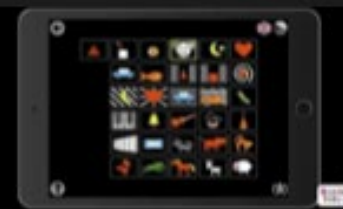
# Visual schedules





# Ballyland for VoiceOver

Madilyn Playing with Ballyland Magic App



0:00 / 0:32

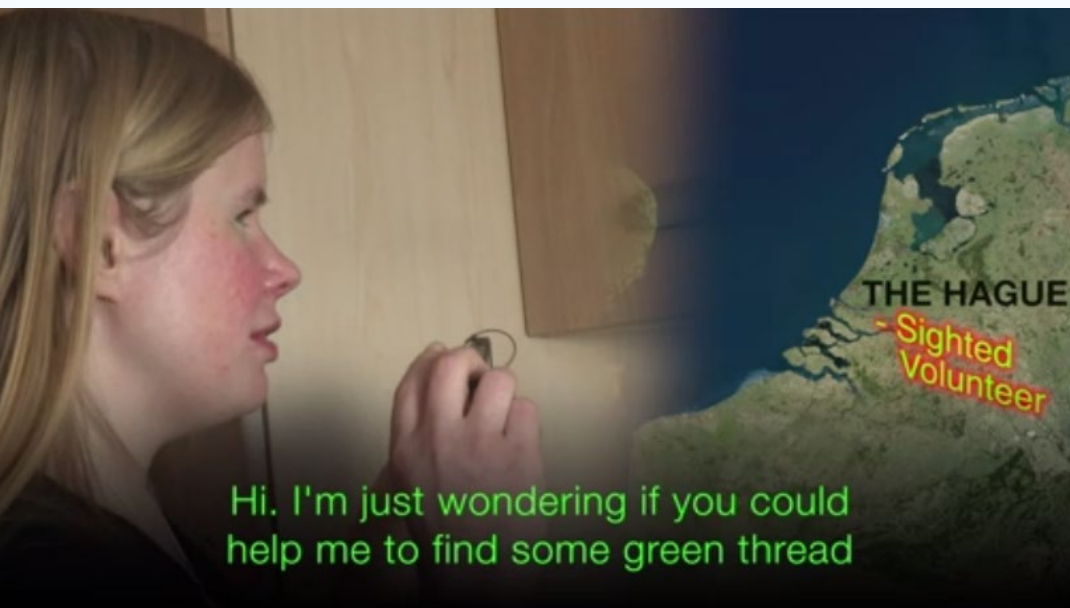


YouTube





# Technology supporting VI





# Orcam reader



Marc Bilton says OrCam makes life so ...



1:09 / 2:49



YouTube





# Augmented reality supporting HI





# Buttons and switches

Speech Therapy - Using a Big Mac Button to Communicate



1:10 / 5:18

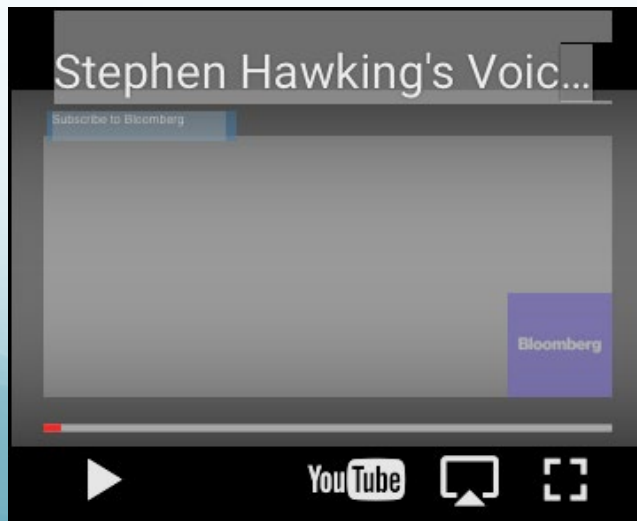
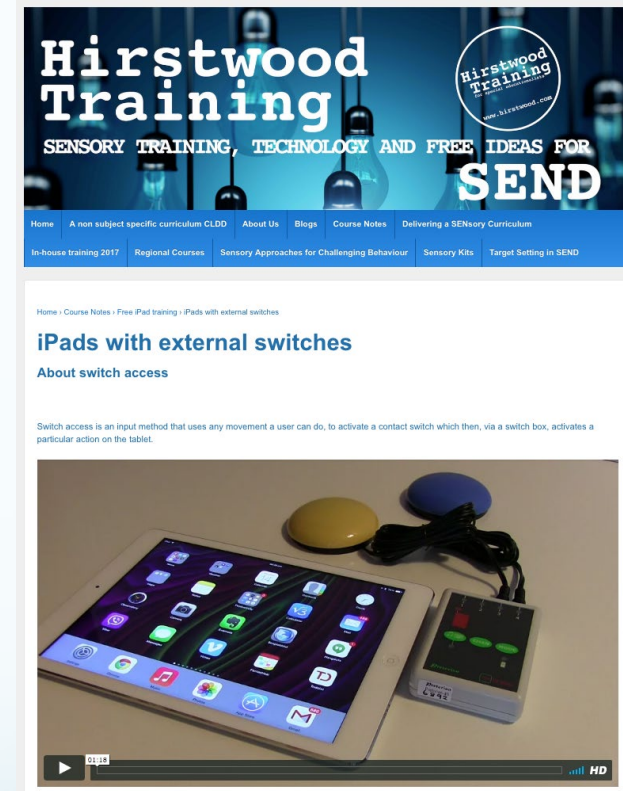
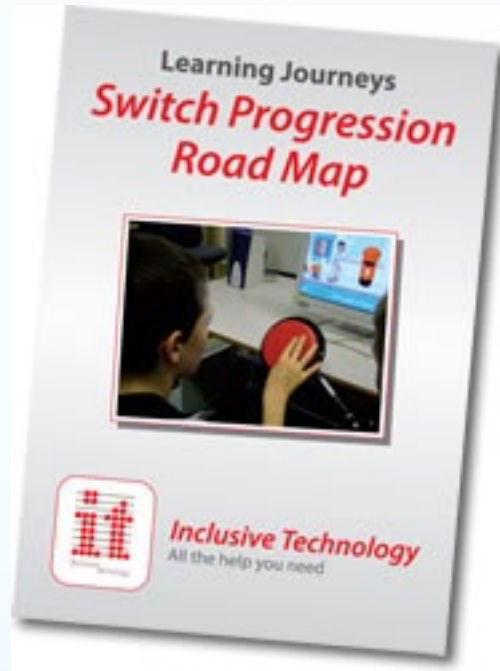


YouTube





# Switch training





# Gesture based technologies

3rd Millennium Award Final



0:43 / 5:00



YouTube



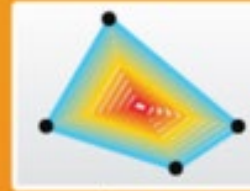


# Gesture based technologies



## List of Somantics

Please choose a Somatic below to learn more:



Tunnel



Sparkles



Slitscan



Paths



Painter




Kaleidoscope









# Accessible music

Soundbeam 6 short Demonstr... 

Beamz Player - How It Works... 

Phonotonic - I am music 

0:46 / 1:30





Becky playing Minecraft using eye gaze



MORE VIDEOS



0:11 / 0:36



YouTube







# HEATH EYE GAZE TECHNOLOGY USER

<https://youtu.be/WAqJ9ouqnuw>



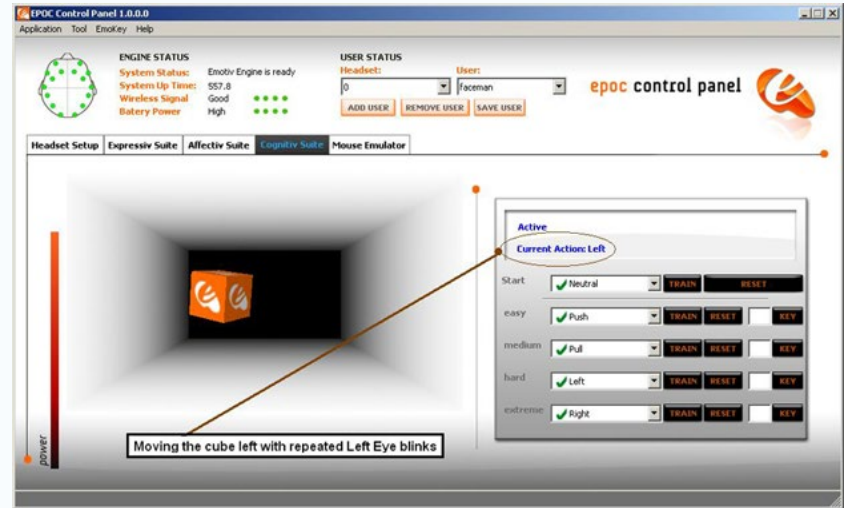
# Eye gaze resources



<http://www.inclusive.co.uk/Lib/Doc/pubs/eye-gaze-hkl.pdf>  
<https://thinksmartbox.com/story/3-ways-to-use-look-to-learn>



# Mind control



## Brainwave Controlled Drone



0:05 / 0:53



YouTube





# Mind control





# Independent living







# Some key strategies

- Promoting independence through customised routines, individual and differentiated choices
- eBook formats with screen adjustments, sound, highlighted text and voice recording for active reading and responding
- Flipped learning approaches allowing choices over ways into topics, control over place and pace
- Bring Your Own Device (BYOD) to personalise learning through a purposeful media-rich approach
- Collaborative working: Google Apps for Education and Office 365
- Apps and tools for visible learning and targeted feedback
- Promoting the idea of productivity tools rather than assistive technology





# Links

## Sources for eBooks:

- Whispersync Immersion Reading on Kindle Fire HDX
- Learning Ally (voice synched): <https://www.learningally.org/>
- Load2Learn accessible textbooks: [load2learn.org.uk](http://load2learn.org.uk)
- Bookshare UK: [www.bookshare.org/cms/bookshare-uk](http://www.bookshare.org/cms/bookshare-uk)
- Audible.co.uk
- Oxford Owl; [www.oxfordowl.co.uk/](http://www.oxfordowl.co.uk/)
- International Children's Digital Library:  
<http://en.childrenslibrary.org/>
- Storynory: [www.storynory.com/](http://www.storynory.com/)



# Multisensory approaches supporting inclusion



# SEN3004

## SEN3004 – BA Hons Special Needs & Inclusion Approaches to Support Inclusion through Technology

**Google+ Communities** Search

**SEN3004 16-17**  
MODERATE

**Filter**

- All posts
- Discussion
- Session 1 Introduction
- Session 2 Approaches to supporting written communication
- Session 3 Apps for Personalised learning
- Session 4 Symbol supported communication
- Session 5 Exploring Switch access & Helpkidzlearn
- Session 6 Assitive Technology and Sensory needs
- Session 7 VR and Technology supporting Games development
- Session 9 Exploring SEND through media

**What do you want to share?**

**Helen Caldwell Moderator** • Session 19 Music technology  
Ideas for music making with technology:  
Cause and effect app Soundbox working with a bluetooth switch  
Garageband: as whole group activity or with individuals. Good for introducing different instruments. Virtual instruments.  
Madpad: quite demanding. Could use for a visual schedule. Could reinforce images and sounds.

**Stephen Cullingford-agnew Owner** • Session 12 Technology supporting cognitive de...  
Photographs from Rowan Gate school  
Jo Whittings Photographs  
07/02/2017  
11 Photos - View album

**Helen Caldwell Moderator** • Session 21 Robotics  
3/15/17  
10 Photos - View album

**Helen Caldwell Moderator** • Session 19 Music technology  
Apps for sound and music  
VidRhythm  
Sound Doodle  
Madpad  
GarageBand  
Beamzz  
Phonotonic  
Soundscope

**Helen Caldwell Moderator** • Discussion  
Originally shared by Helen Caldwell - 3 comments  
Along with some European colleagues we are developing a new free online course on using mobile learning technologies to run in May 2017...

**Helen Caldwell Moderator** • Session 16 Supporting SLCN and Autism  
This is a very interesting film about the Be My Eyes app which has over 400,000 volunteers around the world on hand to support 350,000 blind users by answering short queries using iPhone to iPhone cameras.  
<http://www.bbc.co.uk/news/magazine-39056979>  
An app to help blind people to 'see' - BBC News

**Jennifer Woodiwiss** • Discussion

<https://plus.google.com/communities/108570514394376300693>





# Background

Students using technology to design immersive storytelling environments and pupils moving between digital and physical spaces in order to explore narrative through collaboration and control.

- multisensory storytelling ‘in which stories are not simply told but can be experienced with all our senses’: Preece & Zhao (2015, p.1)
- digital and physical spaces ‘orchestrate..an environment in which (Zoe) can interact with the world in new and constructive ways’: Pagliano, (2000,p.5)



# Richard Hirstwood

iPad special effects



1:52 / 8:49



YouTube



Cheap small sound to light Box



YouTube





# Multisensory spaces

**Hirstwood** Training Ltd

## HOW TO GUIDE:

### GLOW GLOVES

WWW.HIRSTWOOD.COM

**1** THINGS YOU NEED TO KNOW ABOUT YOUR GLOW GLOVES AND TORCH. THIS IS A TOOL NOT A TOY IT IS DESIGNED FOR USE WITH CHILDREN WHEN ACCOMPANIED BY PARENTS OR PRACTITIONERS.

SHINE THE LITTLE UV TORCH ONTO THE GLOVES TO MAKE THEM GLOW

**2** THEY WILL ALWAYS WORK BEST IN A DARKENED ROOM. THE DARKER THE ROOM THE BRIGHTER THE GLOVES WILL APPEAR

HOW MANY DOTS 1 2 3...

JOIN THE DOTS

**3** TOUCH THE TORCH LIGHT ON THE MATERIAL AND START COLOURING

**4** MY HAND...YOUR HAND

MYSELF

COUNTING FINGERS

GREAT FOR BODY AWARENESS AND HAND EYE CO-ORDINATION

**NOTE** ALWAYS USE UV BACKLIGHT TORCHES UNDER SUPERVISION. UV BACKLIGHT TORCHES ARE VERY SAFE HOWEVER AVOID ALLOWING THE LEARNER TO POINT THE LIGHT DIRECTLY INTO THE EYES. THE GLOVES, IF TREATED WITH CARE, SHOULD LAST.



<http://www.hirstwood.com/sensory-kits/sensory-kit-ideas-sheets>

<https://www.theguardian.com/teacher-network/teacher-blog/2012/mar/21/creativity-technology-classroom-teaching>



# Working with light



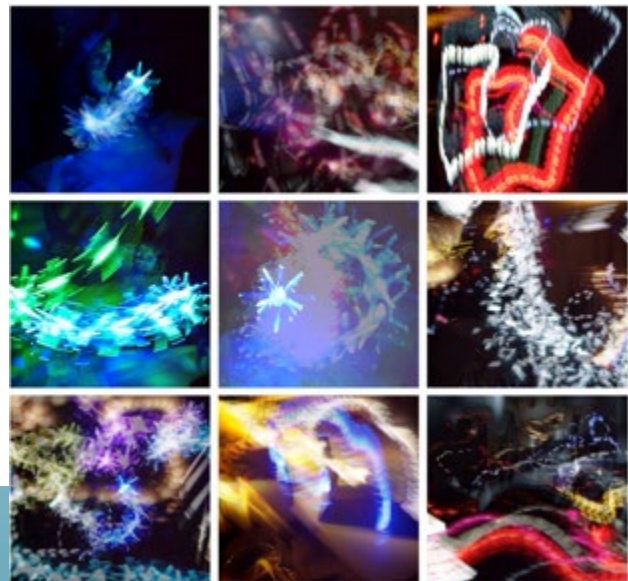


# Multisensory environments





# Manipulating images





# Manipulating images





# Green screening





# Animation



The snowman



0:15 / 0:28




YouTube





# VR: Google expeditions



GOOGLE EXPEDITIONS  
GIANT ANIMALS

**Giant Animals #GoogleExpeditions Lesson Plan**

In this #GoogleExpeditions lesson students explore Giant Animals. The

By [hannahrachaelphillips](#)

(0) ★★★★★ FREE



Physical and Human Geography  
Mount Everest  
Google Expeditions Lesson

Geography  
Ages 7-11

**Physical and Human Geography of Everest #GoogleExpeditions**

This #GoogleExpeditions lesson develops student skills in physical and

By [DigitalExplorer](#)

(0) ★★★★★ FREE



GOOGLE EXPEDITIONS  
MEET THE DINOSAURS

**Meet the Dinosaurs**



EdTechTeam

Standards  
MS-ESS2-1  
ESS2-1-1  
ESS2-1-2  
ESS2-1-3

**GOOGLE EXPEDITION:  
CORAL REEF FOOD WEBS AT THE  
GREAT BARRIER REEF**

BY MICAH SHIPPEE, PHD

**Coral Reef Food Webs at the Great Barrier Reef #GoogleExpedition**

Selected Expedition: The Great Barrier Reef Grade(s): 3-5 Subject(s): Science

By [micahshippee](#)

(0) ★★★★★ FREE



THE GREAT WALL  
PROTECTING CHINA WITH MATH

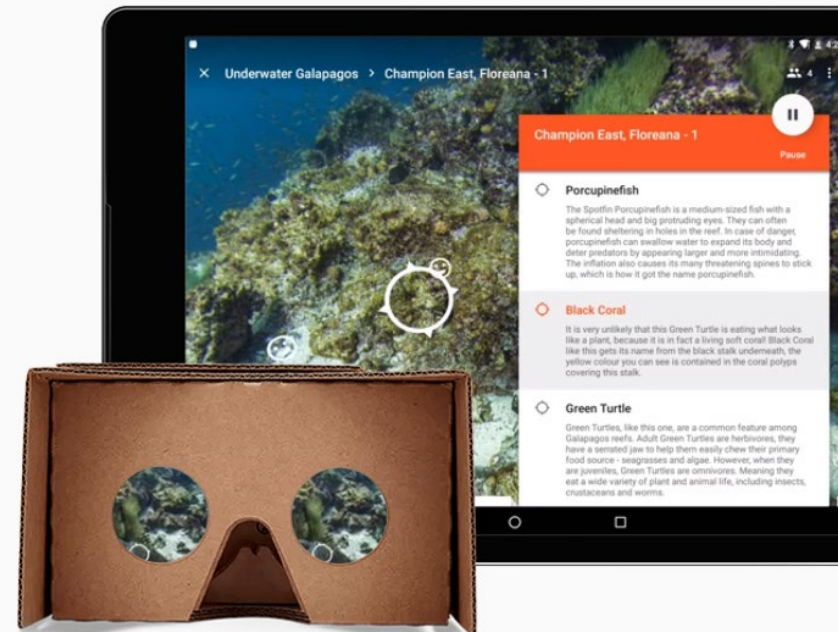
Google Expeditions

**THE GREAT WALL: PROTECTING CHINA WITH MATH**

Students combine historical research with multiplication, division and addition to

By [brennanrps](#)

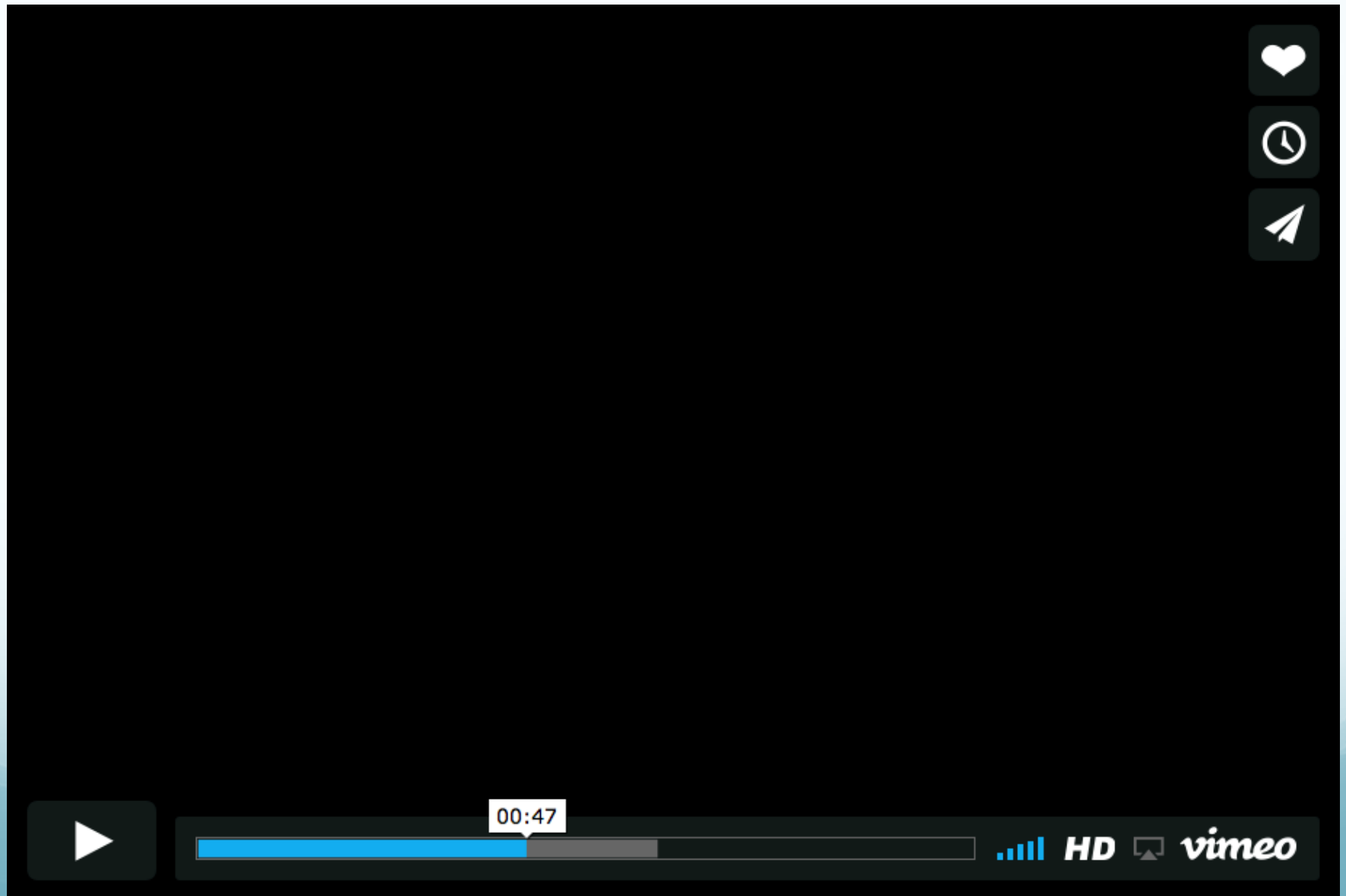
(0) ★★★★★ FREE







# VR inspiring writing







# VR and autism





# VR inspiring writing

## CLASS BLOG

### VR Writing description!

By leapinglizard6 - Year 6

2 Years Ago - 178 words - 2

Langham Village Primary School

Story

I am actually in Waterfly woods! I am surrounded with purple and pink trees. I can see the weirdest looking tree it has strange branches and there it was coloured lavender and scarlet. Some of them are in the shape of a rocket! I can see freckled, illuminous mushrooms that glowed this amazing sapphire blue. I can see the mountains in the distance it sounds like they are calling me. The clouds are candy floss.

Now I am on Sam the spying giraffe, but he is not a normal giraffe he can turn invisible! I can see the time travelling elephants temple it is amazing! After that, a feisty, fierce gorilla that looked as fast as a cheetah run Sam run Sam, he ran as fast as he could and the rocks sat watching Sam run WHOOSH!! The reason I came here today is to see the time traveling elephants temple that has been my wish for years!

That is the end now and after that we time travelled which was amazing! This has been an amazing experience!!

[Write a Comment](#)

By Night Zookeeper Buzz 2 Years Ago

I really liked how you described Stifle LeapingLizard: 'feisty, fierce gorilla'. Well done, keep up the great work.

By Mrs Cotton 2 Years Ago

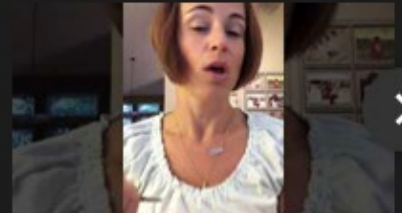
Super first draft LeapingLizard6, I can already spot many of the features we discussed. I can hardly wait to see what happens when you re-visit this.





# Designing spaces

IMG 0116



0:46 / 1:17



YouTube







# Bear Hunt

Going on a Bear Hunt Rowan Gate School 2017





# Reflections using Adobe Voice



## Thematic analysis

Immediacy and immersion  
Engagement of pupils and students  
Confidence with technology  
Emotional responses  
Student/pupil interaction

Combining digital and physical  
Transfer to practice  
Understanding of narrative  
Pupil control and independence





# Quotes

## **Student perceptions**

‘This impacted the children in a positive way as they were able to participate in a fun, interactive activity in which they used sensory equipment to understand the story where the wild things are.’

‘For children who when you read them a story haven't got the ability to conjure up the images in their mind.’

## **Teachers' practice**

‘We're not talking about it we're doing it... I like to make an environment tell a story through a visual and a sound and some objects.’

‘Bringing in the images and the video it meant a lot more to them. It made the understanding come alive.’

## **Pupil engagement**

‘I had so much fun. I would like to do ‘Room on the Broom’.’

‘I remember Jack and the wild trolls, do de do, the wild things.’





# Summary

Our experiences so far have demonstrated that technology-enabled multisensory environments for storytelling can provide *experiential learning opportunities* combining *real world interaction* with the *creation of digital artefacts*.

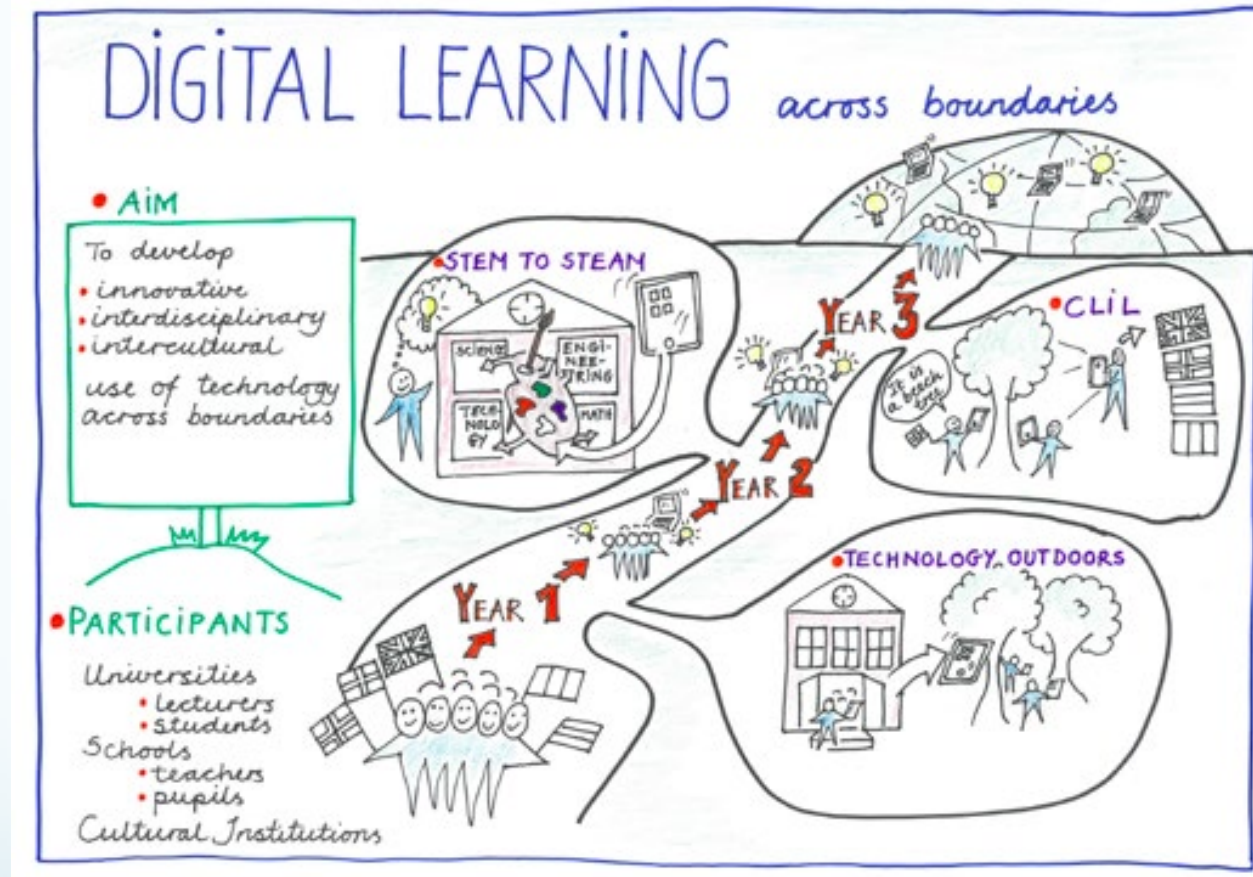
As a result of this, we acknowledge the need to embed the use of technology in SEND contexts through immersive approaches mixing physical and digital learning spaces.



Bringing together physical and  
digital learning



# Digital Learning across Boundaries



Digital Learning across Boundaries (DLaB) MOOC

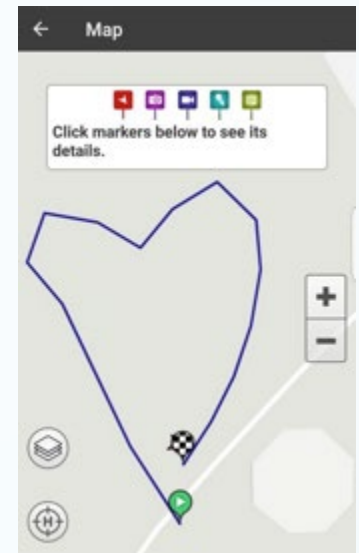
<http://dlaberasmus.eu>

DLaB online

community: <https://plus.google.com/u/0/communities/117458443566280105364>



# Creating trails





# Forest School







# Wild writing




...mobiles capturing outdoor learning



# Wild writing




My Books Pages Undo Page 2 (of 3)



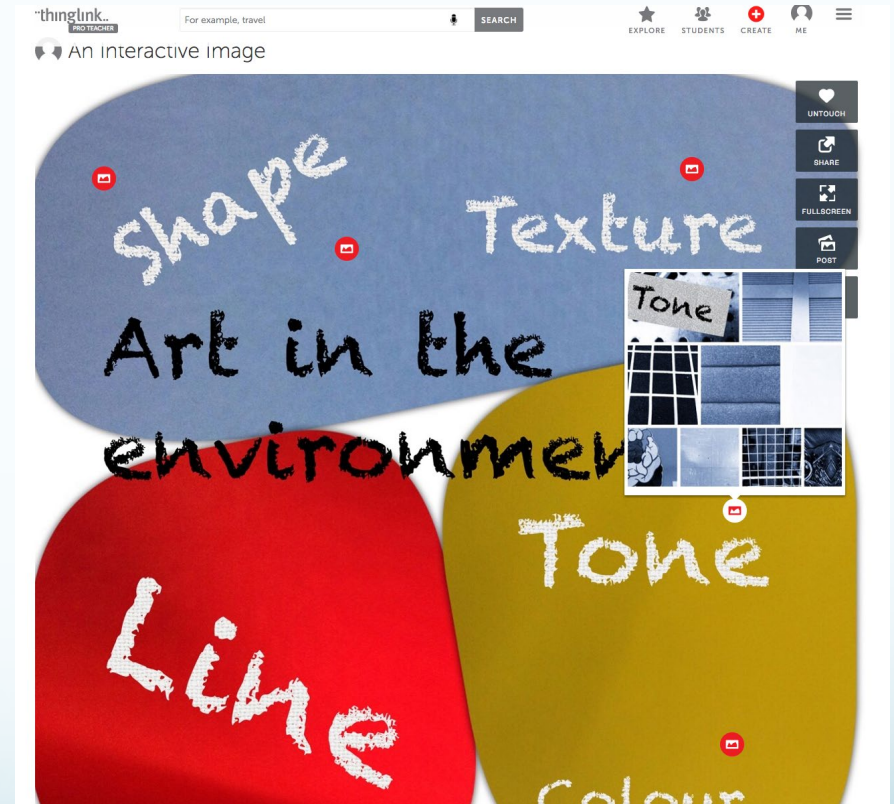
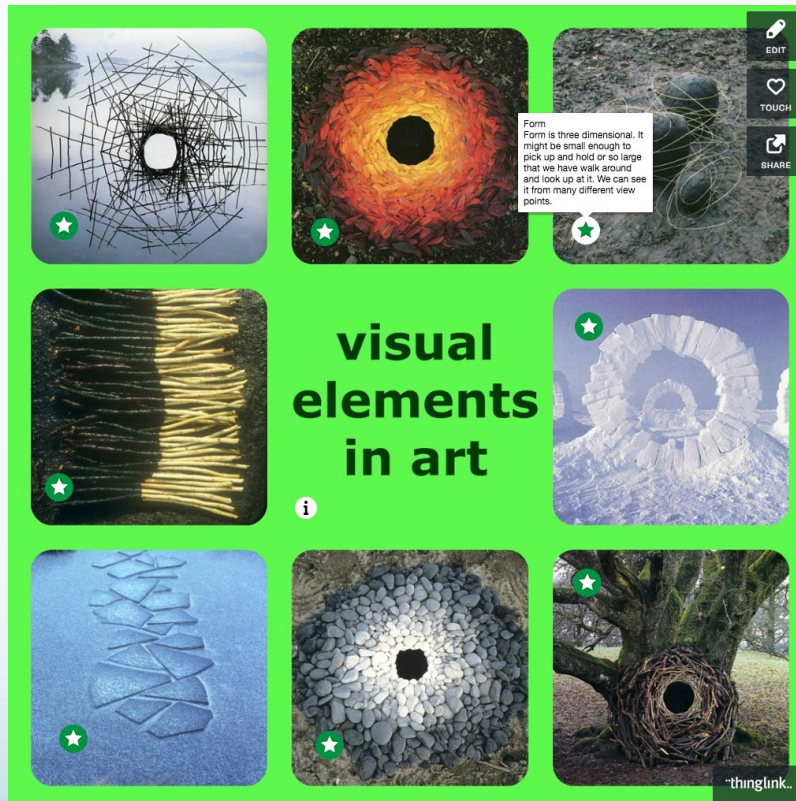
The tree fuels the air  
The tree fills our body  
and mind  
with the soul of the  
earth  
the soil where we live  
from

Swirling pine





# Art in the environment



<https://www.thinglink.com/scene/838166724078469121>

<https://www.thinglink.com/scene/893192555754160128>





# Ephemeral art





# Virtual sculptures





# Appstract art with Rollworld, LayerPic and Fragment





# Sketchbook circles

First image manipulation



Second Manipulation





# Planning to teach computing across the ability range



# Primary Computing

- Children will 'use computational thinking and creativity to understand and change the world'
- Begin by building metacognition using the key concepts and approaches so that thinking strategies are explicit and transferable
- Unplugged plugged and real world applications





# UpTIME: scaffolding planning



## UPTIME

'UpTIME' is a teaching sequence for primary computing. It stands for:

- Use/play
- Tinker
- Improve
- Make
- Evaluate



Image from pixabay.com

Teaching Primary Computing

Getting Started

UpTIME

Setting Learning Challenges

Research

About this site

Constructivism, based on students' active participation in problem-solving and critical thinking, has profoundly influenced the teaching of programming (Ben-Ari 1998). It implies a need for authentic and meaningful experiences to support learning based on prior experiences and models of the world.

<https://challengingcomputing.wordpress.com/uptime/>

Chris Shelton University of Chichester

Sentance, S. and Csizmadia, A., 2016. Computing in the curriculum: Challenges and strategies from a teacher's perspective. *Education and Information Technologies*, pp.1-27.

***...building teachers' repertoire rather than recipes***



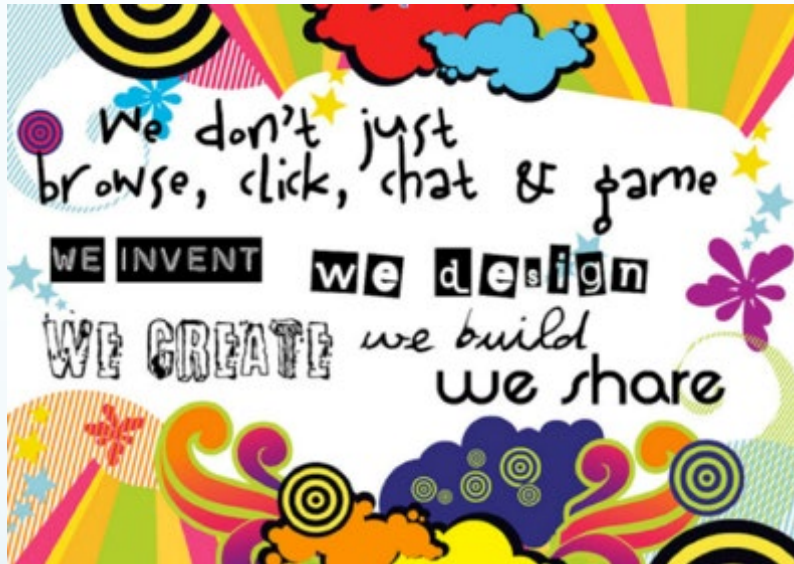


# Ideas to reinforce key vocabulary...

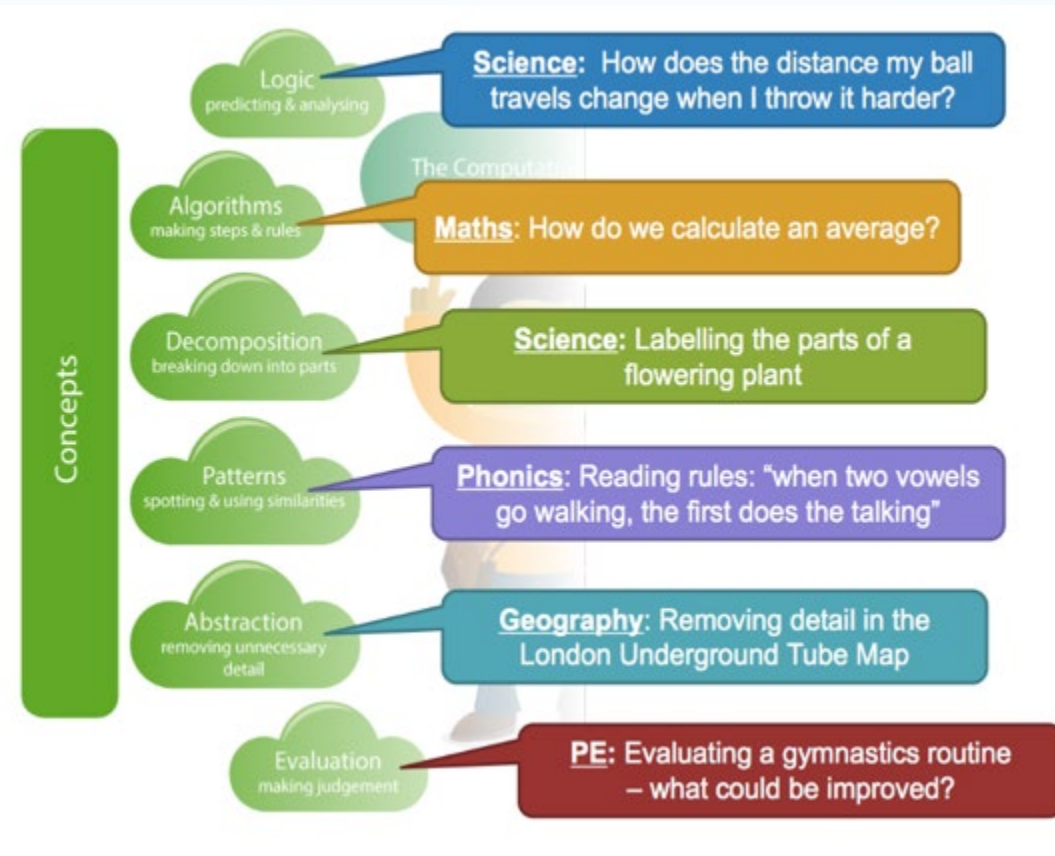




# Computational thinking across subjects



Digital makers: creators, collaborators, digitally critical, responsible and active learners who use computational thinking across the curriculum







# Everyday algorithms

## Chair stacking

Repeat 32 times:

**If previous chair is stacked:**

Stand behind chair

Pick up chair

Walk to the aisle

Walk to front of the first set of tables

**If there are no chairs there:**

Place chair nearest the door

**Else**

**If there are less than 5 chairs in the stack:**

Add chair to stack

**Else**

Make new stack next to previous

**Else**

Wait



# How do I make that?...decomposition



Get a slice of bread.



Eat the sandwich.



Spread the jam on the bread.



Get some butter.



Spread the butter on the bread.



Get some jam.



How do I program this?





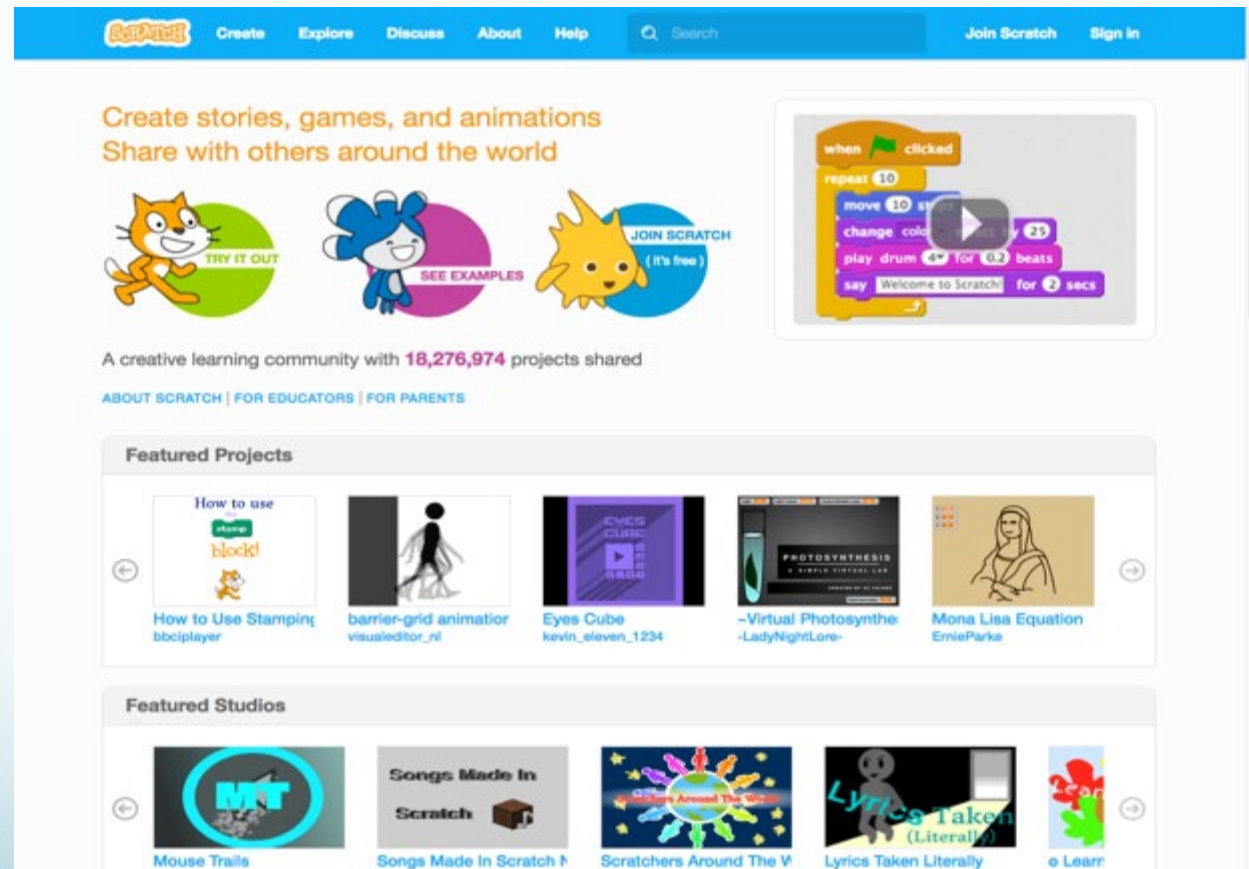
# Makey Makey Playdate





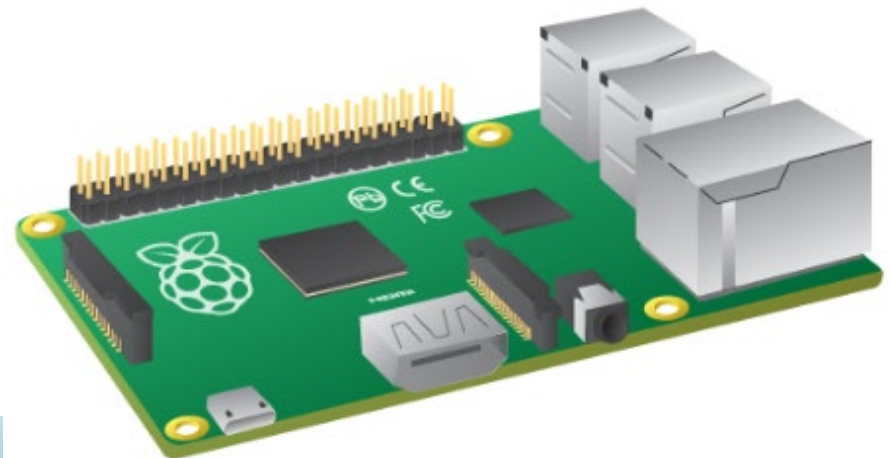
# Scratch 2.0 community

Moving from **computational thinking** to **computational participation**: “the ability to solve problems with others, design systems for and with others, and draw on computer science concepts, practices and perspectives to understand the cultural and social natures of human behaviour” (Kafai and Burke 2014)





# Physical and digital





# Wearable tech



And we have a t shirt that lights up when you jump! @neilnjae  
@SwayGrantham @JeanEd70



Wearable tech Pointe Shoes [arra]stre







# Deconstructing technology





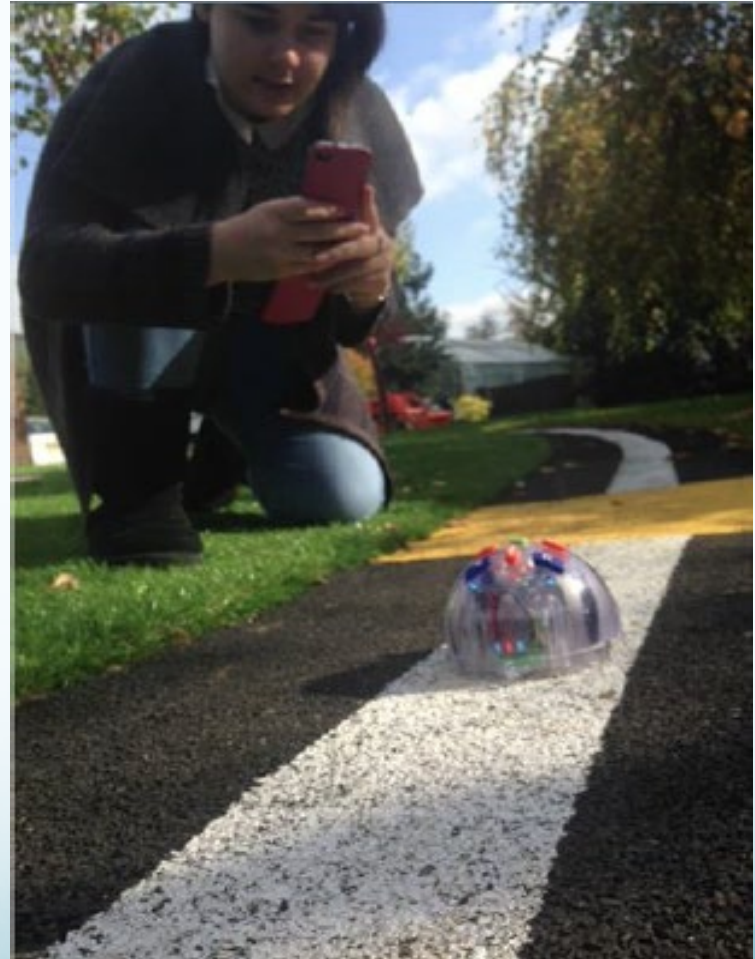
# Rescue Robots



*...real world applications*




# STEM garden







# Robots and autism

University of Hertfordshire -- KASP... 




4:04 / 4:24



YouTube



ASK NAO - Chat About: District ... 



YouTube





# Computing unplugged

Fluffy.

Can we think of anyway we could change our rules to make sure everyone's looked like this?

Choose your challenge

Babbling- Add more detail to how big the eyes are and where they should go?

Flying- Add more detail to crown and wings. Think about their size and where they are on the body.

Zooming- Add detail to all of the instructions. You have two minutes.

- Draw a circle for the body
- Add 2 eyes
- Add a crown
- Add wings
- Add 4 legs.

## Pancake Recipe

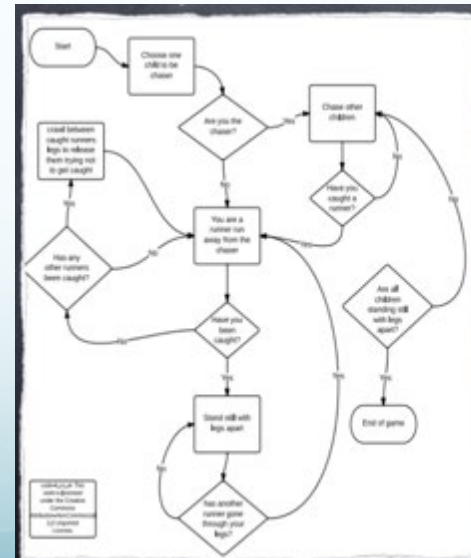


### Ingredients:

- 100g plain flour
- 1 egg
- 300ml milk
- Pinch of salt
- 50g butter

### Method:

- 1) Sieve flour and salt into a mixing bowl
- 2) Make a well in the flour and break the egg into the well. Whisk the egg and flour mixture
- 3) Gradually add the milk and beat to create a smooth batter (consistency of thin cream)
- 4) Heat the butter in a pan. When butter melted, turn heat down to medium
- 5) Coat the base of the pan with pancake mixture (using a ladle is great!)
- 6) Cook for one minutes before flipping the pancake and cooking the other side for 30 seconds
- 7) Enjoy!



<http://www.code-it.co.uk/unplugged/playgroundgames/playgroundoverview.html>



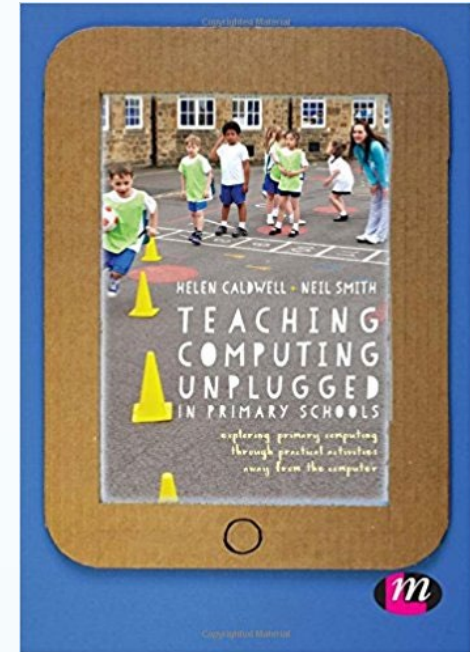
# Unplugged ideas

## Teaching computing? Try switching off your screens

From robot hamsters to beatboxing, there are plenty of activities to help students develop thinking skills associated with programming. No computers needed



**i** Moving away from computers can often help students understand ideas behind programming without being distracted by the technology. Photograph: Alamy

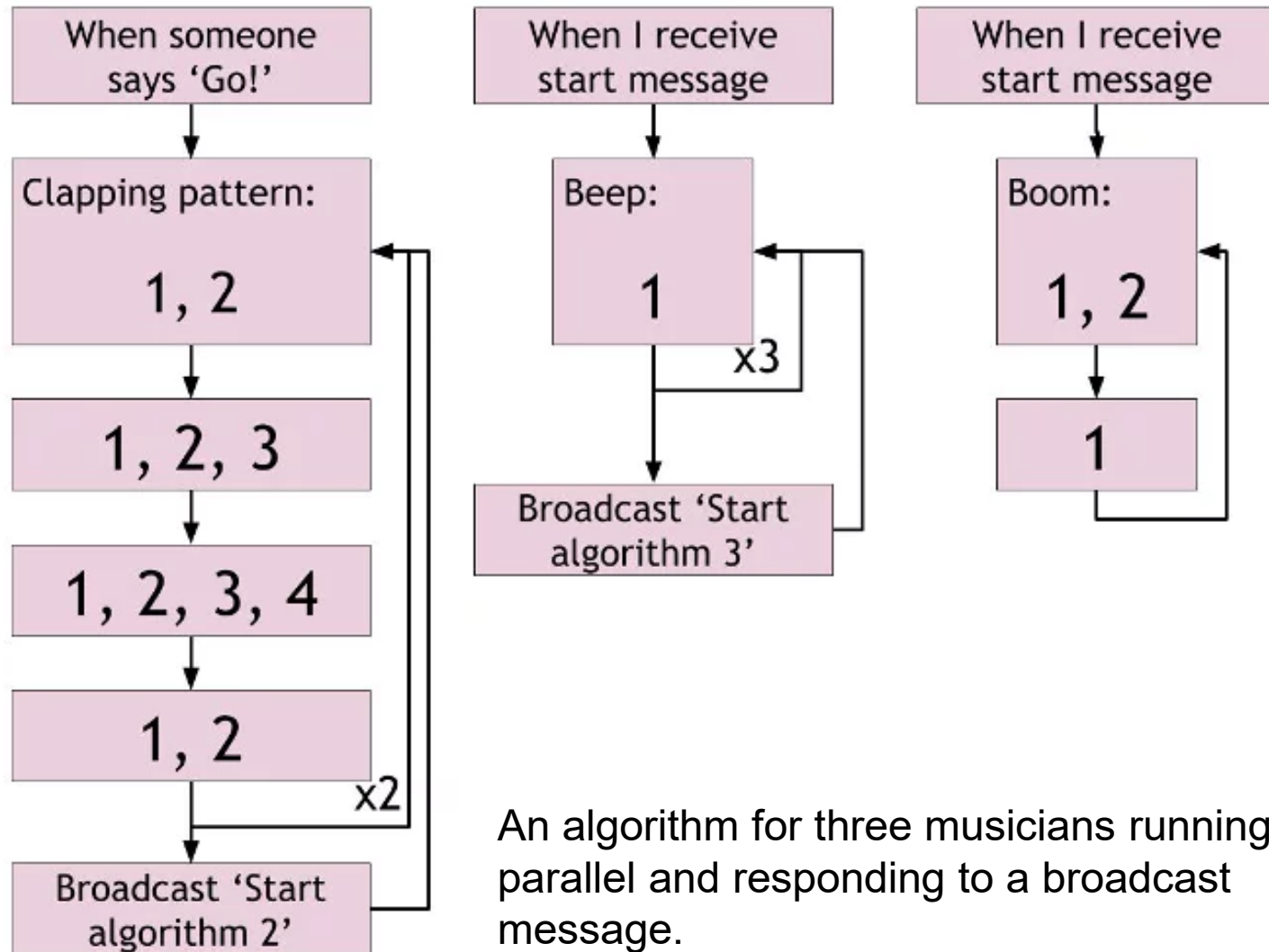


Robot hamster playground  
Kitchen computing  
Codes for transmission  
Conditional questions  
Human beatbox

<https://www.theguardian.com/teacher-network/2017/mar/01/teaching-computing-try-switching-off-your-screens>



# Human beatbox



An algorithm for three musicians running in parallel and responding to a broadcast message.



# What does a technology-enabled supportive classroom look like?





# Next steps?

- explore the use of sound
- look at mobile devices
- develop personalised strategies
- allow time to develop routines
- train staff in adopting a multisensory approach
- support print with visuals and media
- use technology to promote self-esteem
- learn how to create and customise accessible resources
- make resources available online in digital format and navigable using headings and hyperlinks





# Postgraduate Certificate in Primary Computing

- 60 Masters' credits through 2 modules over 2 years
- Online course with optional face to face sessions and continual tutor support
- Shared enquiry with fellow teachers in an online community
- Designed to help you lead positive change in your school
- Flexible content across computing and digital literacy
- Assessment tasks linking classroom practice with theory and research
- No need to be an expert in the field

Contact

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# Links

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## Links:

**Keynote slides:** [goo.gl/jxaANb](https://goo.gl/jxaANb)

**Postgraduate Certificate in Primary Computing:**

<https://www.northampton.ac.uk/study/courses/postgraduate-certificate-primary-computing-pgce/>

**Digital Learning across Boundaries (DLaB) MOOC:**

<http://dlaberasmus.eu>

**DLaB online community:**

<https://plus.google.com/u/0/communities/117458443566280105364>

## Padlets:

Inclusive art:

<https://padlet.com/helencaldwell/art>

Multisensory learning:

<https://padlet.com/helencaldwell/multi>

Virtual sculptures:

<https://padlet.com/helencaldwell/virtualsculptures>

Wild writing:

<https://padlet.com/helencaldwell/ufltdob77zed>

Computing for All:

<https://padlet.com/helencaldwell/inclusivecomputing>

Computing unplugged:

<https://padlet.com/helencaldwell/unplugged>