MA Easter Conference 2016

The iSTEM+ approach

A new STEM Education & Skills strategy for schools, academies and colleges
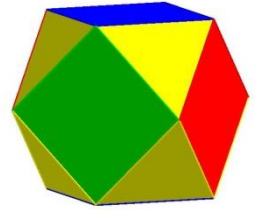
Adrian Oldknow   adrian@ccite.org

Emeritus Professor in STEM Education, Chichester University

Founder of the Cambridge Centre for Innovation in Technological Education CCITE

The presentation can be downloaded from DropBox.

The iSTEM+ approach Adrian Oldknow

- Started in May 2010
- STEM teachers' professional associations
- ASE, ATM, CAS, DATA, MA, NSEAD, YST
- Association of School & College Leaders
- Responding to employers' skills shortages
- Integrating Enhancement **and** Enrichment
- Embedding cross-curricular work
- NOT `one-size fits all' – Open Source.

Spot the connection?
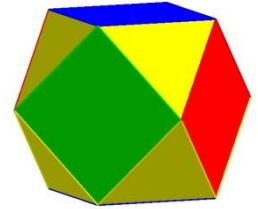
Jonathan Ive
Senior Vice President, Design

London-born designer Jonathan Ive is Apple's senior vice president of Design, reporting to CEO Tim Cook. Since 1996, he has been responsible for leading a design team widely regarded as one of the world's best. As the driving force behind the look and feel of Apple's innovative products, Jony also provides leadership and direction for Human Interface (HI) software teams across the company.

Recognized with numerous design awards, Apple products are featured in the permanent collections of museums worldwide, including MoMA in New York and the Pompidou in Paris.
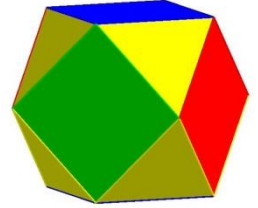
The iSTEM+ approach Adrian Oldknow

Integrated STEM and **more**:
 subjects: A&D, Geography, health, sports..
 skills: team work, communication..
 people: families, peers, employers..
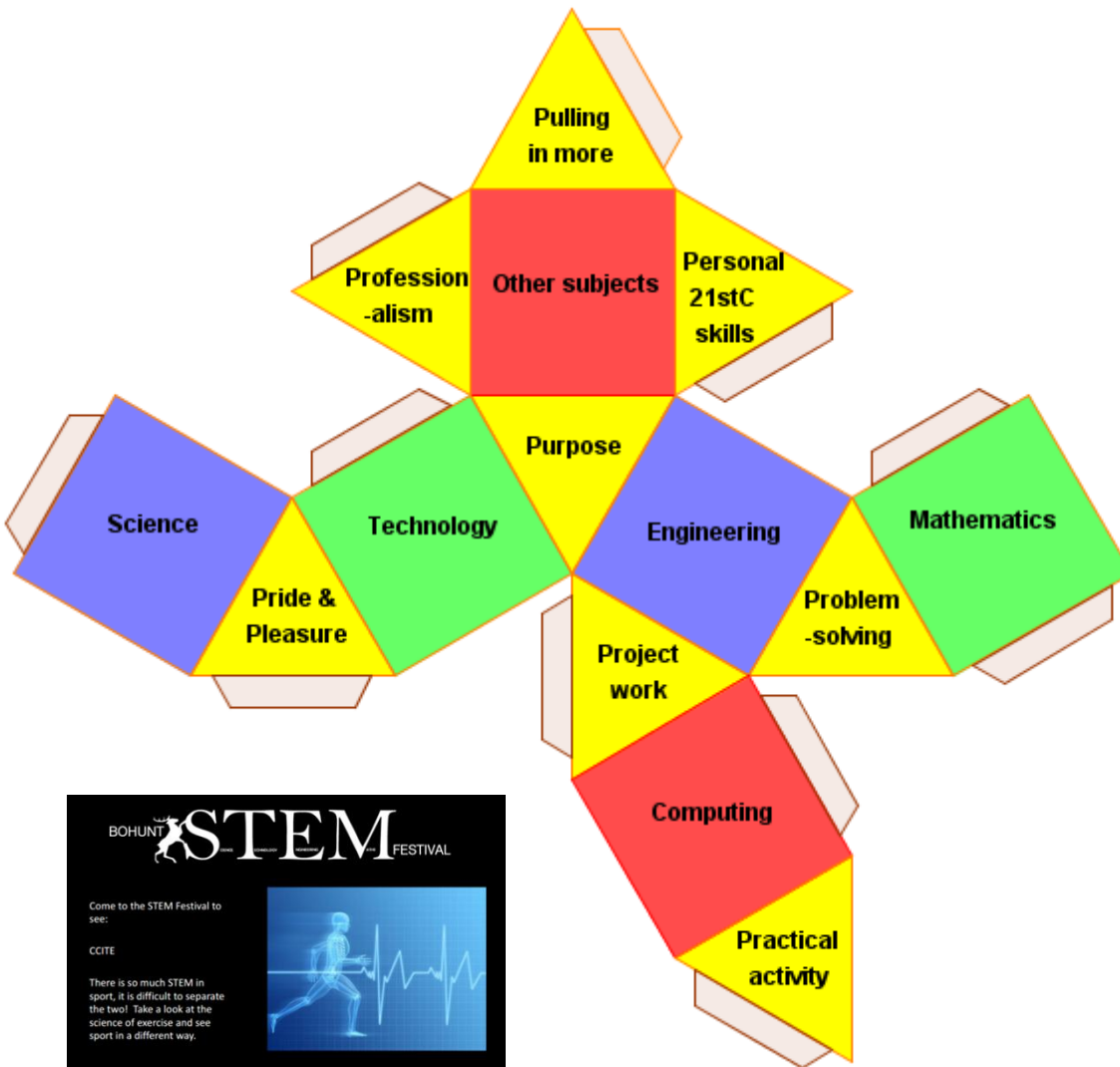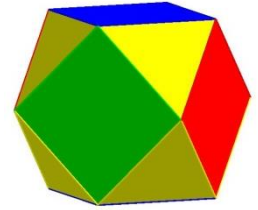embedded into the normal timetable
accessible to all
includes teachers' CPD
minimum disruption, cost and lead time
maximum effect, scalable and sustainable

What is a Skilful School?

Pulling in more

Profession-alism

Other subjects

Personal 21stC skills

Purpose

Science

Technology

Engineering

Mathematics

Pride & Pleasure

Problem-solving

Project work

Computing
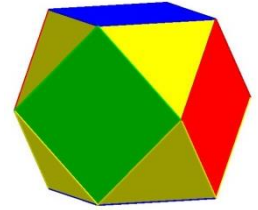
Practical activity

iSTEM+
Integrated STEM and more:
Subjects: Science, DT, Engineering, Maths, Computing, Geography, Art&Design, Sport, Enterprise, PSHE…
Skills: team work, problem-solving, practical skills, communication, study…
Engagement: peers, families, ambassadors, employers, HE, workplace, learning community…

Cross-curricular group projects
Presentations and competitions
Portfolios and accreditation
Open source

BOHUNT STEM FESTIVAL

Come to the STEM Festival to see:

CCITE

There is so much STEM in sport, it is difficult to separate the two! Take a look at the science of exercise and see sport in a different way.

Free for all the community. Open from 10.30 – 16.00 on Saturday 15th March
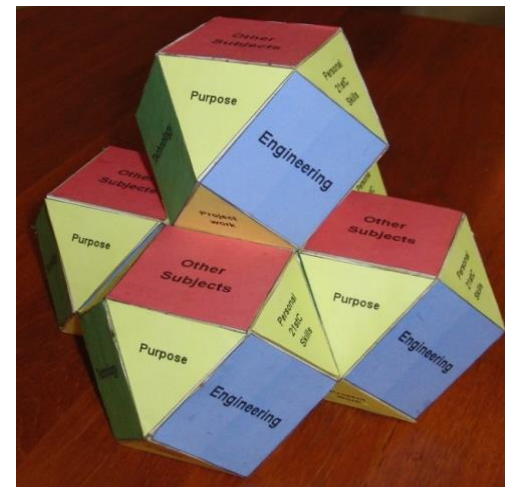
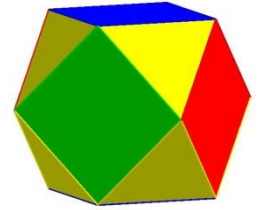# What is an iSTEM+ local Cluster?

The **Gosport iSTEM+ cluster**:

- Fareham College and the CEMAST Centre 16+

- Bay House School and 6th Form 11-19

- Brune Park Community School 11-16

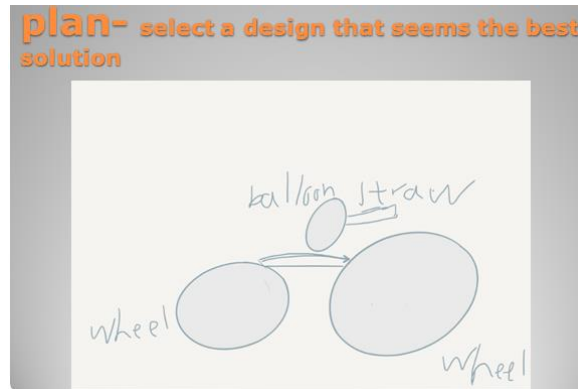- Gomer and Brockhurst Junior Schools 8-11
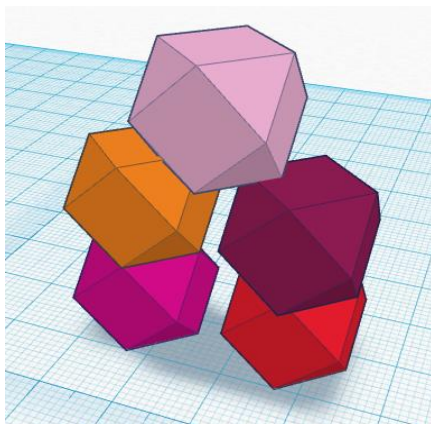
Cross-phase
Collaborative
Sharing
Transition
Progression

Examples from iSTEM+ clusters

Through gSTEM lessons we seek to inspire, engage and enthuse learners iSTEM+ is all embracing as a cross-curricular approach to learning and not simply an acronym representing disconnected single subjects or narrow specialisms. We will be teaching STEM through project based learning, cross curricular and cross phase

Adrian Oldknow adrian@ccite.org 3rd April 2016

Examples from iSTEM+ clusters
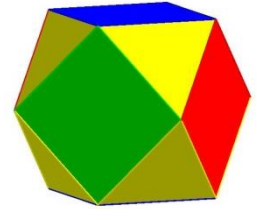
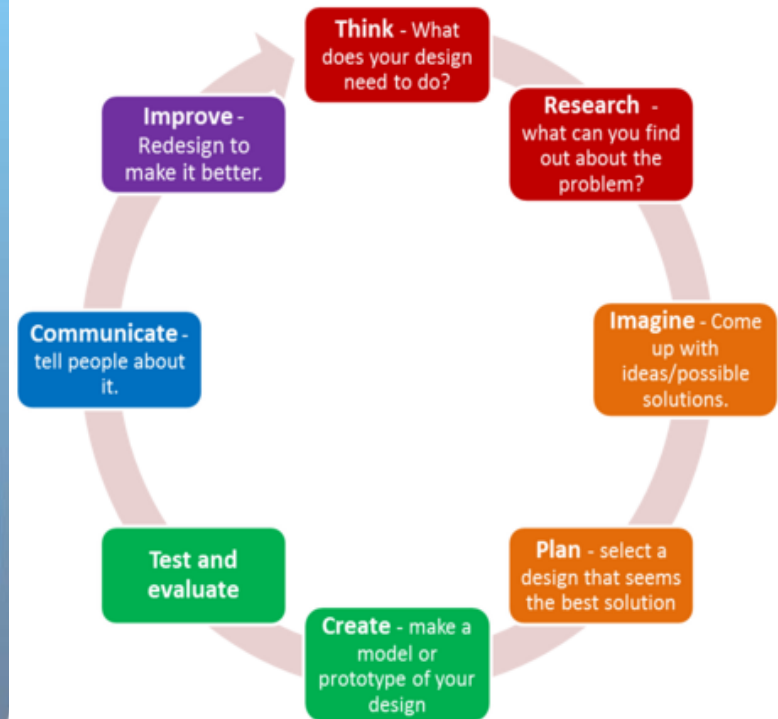## gSTEM Project Theme Map

Aims:

Scientific content: Physics, Chemistry and Biology have even coverage.
Technology: introducing new technologies, including programming.
Engineering: (including Mathematics) gSTEM Engineering and DT design wheel used throughout every project.
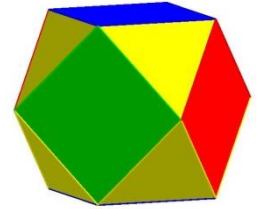
	Star Wars	The Space Race	Future life savers	iSTEM cluster & Science weeks	Sports Science - The Olympics	Powering the next generation
Activities	Getting into space - rocket physics Space vehicles-home learning Our Solar system	Tim Peake's Principia mission Programming Crumble controlled moon buggies	STEM in the world of medicine How motors have changed our lives. Prosthetic limbs	TBC	Biomimicry Sportswear design Maximising athletic performance	Sustainable living - Gomer Growers Environmentally friendly power generation

We use the gSTEM wheel to help us structure our gSTEM work.

Think - What does your design need to do?
Research - what can you find out about the problem?
Imagine - Come up with ideas/possible solutions.
Plan - select a design that seems the best solution
Create - make a model or prototype of your design
Test and evaluate
Communicate - tell people about it.
Improve - Redesign to make it better.

Thinking like an engineer: RAEng – Winchester/Manchester
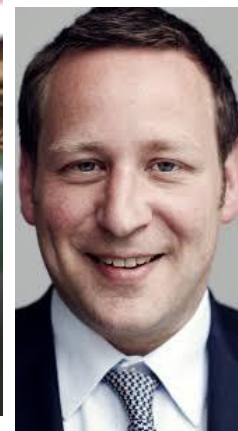
iSTEM+ friends in high places

- John Cridland: *Ambition for all in Schools*
- CBI/Pearson Education & Skills Review July
- Caroline Dinenage MP and DfE Minister
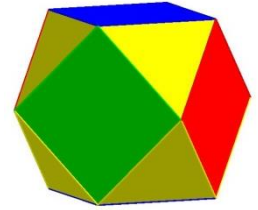- Responses include Nick Boles DfE/DBIS, Ed Vaizey DCMS and Jo Johnson DBIS

We need curriculum reform, not just exam reform

John Cridland
Director General, CBI

cbi.org.uk

#CBIschools

Some reasons to be cheerful

We have

- **Well managed schools** – with autonomy

- **Active Teachers' Subject Associations**

- **Dedicated Teachers**

- **An Innovative nation**

- **Inspirational role models**

- **Excellent educational resources**

- **Powerful free software and cheap hardware**
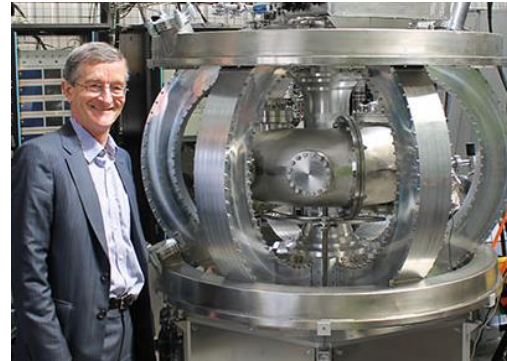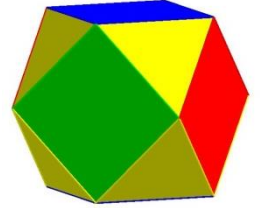
The developing landscape

The DfE's [Careers & Enterprise Company](#):

    employer led – STEM skills emphasis
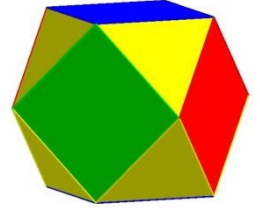
    Enterprise Adviser for each school/college 12-18

    20 EAs managed by each Enterprise Coordinator

    c4 ECs co-funded in each of the 39 English LEPs

    using iSTEM+ local clusters to engage Primary

Supported by other organisations such as [STEMNet](#), [STEM Learning](#), [School Gate SET](#), [TeenTech](#), [Founders4Schools](#), [EDT](#), [IET](#)…..

The digital world includes education

Education 5-19 should (IMHO) be:

- Equipping all learners with basic digital skills
- Inspiring learners to be the developers of the next technologies
- Providing experience with IT tools used by practicing STEM professionals
- Making smart use of new technologies to support innovative approaches to education
- Enabling all families to access educational resources and support
- Engaging with the Tech industries and employers

We're all set to go – who will wave the flag?
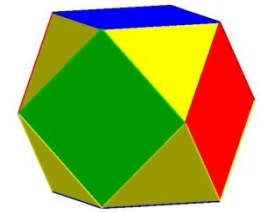
Big skills crisis in the 1980s: '*challenge of the chip*':

The BBC and Government Departments worked together with schools to make UK a world-leader:

BBC micro, MEP, TVEI, Computers for Schools

We are in the same position now.

The UK Digital Strategy has the capacity to restore the UK to being a world-leader in technological education again. Schools, academies and colleges will respond given encouragement, support and recognition from Government and employers.
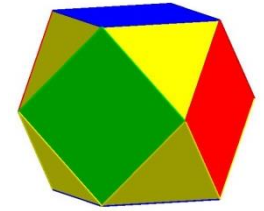
Are you ready to:
- become a Skilful School
- form an iSTEM+ cluster
- help prepare for tomorrow's world
- make the UK great again

when the revolution comes?
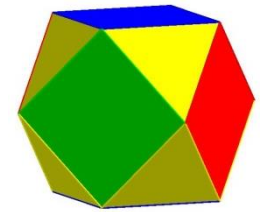
Interlude – questions & comments
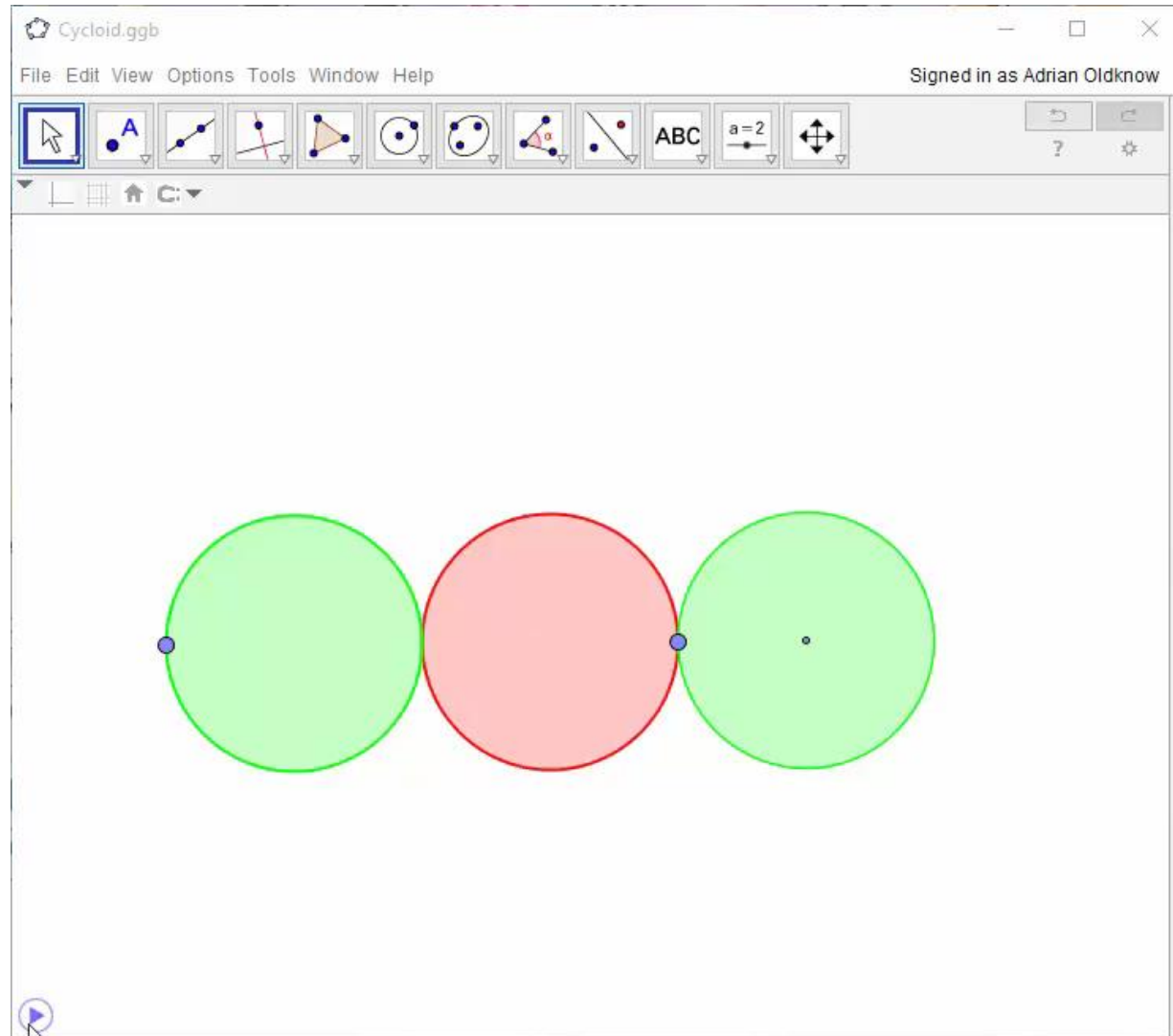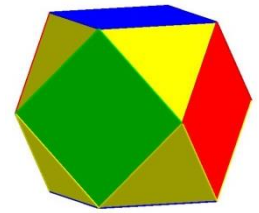
The Cardioid: a film by Trevor Fletcher

This film illustrates the properties of the cardioid which are connected with its generation as a one-cusped epicycloid. These properties are of wide importance as, suitably interpreted, they are

http://www.atm.org.uk/Trevor-Fletcher-Films

This slide has
embedded video

https://www.youtube.com/watch?v=OX12aOh9brw

Adrian Oldknow adrian@ccite.org 3rd April 2016

Film making with GeoGebra and Snagit

https://tube.geogebra.org/material/simple/id/3006373

3D Geometry with GeoGebra, Intel & Acer
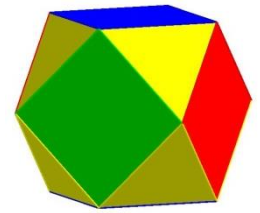
Check out our most recent development efforts to ensure GeoGebra keeps pace with the latest in 3D technology!


Acer, GeoGebra and Intel Schools: making maths easy

Putting the world of math in your han.

0:00 / 1:33

This slide has embedded video

https://www.geogebra.org/material/simple/id/2591039
https://www.youtube.com/watch?v=Ge2o0x9akYw

Adrian Oldknow adrian@ccite.org 3rd April 2016

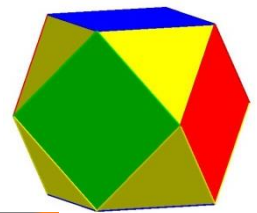# 3D Modelling with TinkerCAD

This slide has embedded video

Adrian Oldknow adrian@ccite.org 3rd April 2016
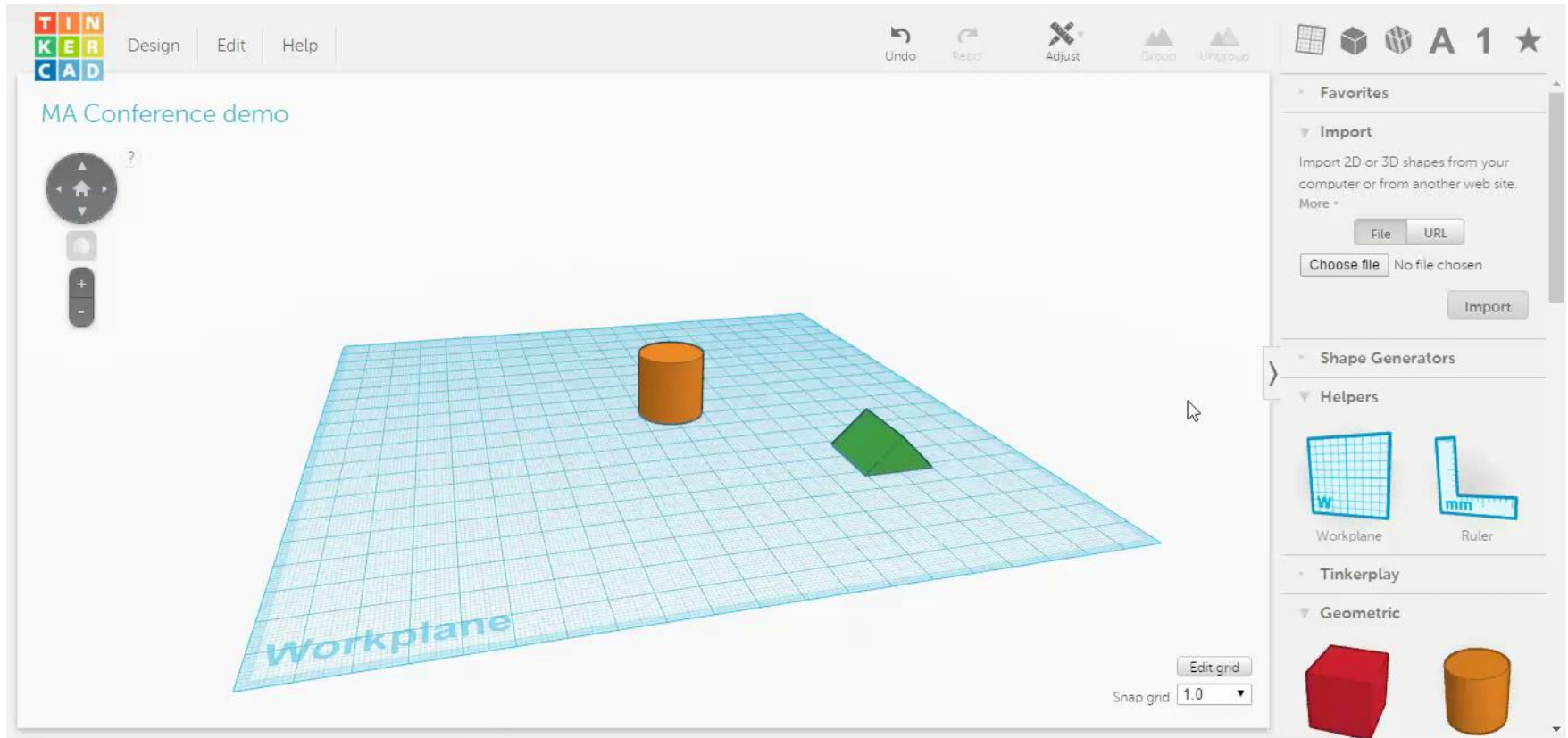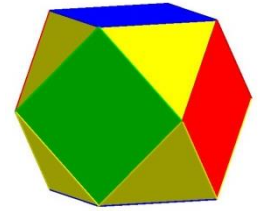
3D Printing < £1k
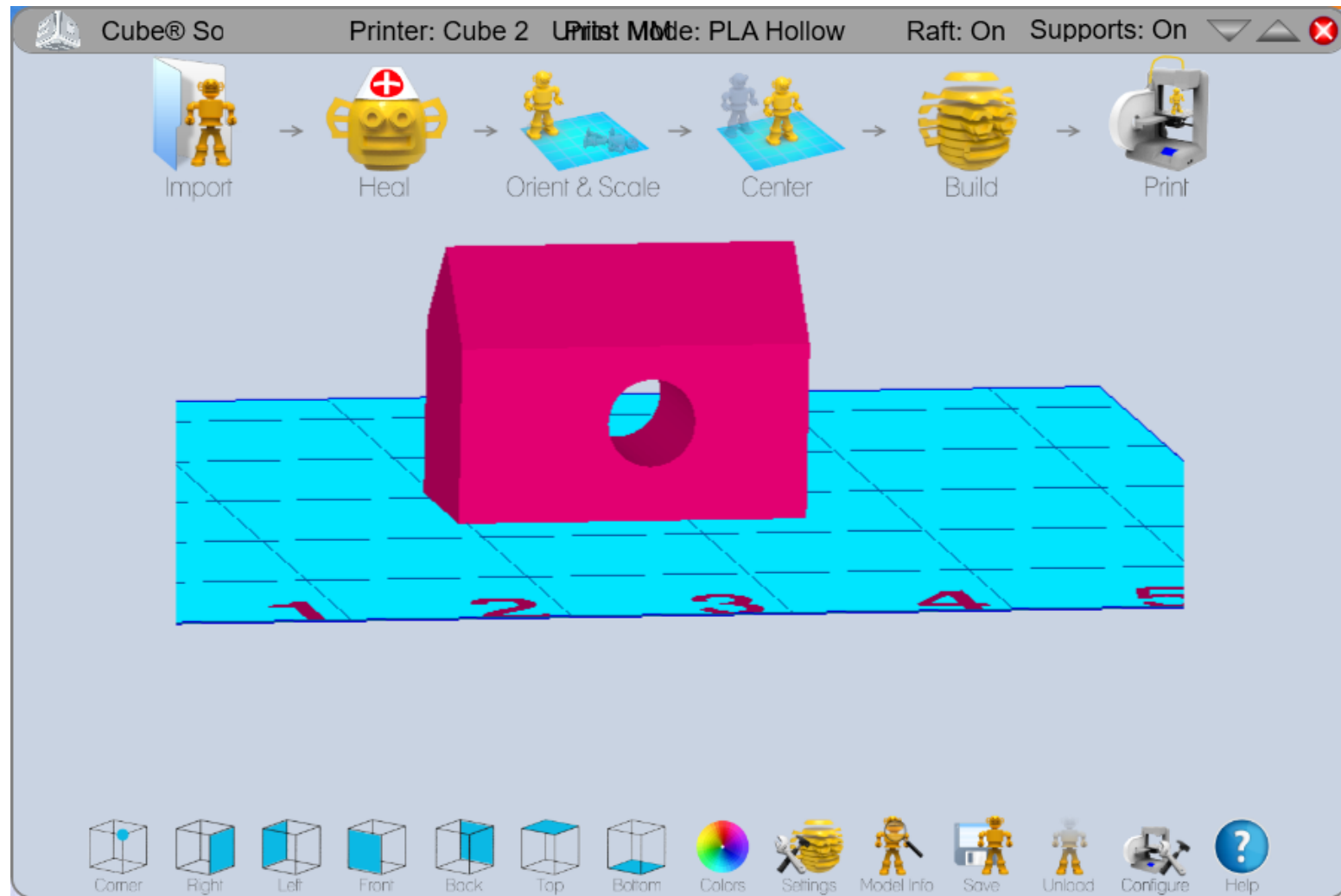
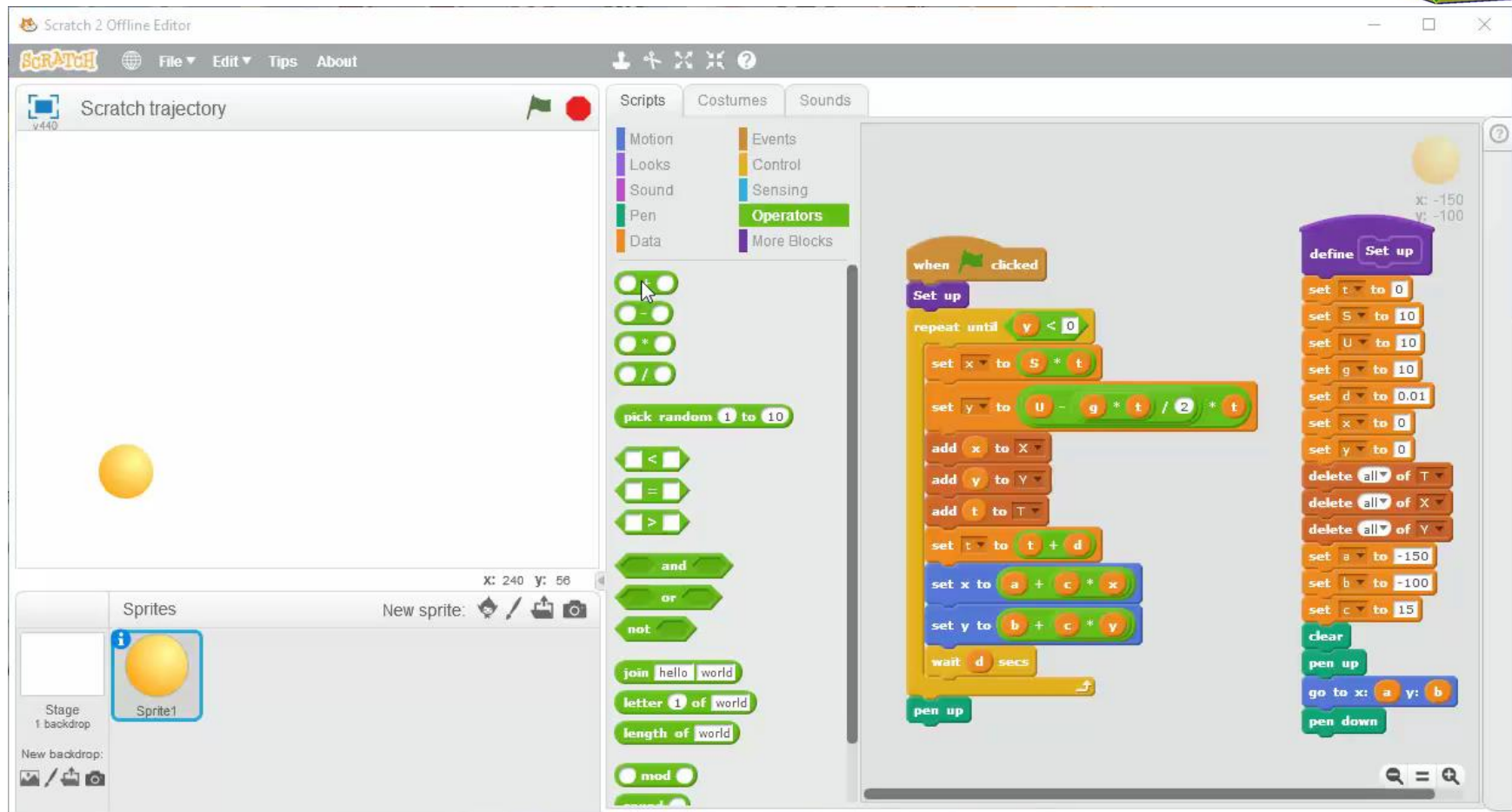# Data-logging with GeoGebra and smartphone

http://web.geogebra.org/chromeapp/#algebra
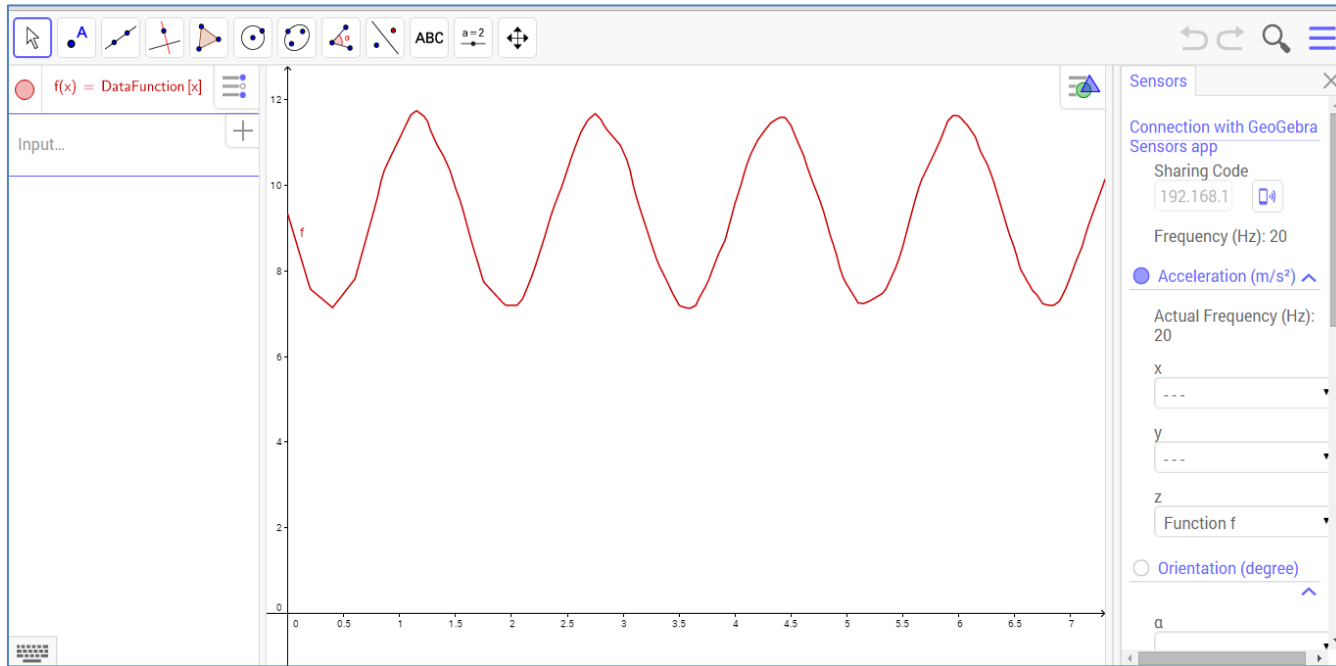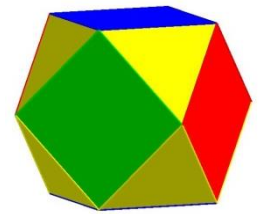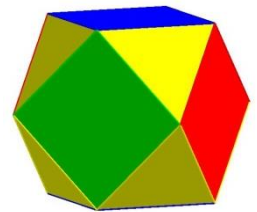
This slide has embedded video

Animation with Scratch – CAS Article

Bridging the digital divide – Digital Inc.

DIGITALiNC.
A WINDOW TO THE WORLD
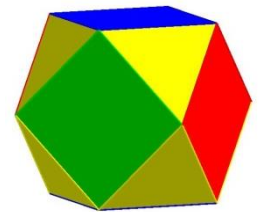
Digital Inc. Limited, Gate House, 5 Chapel Place, Rivington Street, London, EC2A 3SB Registered in England No. 09330640 | **CALL: 0207 012 1501**

Visit shop | | **About Digital Inc.** | **FAQ's** | **Terms & Conditions** | **Privacy Policy** | **Returns** | **Cancellation**

Exclusive deals on EE 4G MiFi and tablet bundles - discounted for parents, school children, pupils, students and Pupil Premium purchases:

- 10" Windows Linx 1010B - 9.6" Android Samsung Galaxy Tab E - 8" Windows Linx 810B - Osprey 2 MiFi/Charger

- Bundles are not available anywhere else for less - only from Digital Inc.

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- School's College's and University's: **FREE UPGRADE to WINDOWS 10 PRO** - register for a Voucher Code below

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"What is

<< Watch our student review here

	Linx 810b 8" tablet + 4GEE Mobile WiFi	Brief tablet description	SAVE £54
	• Windows10, Mobile Office (pre-installed) • 188 pixels per inch • Intel® Atom™ Processor Z3735F • microSD card slot • Osprey 2 MiFi / Portable Charger • 4GEE 24GB Sim, valid to use for 1 year	With its 8" 10-point touch display and lightweight build, the 32 GB Linx 810B 8" Tablet in black is ideal for everyday tablet computing. There's 32 GB of on board storage space for apps, downloads and files. Great size & bundle - put in your bag and go!	**Our price: £236** RRP. £290 All prices inc. vat **More info**

	Osprey2 MBB - 4GEE Mobile WiFi	Brief description	SAVE £46
	• Connect up to 10 Users to the internet • Doubles up as a portable charger for Mobile phones - Tablets - Laptops • Robust case • 12 Month warranty with support • 4GEE 24GB Sim, valid to use for 1 year	Your very own personal pocket mobile WiFi hotspot, **more secure than public WiFi** - superfast 4GEE internet coverage - the biggest and best network in the Country. **DIGITALiNC. EXCLUSIVE : MiFi+24GB SIM**	**Our price: £144** RRP. £190 All prices inc. vat **More info**

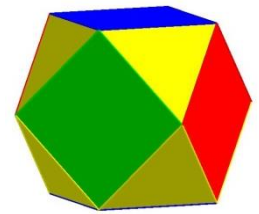|	Superfast 4GEE 24GB DATA only SIM		SAVE £6
	• Connect your tablet or iPad to superfast 4G mobile broadband pre-loaded with 24Gb data. • The data is valid up to 365 days. • Buy more EE PAYG top-up data from anywhere/anytime - from £15 for 2Gb. (24GB=£180) or • Buy another Digital Inc. EE 24GB SIM at our great education discount. (SAVING £66 on 24GB) • If you're not in a 4G area you'll automatically switch to the best EE network speed available. • Please ensure your device is compatible with 4G before purchasing.		**Our price: £114** RRP. £120 All prices inc. vat **More info**

COMING SOON...

pi-top: the laptop for the Rapsberry Pi
Learn. Play. Create.

SOFTWARE AVAILABLE

CEED Universe 3D Slash Scratch RaspberryPi Resources Minecraft

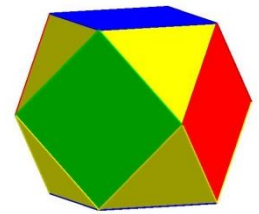Adrian Oldknow adrian@ccite.org 3rd April 2016

What fun – toys in a digital age
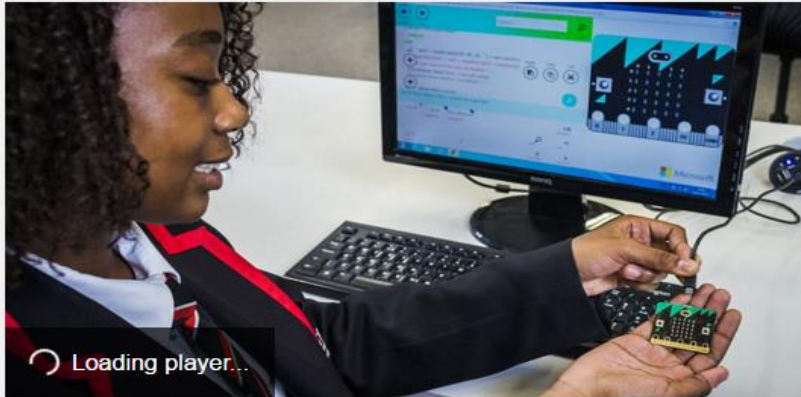
Spot the toy:
Meccanoid, Robosapiens Ollie, Sphero, BigTrak, OhBot, 3D printer, pi-top, RPi Robot, RPi3 laptop, Pi Zero, Edisons, Lego WeDo, Toshiba Camileo, Yo!Bot, EE Osprey, DynaKar, Galaxy S6, iPod, Intel Galileo, Compute Stick, Robitiky, Go!Temp, Go!Motion, ProBot, CodeBug, PicoBoard, Engduino, Arduino, Arduino robot, PicAxe, PicAxe robot, Crumble, Crumble robot, Sparkle, **BBC micro:bit**

Physical computing – Crumble, micro:bit etc

BBC micro:bit

http://redfernelectronics.co.uk/crumble/

The UK Digital Strategy

HoL Digital Skills Report – Digital Literacy

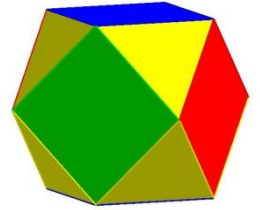DCMS Digital Strategy consultation

BESA – BETT 2016 and Education Show

HoC Sci & Tech Comm digital skills enquiry

Letter to Chair, Nicola Blackwood MP

CCITE written evidence now on-line
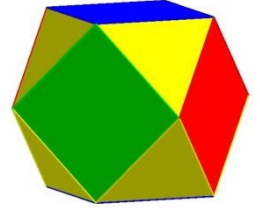
The iSTEM+ approach

Three CCITE Recommendations

Preparing young people to contribute to the digital economy:

In order to give students experience of working together to solve problems and create objects, supported by digital technologies, both primary and secondary schools should provide regular opportunities for cross-curricular group project work within the normal school timetable.
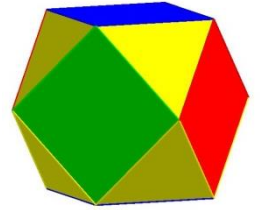
Three CCITE Recommendations

Learning to use the tools of the trade:

In order to prepare students to learn and use the kinds of software tools now endemic in working life, they should learn to use and apply professional IT tools relevant to the subjects they study at school.

Three CCITE Recommendations

**Connecting schools and colleges with digital industries**.

In order to inform schools, teachers and students about the opportunities available within the digital industries and the ways their products contribute to all our lives, the digital industries should play an active role in engaging with and supporting schools and colleges.

Three CCITE Recommendations
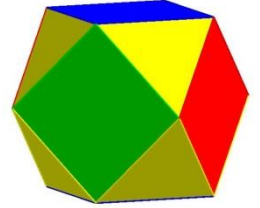
1. Ideas for cross-curricular projects involving mathematics.

2. Examples of mathematical `tools of the trade'.

3. Mathematical openings in the digital industries.

Preparing for an all academy future
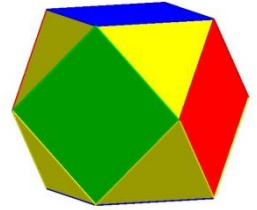
Increased importance of subject associations

Model of <u>CAS</u>? No subs – large membership

Managed through a learned society: BCS

<u>Funded</u> by DfE, Google, Microsoft, Ensoft…
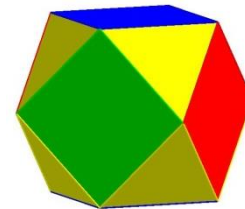
Online, face-2-face local hubs, CPD…

22301	3447	72968	190
Registered Users	Teaching Resources	Discussion Posts	Local Hubs

Adrian Oldknow adrian@ccite.org 3rd April 2016

A new professional association for Maths?

No subs – large membership

Managed through a learned society: ???

Funded by DfE, ???

Online, face-2-face local hubs, CPD…

I have registered **AMathEd.com** – join me?

22301	3447	72968	190
Registered Users	Teaching Resources	Discussion Posts	Local Hubs

Adrian Oldknow adrian@ccite.org 3rd April 2016