COMPUTING AT SCHOOL
EDUCATE · ENGAGE · ENCOURAGE
In collaboration with BCS, The Chartered Institute for IT

The dream of a lifetime

Shaping how our children learn computing

Simon Peyton Jones, Microsoft Research

What is education for?

“Education should prepare young people
for jobs that do not yet exist,
using technologies that have not yet been
invented,
to solve problems of which we are not yet
aware.”

Richard Riley

Disciplines

Skills

Disciplines

Ideas, knowledge, principles, techniques, methods

Maths, science, history, English

Skills

Artefacts, devices, programs, products, organisations, business

Presentation skills, metalwork, textiles, food technology, teamwork

What has happened in practice?

Computer Science

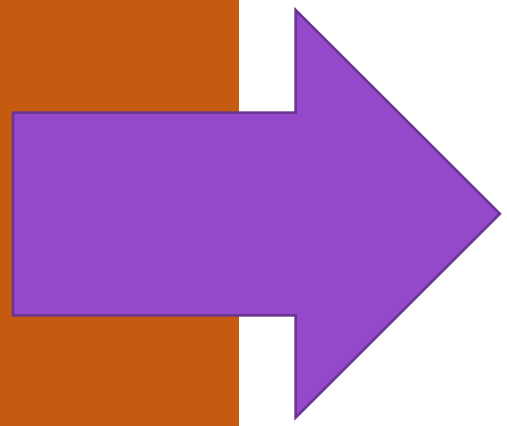
ICT
Information and Communication Technology

Spreadsheets, databases, Powerpoint, web, internet, audio, video, e-safety

Too much focus on technology

Not enough on ideas

Technology
Read
Consume
Use
Magic



Ideas
Write
Create
Understand
Knowledge

Mission

Establish computer science as a foundational subject, that every child should learn, from primary school onwards

Articulate the vision

What is Computer Science?

What is Computer Science?

Algorithms + data structures = programs

Computation + information = computer science

Computational thinking (Jeannette Wing)

Computational thinking is the process of *recognising* aspects of computation in the world that surrounds us, and *applying* tools and techniques from computing to understand and reason about both natural and artificial systems and processes.

Don't forget "informational thinking" too

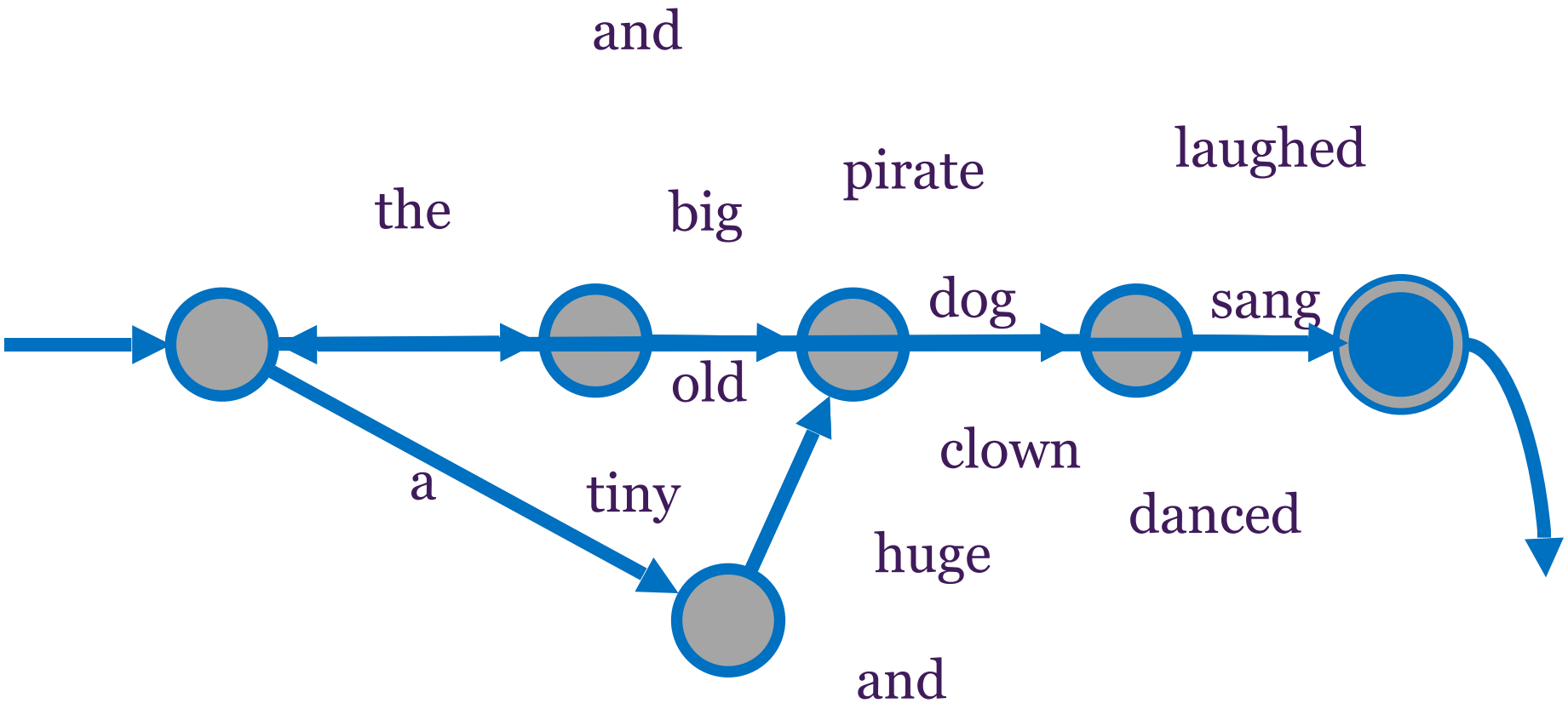
- Computational thinking is something **people** do, not something **computers** do
- Computational thinking is **ubiquitous**; it is useful in every profession, and in daily life

Look!
No computers

Video

http://csunplugged.org/sorting-networks

Follow the arrows to generate a sentence



Programming

Computer science
(discipline)

≠

Programming
(craft, skill)

Observer

1 April 2012

Programming

Programming *incarnates* computer science

Why Computer Science for *every* child?

Why?

- Understand the digital world
- Understand the natural world
- Skills for almost any job

Summary so far

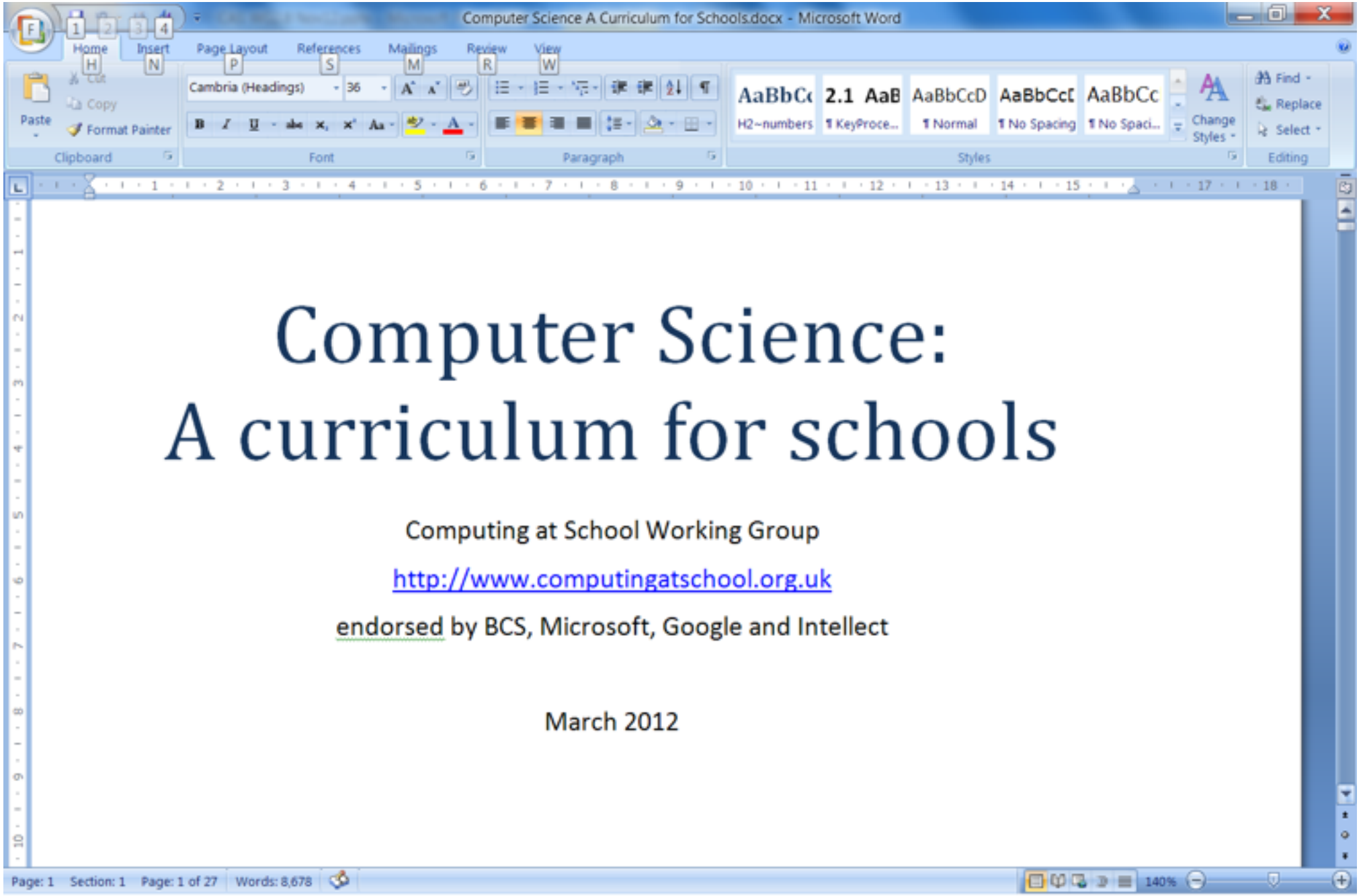
1. Computer science is educationally foundational
2. Computer science equips students to meet the huge un-met demand from employers.
3. Computer science is tremendous fun: creativity, intellectual beauty, programming, robots, making things do stuff.

What more do you want?

Which leaves the problem

Engage the Policy makers

2010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Computer Science:
A curriculum for schools
Computing at School Working Group
http://www.computingatschool.org.uk
endorsed by BCS, Microsoft, Google and Intellect
March 2012
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2011/2: High profile reports

- Feb 2011: The Livingstone/Hope report
  - Bring computer science into the National Curriculum as an essential discipline
- 2011: Ofsted report on ICT
- Jan 2012: Royal Society Computing in Schools Report
  - The current delivery of Computing education in many UK schools is highly unsatisfactory
  - Computer Science is a rigorous academic discipline and needs to be recognised as such in schools
  - Every child should have the opportunity to learn Computing at school

2011: Into political discourse

"I was flabbergasted to learn that today computer science isn't even taught as standard in UK schools," he said, *"Your IT curriculum focuses on teaching how to use software, but* ***gives no insight into how it's made****."*

Eric Schmidt, CEO Google, August 2011

Qualifications

	Awarding bodies	Number of GCSEs in Computer Science
Sept 2009		***0***
Sept 2010	OCR	1
Sept 2012	***AQA, Edexcel***	***4***
Sept 2013	CIE	5

New dirt-cheap hardware platforms

BBC micro:bit

.NET Gadgeteer Infrared Remote Control

FEZ Spider
LED Array
helicopter

BBC Mobile

News | Sport | Weather | iPlayer

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29 February 2012 Last updated at 07:59

829 Share

Raspberry Pi computer: Can it get kids into code?

By Julian Joyce
BBC News

2011-4

Review of the National Curriculum in England

culminating in…

Department for Education

Computing

Programmes of study for Key Stages 1-4

Starting Sept 2014 in England

Aims

The National Curriculum for computing aims to ensure that all pupils:

- can understand and apply the fundamental principles of computer science, including logic, algorithms, data representation, and communication
- can analyse problems in computational terms, and have repeated practical experience of writing computer programs in order to solve such problems
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems
- are responsible, competent, confident and creative users of information and communication technology.

Making it Happen

New, foundational subject

- Training teachers
- Pedagogy
- Materials
- Assessment
- Qualifications

Who will do all this?

Not the Department for Education

We will!

A once-in-a-generation opportunity...

...for all of us:
companies
computer scientists
educational folk
software professionals
all of us...

…to shape what
the subject we know best
means in practice…

…for the children we love…

…and the rest of the world

England is first out of the gate
Everyone else is watching

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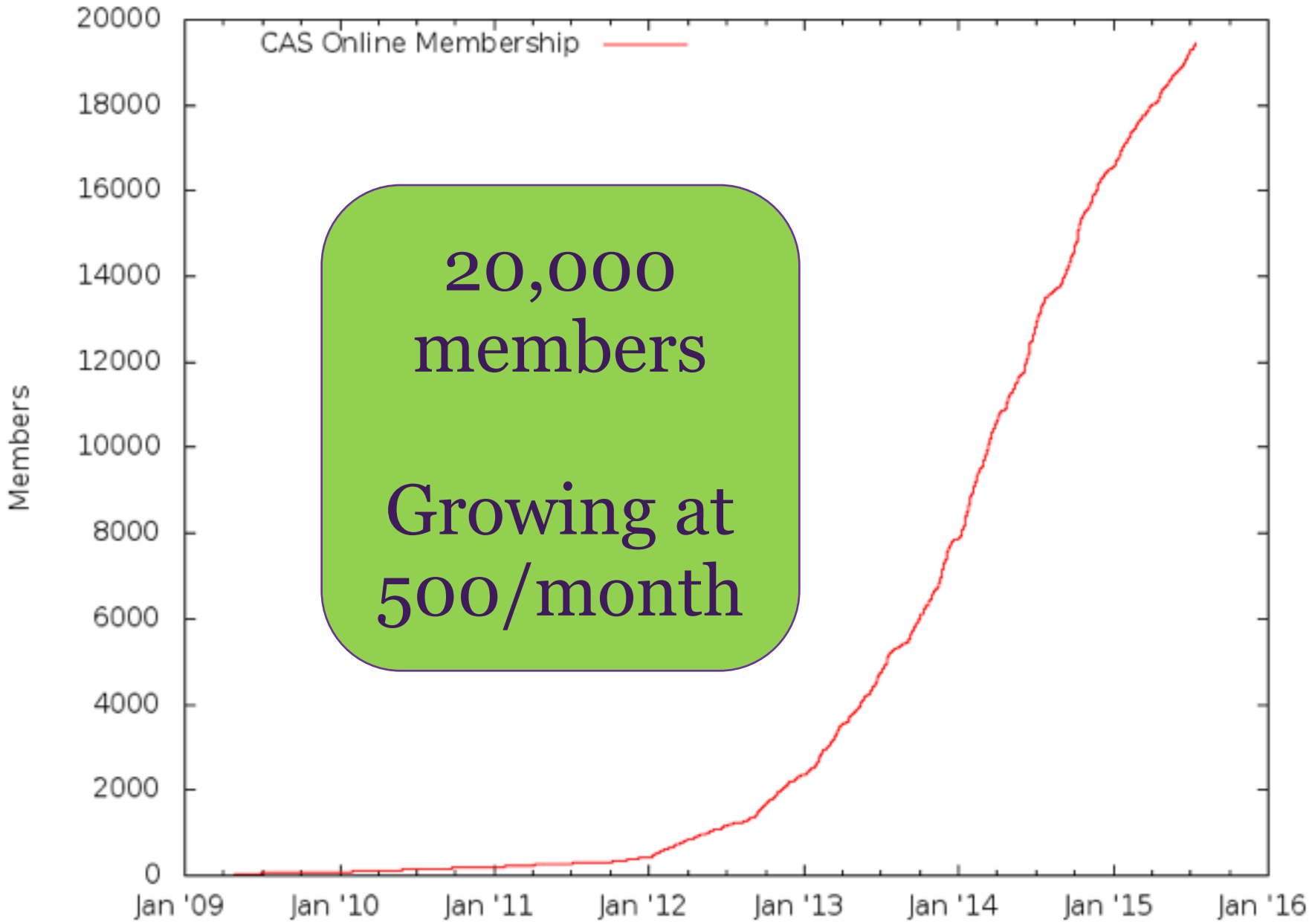
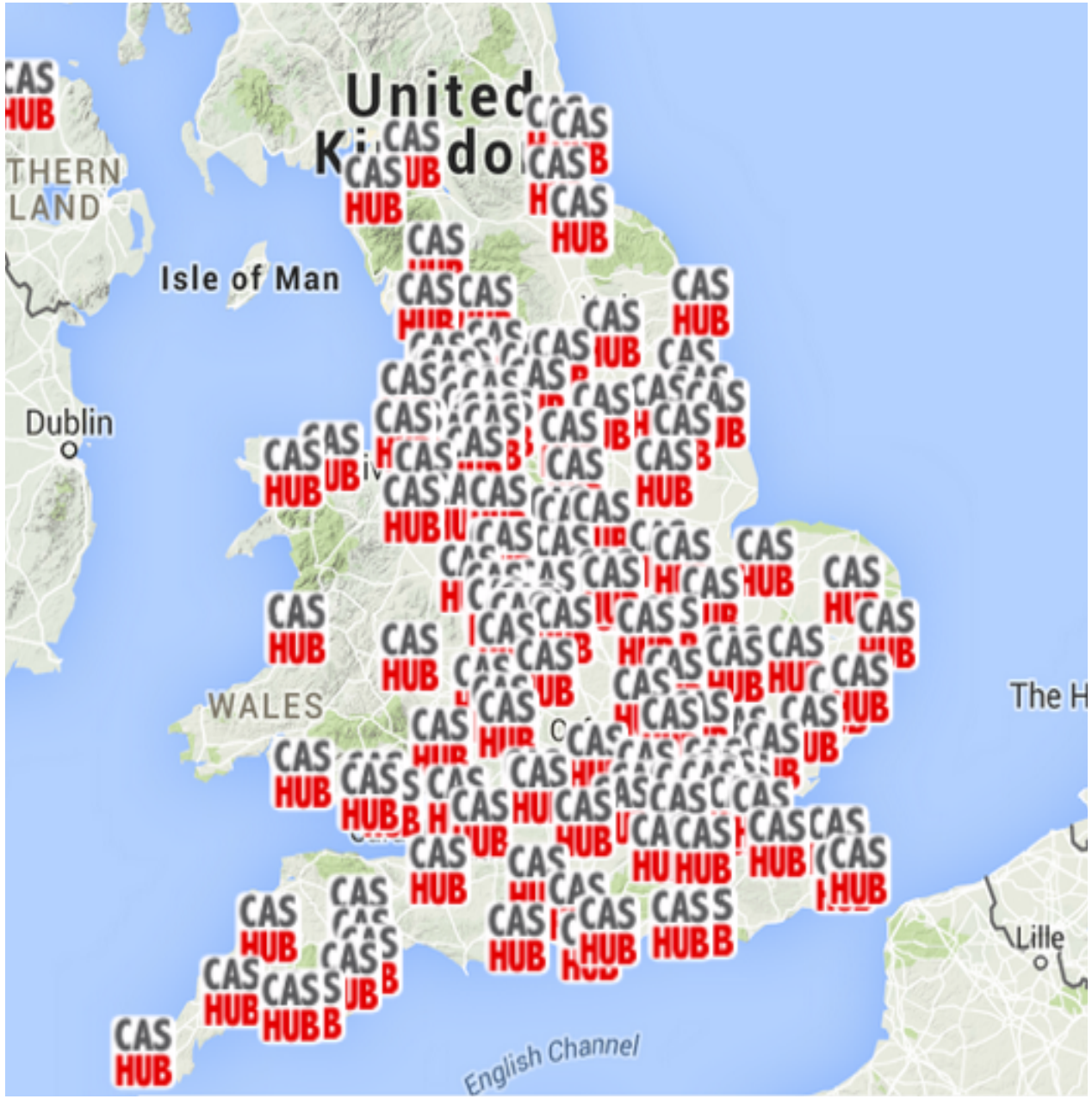
Part of BCS –The Chartered Institute for IT

- Simply a group of individuals, concerned about the state of computing education at school in the UK
- Varied backgrounds, common concerns
  - Teachers
  - Industry (eg Google, Microsoft)
  - University academics (incl CPHC, UKCRC)
  - Members of exam board (eg AQA)
  - Members of professional societies (eg BCS)
  - Parents
  - Local educational advisers
  - Teacher trainers
- Virtually no staff, no money, no office. All volunteers



- About 3/4 teachers
- Both primary and secondary
- A community
- A gift economy

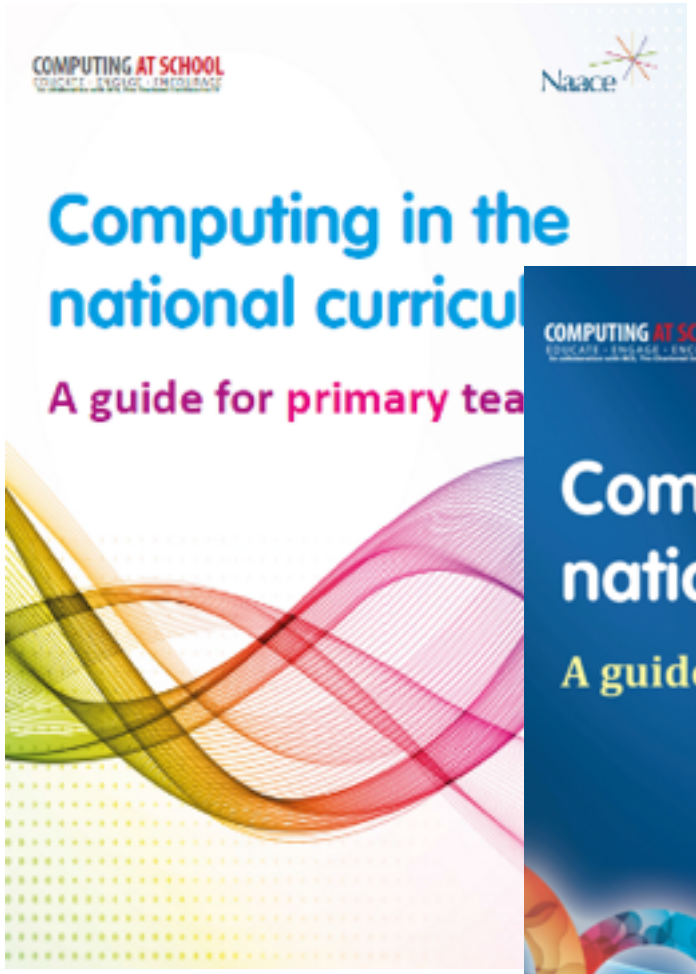


163 Hubs

CPD and the Network of Excellence

- Massive challenge
  250,000 primary teachers
  20,000 secondary teachers
- Computing at School (CAS) and the British Computer Society (BCS) have launched a national **Network of Excellence for Teaching Computer Science**
- 800+ schools signed up
- Single goal: support and equip our teachers to teach Computing
- Modest DfE funding

Resources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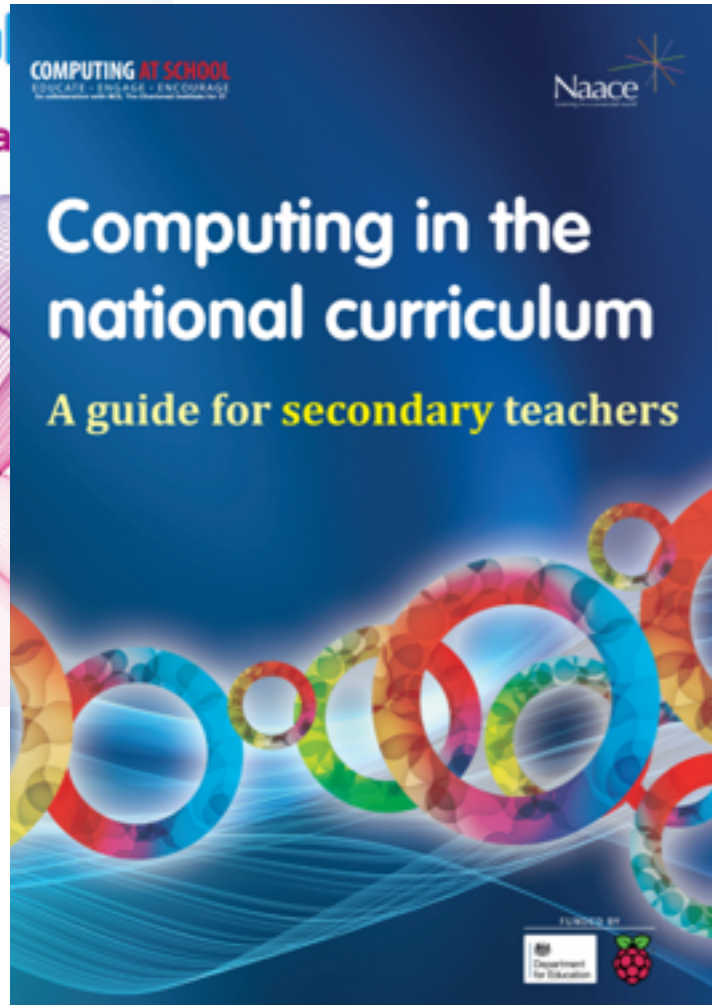
Computing in the national curricul
A guide for primary tea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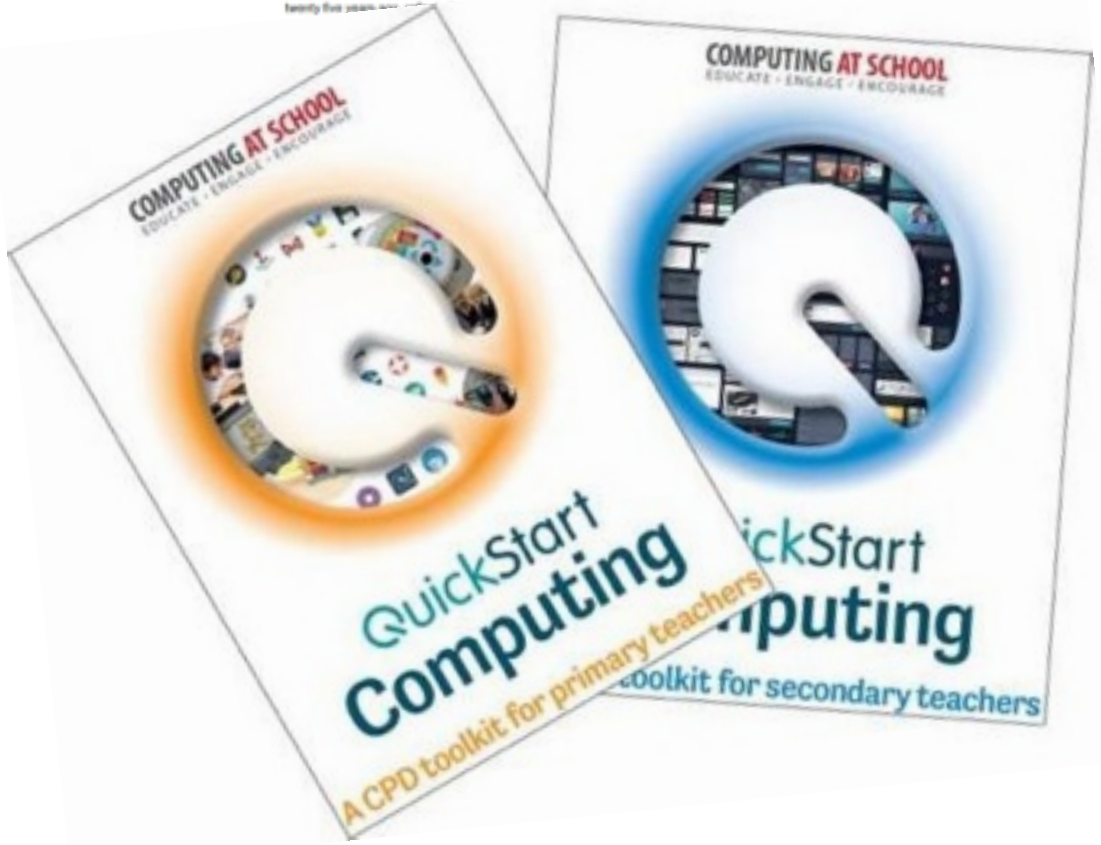
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QuickStart Computing
A CPD toolkit for primary teachers
COMPUTING AT SCHOOL
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puting
oolkit for secondary teachers

Our friends… we love you

Codio

Cambridge Hacklab

Greenfoot

Technocamps

Apps for Good

cs4fn

Code Club

Codecademy

Raspberry Pi

YouSrc

Hack to the future

Computing at School

Make Things Do Stuff

Sonic Pi

Young Rewired State

CoderDojo

NextGen skills campaign

PPIG!
Your country needs you!

Two challenges

Scale

Evidence-driven reflection

Programming

What language? For what purpose?

Scratch, Kodu, TouchDevelop, Greenfoot, Minecraft, Python, HTML, CSS, Javascript…

Programming as a vehicle for learning computational/ information thinking, rather than as an end in itself

Debugging, explaining, predicting, not just writing code

Pedagogy and assessment

Testing what we want students to learn,
not just what is easy to measure

Plugged vs unplugged?

Which concepts in which order for which age groups?

Discovery, or worked-out examples?

Practical steps

Join CAS

Go to a CAS Hub

Partner with a teacher

Be a cs4fn speaker

Run a Code Club

Write a research proposal

This is our moment
It won't come again

Engaged, curious

Empowered, informed

Creative, playful

Employed