Teacher Conference 2009
University of Birmingham
June 19th

Conference Report

June 29, 2009
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1 Introduction

Computing at School (www.computingatschool.org.uk) held their inaugural conference for teachers at the University of Birmingham on June 19th 2009. The event, was aimed squarely at teachers and sought to provide resources and ideas for those looking to engage their students in fun and exciting ways.

The conference attracted over 120 people, mostly teachers in secondary schools from England, Wales and Ireland and they participated in a day that consisted of lively presentations, workshops and smaller discussion groups.

CAS was born out of excitement with the discipline combined with a serious concern that many school pupils are being turned off computing as a subject. The number of students applying to computing courses at university has halved in the last ten years, despite increasing take-up of university education, and strong employer demand. The number of students wanting to take an A Level in Computing is small. Consequently, schools typically have one computing teacher who has no colleagues and feels isolated.

If nothing else, we hope that the conference demonstrated to those present that they are not alone and that resources exist to help them inspire their learners to engage with Computing.

This report provides links to all of the materials distributed on the day of the conference which are all available from the CAS website. It attempts to summarise activities and provide some detail for the discussion topics.

CAS are particularly grateful to both Microsoft Research (UK), the Council of Professors and Heads of Computing (CPHC) and the University of Birmingham for making the event possible through their generous financial support. Grateful thanks also to the speakers and workshop leaders who donated their time and made the event such a success.

In particular we wish to thank, on behalf of the CAS Working Group, the local organisation team at Birmingham University - Achim Jung and Justine James. Without you none of it would have been possible!

Simon Peyton-Jones, Chair of the CAS Working Group
Simon Humphreys, 2009 Conference Organiser
2 Our Challenge

The conference had a number of broad aims:

- To bring together teachers of computing and share with them different resources and activities
- To bring the existence of CAS to the attention of these teachers

From the feedback taken on the day and subsequent messages sent to various people involved in CAS I believe we achieved both of these objectives. We are, however, left with the question “What next?” It’s a good problem to have and one which CAS will begin to articulate over the coming weeks and months. We hope to be able to show tangible progress when we convene for our second teacher conference in 2010!

I list below a number of suggestions and challenges that arose during the day and from messages sent to date.

- To form a number of regional hubs in different parts of the country extending the current number of 3 to 10
- To provide, through training days, subject support for A Level teachers of Computing
- To support the regional hubs by connecting each hub to their nearest university department and exploring ways of strengthening these relationships by way of training (CPD), mentoring etc..
- To create the CAS “community” website - an online meeting point for teachers of Computing
- To further the advocacy role of CAS, in particular, and to continue to work with exam boards on the GCSE Computing
- To establish an association for Computer Science Teachers, possibly in connection with the CSTA in the US

It is a grand challenge! I encourage you to get involved so that together we can see real change take place in the curricula of our schools.

Simon Humphreys
June 29, 2009
The conference day was divided into three sections:

- Presentations
- Workshops
- Discussion Groups

What follows is an overview of each of these with links to the materials provided by the various speakers. More detail is provided for the GCSE in Computing session and the discussion groups.

3 Presentations

3.1 Welcome - Chris Bishop

Chris was unable to be with us for the day as he was giving a talk to “Digigirlz” event. (Do take a look at their website: http://www.microsoft.com/about/diversity/programs/digigirlz/default.aspx) However he recorded a short video address. A low-res version can be found at http://computingatschool.org.uk/files/conference2009/KeyNote256.wmv.

3.2 The State of the Nation - Roger Boyle

It is clear that there is a major recruitment issue for computing departments at our universities. After a steep rise in applications, peaking in 1999, numbers have steadily declined over subsequent years. Roger expressed his concern that the healthy interest in computing at KS2 is not being built upon further up the school and reminded us that the situation for girls is even more dramatic.

Personally, I was struck with his comparison of ‘Digital Natives’ vs ‘Digital Immigrants’ first put forward by Marc Prensky¹

“Our students have changed radically. Todays students are no longer the people our educational system was designed to teach ... our Digital Immigrant instructors, who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language.

Roger’s presentation can be found at: http://www.computingatschool.org.uk/files/conference2009/roger.ppt

¹From On the Horizon (NCB University Press, Vol. 9 No. 5, October 2001) 2001 Marc Prensky
3.3 CSUnplugged - Tim Bell

Tim presented with humour and integrity the reasons why he initially started developing the unplugged materials for schools and how over the past 10 years he has seen a rapid growth in schools across the world using the resources. He presumed that schools were beginning to try the resources at a time when interest and recruitment was falling. He reminded us that the situation in the UK is mirrored in New Zealand and America. Whilst targeted primarily at KS2 the resources have been used, with minor changes, to all ages. He has also trained his own students to deliver roadshow style presentations to local schools.

Further examples of his work can be found at: http://youtube.com/csunplugged and http://csunplugged.org

3.4 Computing at Schools - Simon Peyton Jones


4 Workshops

4.1 CS is Magic (Paul Curzon)

Paul, from Queen Mary University London is well known for the cs4fn website and accompanying magazine sent free to schools. He gave us several examples of ‘unplugged’ activities including the intelligent piece of paper, building an emotional robot and building a brain.

The cs4fn website: http://www.cs4fn.org/ Class sets of the magazine (or pdfs downloaded) can be ordered at: http://www.cs4fn.org/magazine/ Magic of computer science (including pdfs of book) is at: http://www.cs4fn.org/magic/ All the activity write ups that are completed are also all at http://www.cs4fn.org/teachers/ and the Sodarace project is at http://sodarace.net/

4.2 CSInside (Quintin Cutts)
Quintin has developed a number of workshops that enthuse pupils with an excitement about the technology that is all around them. Visit his website for details of all the workshops and resources currently developed. Quintin approaches each workshop from a starting-point i.e. the ‘grab’ then proceeds to explain through a variety of activities how the technology works - the computer science!

Predictive texting was our ‘grab’ and full materials can be found by following http://www.computingatschool.org.uk/files/conference2009/PredictiveTextJan09.zip

4.3 CSUnplugged (Tim Bell)

Tim developed many of his keynote address points and gave further examples of how the unplugged approach can be used to engage with pupils. See http://csunplugged.org for the collection of activities.

4.4 Greenfoot (Michael Kölling)

Greenfoot teaches the fundamental concepts of programming. Michael demonstrated how, with no prior experience, students can use the Greenfoot environment to create animations and quickly go on to invent interactive games, while learning real programming techniques.

The Greenfoot website is http://www.greenfoot.org

Conference materials:

4.5 GCSE Computing Panel (Terry Myers (AQA), George Rouse, Karen Reid (OCR))

The GCSE discussion workshop had about 30 participants. We were fortunate to have Terry Myers from AQA, and Karen Reid and George Rouse from OCR, who each gave the group a summary of AQA and OCR’s thinking about a GCSE in Computing. What follows are brief notes about the discussion.

- Terry welcomed the CAS initiative. In particular, he hopes that it will articulate a “body of knowledge” that AQA can use to guide the content of a GCSE in Computing.
- AQA perceive the market for qualifications in ICT and Computing to be quite fragmented, and becoming more so. They are cautious about introducing a new GCSE
in Computing: although they see a clear case for an education need, they are not convinced that there is a real market. AQA is non-profit-making, but must cover its costs. (In answer to a question, Terry said that AQA would need about 20,000 entrants to justify a GCSE.) These business-related observations led to a spirited debate about the role of the free market in examinations.

- George Rouse, from OCR, agreed with Terry that the QCA has, until recently, not had a Subject Specification that matches Computing. (The subject specification is the spec from which exam boards design detailed curricula and examinations.) So OCR wrote one, and QCA has agreed it!

- Over the last three months, OCR have designed a GCSE in Computing against this new subject specification. Although the timescale was very brisk, OCR took significant input from the CAS working group, which had a real effect on the resulting design. The final version is going to QCA for review shortly, and will at that point become available to CAS members. Three main units:

  1. Basics of computing: algorithms etc
  2. Practical programming
  3. Comparing technologies

There was a brief discussion about what to make of the third of these units. [The CAS teachers conference was the first time OCR has gone public on the nature of the new GCSE.]

- There was quite a bit of discussion about CPD for teachers. AQA regard the state of teacher prepared-ness as a significant potential problem: would today’s ICT teachers be able to deliver a GCSE in Computing? OCR recognise the problem, but do not regard it as a substantial obstacle; they would put on training courses if necessary. Several teachers argued strongly that training is definitely a soluble problem. One memorable comment: “we are teachers, so we should be able to learn”.

Many thanks to Terry, Karen, and George for coming to the conference.

4.6 KS3 Programming Activities (John Woollard)

John had been ably assisted by Emma Wright (Harvey Grammar School, Folkestone) in the development of programming activities that can be done at Key Stage 3. Activities that use tools such as Alice, Greenfoot and VB Express to introduce students to programming. Still a work in progress but an example of the kind of document that CAS are keen to develop to support teachers.
John’s presentation: http://www.computingatschool.org.uk/files/conference2009/woollard.ppt and the current programming activity booklet can be found at http://www.computingatschool.org.uk/files/conference2009/KS3Programming.pdf. NB. This document is still in the process of being developed. If you have any further suggestions please email John (his email address is in the appendix) or info@computingatschool.org.uk.

4.7 Python Programming (Jonathan Aylward)

Jonathan shared his experiences of using Python as the programming language of choice for his students. Ably supported by the folk at Leeds University Jonathan showed the changes he has introduced to the curriculum in his school. His presentation can be found at: http://www.computingatschool.org.uk/files/conference2009/TeachingPython.ppt

4.8 Tools for Thought (Roger Davies)

Roger gave a brief overview of some of the many different tools that are available for teaching programming with particular focus on the lesser known StarLogo. As teachers we are always on the lookout for new resources and even better if there are some sample activities that can be used ‘out of the box’. Follow the links below to find one such resource! http://www.computingatschool.org.uk/files/conference2009/epidemic.pdf, http://www.computingatschool.org.uk/files/conference2009/ProgrammingResources.pdf, http://www.computingatschool.org.uk/files/conference2009/davies.zip

5 Discussion Groups

For many the discussion groups provided the ideal opportunity to talk through many issues facing us as a community. A wealth of ideas were put forward may of which will be carried onward to the CAS working group for further discussion and we hope to be in a position to implement many of the fine ideas suggested. The following is a brief summary of each as appropriate.

5.1 CSTA (Michael Kölling)

5.1.1 What should CSTA do?

- Main aim: Support teachers
– distributing / making available material (question: who produces this? Teachers, paid creators?)
– showcase best practice

• Provide a shared Code of Conduct / Ethics (Along the lines of: “We share material and support each other.”)

• Facilitate links between universities and schools.

• Also with businesses and exam boards.

• Organise trips to companies (MS, Google, etc.); list contact names at companies for school contacts.

• Support school outreach activities at universities.

• Set up dialogue between teachers and university (may be done through Hubs)

• Organise workshops and training (preferably accredited) (may be done through Hubs)

• Organise and run annual conference.

• Provide a web site and newsletter with:
  – news (with alerts, RSS)
  – discussion forum
  – file sharing
  – private/public sections

5.1.2 Who is the CSTA for?

• Everyone who identifies themselves as a computing teacher.

• Be inclusive towards other groups.

• Not ICT.

• Other groups (university, industry, exam board, etc.) should be involved in some capacity, but not yet clear what the formal relationship is (members? associates? supporters? board members?)

5.1.3 What should it be called?

• Probably CSTA-UK (since the CSTA name seems to be known/in use elsewhere, and fitting in there might be good)

• Should be independent of CSTA US, but collaborating/discussing.

• ACTION: Andrew Congdon to make contact to CSTA-US.
5.1.4 What is it’s structure? Who runs it?

- CAS? No.
- Teachers. Yes, mostly. (Board of teachers. And others? CAS/ University/industry?)
- Needs a few good (probably paid) admin people.
- More questions than answers:
  - What are the legal/financial requirements? Who arranges this?
  - CPHC can help! (with admin and legal.)
  - Charitable status? is this possible? (ACTION: Andrew Tringham to try to find out about this.)
  - Do members pay fees? - Probably.
  - Sponsorship? Yes. (ACTION RM as potential sponsor: Andrew Tringham & Ruth Nuttall to make contact)

5.2 Hubs (Thomas Ng)

Being able to connect with teachers in our own region is a priority and we hope that CAS will be able to lend support to any such hubs. Of those present in the group we each committed to start a conversation with our own professional networks from our region (South London, Kent, Warwick, Devon and Exeter, Berkshire). Our contact details will soon be available on the CAS website as, I believe, will be the names and email addresses of others at the conference who would also like to begin a local CAS hub. We will spread the message from the CAS conference and use some of the materials presented here today as our starting point.

5.3 A Level SIG (Roger Davies)

A very well attended group with lively discussion. Vast majority of attendees were delivering AQA Computing with just 2 or 3 doing OCR or WJEC. As a result much of the discussion revolved around specifics of AQA syllabus change.

A general problem for many colleagues was a frustration with their IT Support implementing security policies that made teaching A level computing hard e.g. no access to operating systems, not allowing .exe files to be saved etc. It was felt that many IT Support teams simply lacked knowledge of how to provide more granular access to certain resources. Suggested that CAS could make available a document that made clear the technical / access requirements for teaching at this level and point to possible solutions for making this possible e.g. virtual machines / dual boot etc. Maybe some
liaison with or a visit to University technical support would help as these clearly must grapple with similar problems.

Pointed out that a barrier to getting teachers willing to teach Computing A level was the workload involved in running the course which was widely felt to be far greater than ICT courses.

There was widespread support for the idea of developing a resource repository and web-links to supporting material for the subject.

There was a widespread feeling that, without any prior experience we were often expecting far too much of children at A2 in practical terms. The ‘step up’ from AS being too great.

Felt that it wasn’t recognised how long some basic fundamentals take to sink in and we often had to move on to complete the syllabus without pupils gaining sufficient grounding. This resulted in poor foundations leading to frustration and loss of confidence when trying more complex things at A2 level.

Whilst the thrust of the new AQA spec was broadly welcomed in terms of the theoretical content the approach to programming was questioned. Console programming was seen by some children as demotivating, old fashioned and boring.

There was some discussion about how we should teach programming, the place of OOP and the difficulties of moving from a procedural approach and associated design methods to OOP. Very few attendees had pupils using OOP techniques in project work.

The notion of allowing or encouraging pupils to tackle projects in a variety of languages seemed to imply students could ‘pick up’ any language easily without teacher input. It also suggested that teachers should be able to support this when, in reality, it takes a member of staff a long time to be proficient enough to dig pupils out of holes in just one language.

Many felt projects weren’t enjoyed by pupils.

The insistence on a client based project ran counter to the stated aim of moving away from database projects. Indeed several questioned the whole approach of a ‘software engineering’ project when a huge amount of pupil time needed to be focused on implementing a project. Several suggested short structured tasks would be far better with a focus on programming skills rather than the whole software design process for which children (and even undergrad students) lacked sufficient background experience. Set tasks would also remove the problem of plagiarism which several teachers reported as a problem.

There was a widespread recognition of the isolation many staff felt, the lack of any way to update skills (particularly practical skills) other than through doing it themselves in
their own time and a general feeling that the current spec change hadn’t been managed well. As a result teachers often lacked confidence in their ability to deliver unfamiliar material at the right level whilst feeling it must be their fault. A need for a forum to continue discussions was raised and generally everyone welcomed the fact that, by discussing things, they weren’t alone in their worries.

Ways to recruit the ‘right’ students were discussed with several colleagues reporting high drop out rates as it became apparent to pupils what was involved. Suggested there could be a supporting short course in decision mathematics put on by maths departments to support computing pupils.

Widespread support for the idea of CAS providing broader / deeper training sessions on all the new areas, utilising expertise in higher education. Willingness to pay for these and also attend on Saturday if needed. Suggested that YouTube training in key areas would be beneficial. Could CAS lecturers produce short video intro’s to topics which must be covered in 1st year undergrad courses (particularly maths foundations). Or even make course notes they use available to CAS teachers. The general thrust was that we needed some proper in depth teacher training that went beyond the sort of CPD that the exam board provided which looked at areas only to the depth required by pupils. Teachers need greater depth to feel comfortable teaching material to pupils.

5.4 Connecting with Higher Education (Lynne Dagg)

Those present were mainly from HE establishments - two teachers from boys selective schools were also present.

5.4.1 Undergraduate Admission

One teacher noted that they had scrapped ICT at their school and now simply offered A Level Computing. They noted that they had contacted Admissions Tutors at a number of Russell Group Universities. The ATs had indicated that they did not welcome A Level Computing as a subject for admission to Undergraduate Programmes. Some HE tutors present indicated that they had not been aware that Computing in schools was more than basic ICT until recently.

5.4.2 Progression

The issue of progression was mentioned. Teachers from a Computer Science background often wanted to teach Object Oriented languages but there was little support provided. Some University tutors indicated that they would prefer pupils in school to build answers to complex problems using Pascal and other non OO languages rather than build the
complexity through the use of languages. One suggestion was that Ruby could be used by schools as it was a simple language but was OO in nature. Java was also felt to be a good language by some present.

5.4.3 Links between Universities and School

Some Universities indicated that the teachers within their area required CPD (many teachers are self taught). It was felt that courses at the Universities for schools they were linked with could be beneficial. Some contributors noted that the technology had changed but the methodologies had not and that what was required was the mode of thinking rather than up to date knowledge. This led to a discourse re:

- Universities need to feed more into the exam boards indicatating relevant concepts and notions- Schools indicating what CPD was required
- Universities to assist in providing CPD to update teacher knowledge.

Pupils coming from schools and entering HE sometimes indicate that they are repeating material already covered. It was suggested that Universities look at modules where what Computing students have previously done is re-enforced and built on.

5.4.4 Teaching as a career

It was also noted by Universities that they do not encourage the high flying students to consider teaching as a career and this needed to change in future. At present some students see it as a backup. It was noted by one teacher that he looked around in vain for a PGCE in Computer Science. HE participants from Teacher training institutions indicated that PGCE students were expected to have a good coverage of Computer Science concepts. Those undertaking Undergraduate routes were expected to obtain that knowledge during their Programme.

5.5 CAS Community Website (Miles Berry)

Discussion focussed on the development of a community site for CSTA-UK, with accounts on the website being matched to membership of the association.

Our hope was that there would be sufficient content for everyone to be interested in returning to the site regularly, and for this high quality, quickly changing user-generated content would be key, to avoid members ’dropping out’. A vision of a ’website based around ideas’ was articulated.

The site would evolve over time in whichever direction members themselves would choose, and thus architecture and administration would need a degree of flexibility. Devolved ownership of the site was seen as important User profiles were seen as important,
with a relatively loose structure of suggested headings which would encourage members to discuss previous experience, present activity and future intentions.

Profiles, as with much other content, would include a tagging system, of an open, folksonomy based design, with the facility for automatic tag suggestions, and some initial seeding.

Various forms of user-generated content were discussed.

Facilities should be provided for members to be able to upload resources. Finding resources would need a good search tool, as well as proper descriptions/metadata on upload. A flickr-like system in which users could tag others’ resources was proposed. Users should be able to comment, and perhaps vote on uploaded resources.

Content should not require moderation to appear on the site, although facilities to flag inappropriate content would allow admins/moderators to remove offensive material in a timely fashion. It was felt that even low quality content would be welcomed, with the comment/voting system providing appropriate feedback and filtering of search results. Complex recommendation systems did not seem appropriate at this stage.

A forum system was seen as vital, beginning initially with a single discussion forum, which might then evolve into forums around particular sectors/interests as membership and activity grew, including perhaps a ‘hot-topics’ forum. The forum system should allow for notifications by email for subscribed discussions, but there was no need to allow response via email. The membership would be expected to administer the forums. Forums would not be accessible to non-members (or Google’s spider), and members would be expected to be identifiable, as participants in a professional discussion space. Light-touch moderation might be appropriate to welcome new members and promote good online practice, such as the need for descriptive subject headings.

Some provision should be made for Frequently Asked Questions, perhaps as a separate forum, or as a wiki page.

A wiki was felt to be useful, although there is a need for clarity as to how this would serve a different purpose from forum discussions.

Mechanisms which might encourage greater participation, i.e. kudos points, 'thanks', votes or avatar badges were discussed.

A CAS-planet style blog aggregator was suggested, combining RSS feeds from members' blogs.
Integration with online **bookmarking** tools (eg del.icio.us) was felt to be worthwhile.

A regular **newsletter** was seen as an effective way of keeping membership in touch, using highlights from discussion topics, members’ blogs and other content as a starting point for content.

In addition to members-only sections of the site, some content should be **publicly accessible**, including perhaps case studies or the newsletter archive. The existing CAS website materials might form the initial core of such content. A regularly updated, **blog-style** page was seen as a worthwhile service to a wider audience, although concerns were expressed over the need to keep this regularly updated.

A generic **content management system** was seen as the best technical solution, with several individuals recommending Drupal as fit for the purposes envisaged.

### 5.6 KS4 SIG (Mandy Honeyman)

One main idea that emerged from our group was the need for some resources that would excite students in year 9 in order to introduce computing for the GCSE - if/when that becomes a reality(?) It is clear that Key Stage 4 is currently a vacuum for those students who wish to really engage with Computing per se. There are a number of programming competitions that some schools use e.g. the Cipher Challenge and British Informatics Olympiad but many staff are very busy trying to keep their heads above water as full-time teachers that running extra-curricular clubs can become very difficult. It was suggested that this was something that HE could possibly provide, perhaps through student mentors, who could come in to schools and run an after-school club. Could CAS provide some leadership/steerage with this?

### 5.7 Programming Competition for KS3 (Roger Boyle)

Roger reported back to this group that a meeting of HE lecturers and some teachers took place earlier this year to scope the possibility of a national competition for KS3 students. The competition would look to encourage computational thinking and may take the form of some kind of programming competition. There was widespread support for such an initiative. Obviously taking it from the point of ‘that’s a good idea’ to a reality is a much bigger question that would inevitably need funding and a solid infrastructure. The group had heard, and some had participated in, competitions such as Animate ’09 (Manchester University). They found the competition worked as a very useful stimulus to classroom activities.
5.8 The Body of Knowledge (Kevin Bond)

Kevin Bond reported that a sub-group of CAS had formed with the stated intention of establishing a Body of Knowledge (BOK) for Computing across the National Curriculum (NC) Key Stages 2, 3, 4 and 5. Kevin reported that this was no mean undertaking. He reported that the team had tried to avoid falling into the trap of arguing on the basis of intuition and anecdote because such an approach cannot easily change the mind of someone with a different intuition or anecdote [Lister 2007]. Instead, he reported that the team had tried to adopt an evidenced-based approach. Inevitably, this had been a very time-consuming task but some positives have emerged. Several exemplar curricula exist already - Israel, South Africa and ACM’s K12. These were considered as potential candidates. Much good work has also been done towards providing appropriate exemplifying material to aid delivery of a Computing curriculum for the age ranges covered by NC Key Stages 2, 3, 4 and 5 - CSInside, CS4FN, CSUnplugged.

Kevin Bond (KRB) argued for a principles-based framework rather than a technology-based framework for the structure of the BOK. KRB reported that two alternatives of the BOK had been generated each based on Peter Denning’s Great Principles of Computing project. KRB reported that each needed editing in order to more closely match student aspirations, abilities and current research evidence in the field.

Purpose: To assist

- Curriculum developers
- QCA/OfQual
- Teachers of ICT
- Examining Boards

KRB raised some problems with current approaches:

Most students are motivated by puzzle-solving activities but a difficulty arises when this activity involves programming as well.

“In a mathematics contest, any student can follow their nose and scribble ideas down. In a programming contest—certainly the traditional type in which programs are scored according to their behaviour—a student cannot score any points (or even have their submissions judged) unless they can create a running program in a relatively short period of time.”

— Burton 2008

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Burton concludes that instead of motivating the desire to learn, coupling problem solving with programming can have the opposite effect.

On the competition front some Informatics Olympiads have recognised this by offering both non-programming based competitions as well as programming-based competitions [Burton 2008, Dagiene 2008]. KRB referenced various studies that have drawn the conclusion that programming does not have as wide an appeal as we might think and that many students experience significant difficulty learning to program.

Aaron Sloman backed this up with his own experiences with undergraduates some of whom struggled with programming.

KRB argued that a principles-oriented descriptive framework should:

- Reveal Computing’s deep structures
- How they apply in many fields
- Reveal common aspects of technologies
- Create opportunities for innovation
- Open entirely new ways to stimulate the excitement and curiosity of young people about the world of computing

Aaron Sloman argued for the BOK to emphasise a history of Computing that would reveal the challenges that were overcome to reach today’s position.

KRB presented Peter Denning’s view of Computing:

In its older tradition, computing was most naturally described by the ideas in its core technologies such as programming, graphics, networks, or supercomputing. The new tradition calls for a description in terms of fundamental principles.

The scientists in the audience expressed agreement with this view privately to KRB at the end of the session.

KRB argued that a principles-framework has the advantage that it is easier to learn than a technology framework. This was not always the case as in the early days describing the field in terms of technology ideas was a good approach when the core technologies were few but the situation has changed. KRB stated that Tim Bell’s CSUnplugged and an as yet unpublished version did in fact provide exemplification of a principles-based approach.

Tim Bell asked if the entire BOK would be focussed on principles. KRB responded that any curriculum should be a balance between principles and practice. The problem
currently, in KRB’s opinion, is that the balance is out of kilter favouring practice over principle.

KRB argued that on a principles-based framework:

Computation is the principle and computers are the tool
This leads to many important questions that do not involve programming e.g. no one ”programmed” the information processes that read DNA and build new cells i.e. Computation was present long before computers were invented.

KRB listed seven high level categories of principle drawn from the Great Principles project that formed the basis for the development of the two draft versions of the BOK:

1. Computation - Meaning and limits of computation
2. Communication - Reliable data transmission
3. Coordination - Cooperation among networked entities
4. Recollection - Storage and retrieval of data
5. Automation - Meaning and limits of automation
6. Evaluation - Performance, prediction and capacity planning
7. Design - Building reliable software systems

Aaron Sloman offered the opinion that systems analysis was also important. KRB offered the opinion that analysis was a formal operational skill - high on Piaget’s scale - and that about 50% of the population never ever reach this level. Tim Bell affirmed this opinion.

KRB stated his belief that the design of computer science curricula for 5 - 18 should rely on central concepts of the discipline, not on technical short-term developments

KRB presented a potential way forward for selecting contents for the BOK: In the ”structure” approach four criteria are used to help to identify fundamental ideas of computing education:

1. Horizontal criterion - the fundamental idea is applicable or observable in multiple ways in different areas of computing
2. Vertical criterion - the fundamental idea may be demonstrated and taught at every intellectual level from kindergarten up to university level
3. Criterion of time - the fundamental ideas taught should be of long lasting relevance
4. Criterion of sense - the fundamental idea is related to everyday language and/or thinking

The aim of the BOK should be:

1. To achieve a balance between practice and principle
2. Identify a Computing knowledge space consisting of:
   (a) Principles
   (b) Practice
3. Attach equal importance to each

6 The Exhibition

Many thanks to Royce Neagle (Leeds University) for putting together a small exhibition to go alongside the exhibition. Those who looked around found some useful tools and extra resources.

The School of Education, University of Southampton
The role of computing in the key stage 3 curriculum Teacher training for IT

School of Computing, University of Leeds
Display of educational videos “Maths Matters in Computing”:
http://www.comp.leeds.ac.uk/alic/videos/
“More than you think” interactive website:
http://www.morethanyouthink.com/

Microsoft Ltd
The Microsoft team demonstrated a range of developer tools that can help inspire and educate school students of all ages. From SmallBasic to XNA, with some hardware interfacing along the way, we’ll be able to demonstrate software and resources that are freely available to educators.

University of Exeter
Demonstration and examples of computing events they run for local schools with emphasis on the workshops we currently offer to year 8 students.

cs4fn
cs4fn is a major international campaign to get young people interested in computer science. They engage directly with students and teachers in a variety of ways - a print magazine, a website and live shows. Samples of the magazine and online materials, plus material from the innovative workshops and magic shows they have produced to engage students were available
Andrew Scott. University of Glamorgan
Exhibition, and demonstration of ‘Progranimate’ a free, online, visual, interactive and simplified development environment for novice programming instruction. Progranimate has been tried in high schools to great success. It is an excellent way convey the basics of programming within the time constraints of a crammed computing syllabus.

Anne Matthews and Miles Berry
An opportunity to engage with Open Source Schools community and review the website, see demonstrations of open source software application.

CSUnplugged
A display of materials relating to the Computer Science Unplugged project, including demonstrations of magic tricks and games.

Chris Bishop
The DVD of the Royal Institution Christmas Lectures 2009
### A The Conference Program

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>9:00am</td>
<td>Registration</td>
</tr>
<tr>
<td>9:30am</td>
<td>Welcome Address : Chris Bishop (<em>Microsoft Research</em>)</td>
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<tr>
<td>9:40am</td>
<td>The State of the Nation : Roger Boyle (<em>Leeds University</em>)</td>
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<tr>
<td>10:00am</td>
<td>Computer Science Unplugged : Tim Bell (<em>University of Canterbury, Christchurch, NZ</em>)</td>
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<tr>
<td>11:00am</td>
<td>Refreshments/Exhibition</td>
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<td>11:30am</td>
<td>WORKSHOPS</td>
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<td></td>
<td>CSUnplugged : Tim Bell</td>
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<td></td>
<td>CSInside : Quintin Cutts (<em>University of Glasgow</em>)</td>
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<td></td>
<td>CS is Magic : Paul Curzon (<em>QMUL</em>)</td>
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<td></td>
<td>Greenfoot : Michael Kölling (<em>University of Kent</em>)</td>
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<td></td>
<td>KS3 Programming Activities : John Woollard (<em>University of Southampton</em>)</td>
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<td></td>
<td>Other Tools for Thought : Roger Davies (<em>Queen Elizabeth School, Kirby Lonsdale</em>)</td>
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<td></td>
<td>Python Programming : Jonathan Aylward (<em>Royds High School, Leeds</em>)</td>
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<td>12:30pm</td>
<td>Lunch/Exhibition</td>
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<tr>
<td>1:30pm</td>
<td>Computing at School - Towards a teacher’s association for Computing teachers (Simon Peyton Jones, Simon Humphreys)</td>
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<td>1:45pm</td>
<td>WORKSHOPS</td>
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<td>Panel: The GCSE in Computing (Terry Myers (<em>AQA</em>), George Rouse, Karen Reid (<em>OCR</em>))</td>
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<td>CSInside (Quintin Cutts)</td>
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<td>CS is Magic (Paul Curzon)</td>
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<td>Python Programming (Jonathan Aylward)</td>
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<td>2:45pm</td>
<td>Refreshments/Exhibition</td>
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<td>3:15pm</td>
<td>DISCUSSION GROUPS</td>
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<td></td>
<td>CSTA (Michael Kölling)</td>
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<td>Hubs (Thomas Ng)</td>
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<td>A Level SIG (Roger Davies)</td>
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<td>KS4 SIG (Mandy Honeyman)</td>
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<td>Body of Knowledge (Kevin Bond)</td>
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<td>Community Website (Miles Berry)</td>
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<td>Connecting with HE (Lynne Dagg)</td>
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<td>Programming Competition for KS3 (Roger Boyle)</td>
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<tr>
<td>4:30pm</td>
<td>PLENARY and Close</td>
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</tbody>
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B Quotes

The following are extracts from email messages received after the conference or statements from the feedback forms.

“Can I just say that I know the two delegates from my school had an absolute blast. It was brilliant talking to other like minded people about what can be done, especially as we generally do hear much up in Cumbria. We are already starting the ball rolling now by using CSUnplugged on our year 6 induction day (thanks Tim, you are a star) and are working on KS3 stuff to use. Now just to start the argument for doing GCSE computing!!! Thanks to everybody for all the organisation, and thanks to everybody for being so friendly. Viva la revolution.”

“I was bowled over by the enthusiasm and interest shown by all there! I had a wonderful day talking to people from all over the country and sharing ideas. You should be very proud of the event, and of the `ripple’ that will now go around schools in its wake.”

“Reflecting on what was a very stimulating day, could I just add that this was the first opportunity I have had in 20 years of teaching to meet with like minded teachers in a sizeable forum. That alone made it a unique event that … was highly valued by all. Just countering the sense of isolation that many of us must have felt for years is a massive step forward, with plenty of emergent themes to now pursue. There is indeed a `buzz’ on which we need to try to capitalise.”

“It was a great occasion, though all too short …”

“…an inspiring conference …”

“Excellent activities and speakers … real enthusiasm and drive”

“Really inspiring sessions about activities and teaching methods”

“A really excellent day!”

“Tim Bell! Excellent presentation about CSUnplugged. Enthusiasm and honesty of key staff. Facilities were good, activities well organised and planned. Excellent materials were given out e.g. DVDs, posters etc.. Thanks!”

“What a positive event, full of energy and enthusiasm at every level, Very informative … will be helpful in raising aspirations and in forging links between our school and local universities”

“What a great opportunity to meet other Computing teachers and find out what they
are doing”

“A great mix of people interested in computing education - and very even structure - no heirarchy imposed.”

“I learnt more and connected with more interesting people than on any course that my school has previously forked out hundreds of pounds for ...”