Teacher training to implement the Australian Curriculum

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University of Sydney

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About our activities

• National Computer Science School (NCSS)
  • NCSS Summer School
  • NCSS Challenge
  • Girls’ Programming Network
  • TeachPy teacher training

• ICT Educators of NSW and CSTA board/PD workshops

• Australian Curriculum: Digital Technologies writer
Our goal is to revolutionize school computing

- both computer science and literacy (less so)
  - curriculum reform (ACARA and NSW)
  - teacher professional development
  - teaching resources and technology
  - enrichment activities for current students

- in the meantime provide a great experience for students
NCSS Summer School

- 10-day (elite) residential camp at the University of Sydney
- for students starting Year 11-12
- 90 students and 10 teachers
- 25 ugrad/pgrad/industry tutors
- started in 1996 and grown in all dimensions
- many sponsors over the years:
  - NICTA, CSIRO, Smart Services CRC, Capital Markets CRC
  - NSW Trade and Investment, Defence Signals Directorate
  - Australian Computer Society, ACS Foundation
NCSS Challenge

- 5-week online programming competition in August/September
- for students in Year 7-12 (and some primary kids)
- a learning activity masquerading as a competition
- in 2012 we had:
  - 4210 students
  - 766 girls
  - 421 schools
  - 337 teachers

- 10,000 target for 2013
## Teaching computing vs mathematics

<table>
<thead>
<tr>
<th>Students</th>
<th>Teachers</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>enjoyment</td>
<td>somewhat enthusiastic</td>
<td>mostly suffering</td>
</tr>
<tr>
<td>respect</td>
<td>little or none</td>
<td>“hardest subject”</td>
</tr>
<tr>
<td>recreational</td>
<td>many</td>
<td>very few</td>
</tr>
<tr>
<td>practice</td>
<td>4–6 years</td>
<td>11–13 years</td>
</tr>
<tr>
<td>Teachers</td>
<td>never?</td>
<td>never?</td>
</tr>
<tr>
<td>retraining</td>
<td>non-stop</td>
<td>never?</td>
</tr>
<tr>
<td>shown up</td>
<td>frequently</td>
<td>never?</td>
</tr>
<tr>
<td>learn on the fly</td>
<td>frequently</td>
<td>never?</td>
</tr>
<tr>
<td>careers</td>
<td>many direct</td>
<td>few direct</td>
</tr>
<tr>
<td>University</td>
<td>teacher contact</td>
<td>lots</td>
</tr>
<tr>
<td>prerequisite</td>
<td>very few</td>
<td>yes (weakening)</td>
</tr>
<tr>
<td>compulsory</td>
<td>never</td>
<td>yes</td>
</tr>
</tbody>
</table>

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8/7/2013
Situation in schools: Victoria (2011)

- 11.2% took Information Technology Unit 1
- 81.9% took either Foundation or General Maths Unit 1
- 0.9% took Information Technology (VCE VET) Unit 4
- 55.7% took further maths (General Maths Unit 4)
- 30.6% took higher maths (Math Methods Unit 4)
- 8.5% took hardest maths (Specialist Maths Unit 4)

- enrolments have dropped since 2003 (was 23.7%)
- enrolments for girls have dropped faster (2003 to 2011):
  - IT Unit 1: from 33.9% to 17%
- slight bounce in 2011
Situation in Schools: NSW (2012)

- 5.8% took Information Processes and Technology
- 73% took either General Mathematics or Mathematics
- 2.3% took Software Design and Development
- 14% and 5.3% took the two higher-level maths (Ext 1 and 2)

- enrolments have dropped since 2003 (was 17.9% for IPT)
- enrolments for girls have dropped faster (2001 to 2012):
  - IPT: from 37% to 21%
  - SDD: as low as 6%
Teaching as a career is broken

- computing highlights problems in the wider profession
- PD for teachers is almost non-existent
- career progression is up/away from the classroom:
  → head/year coord. → deputy principal → principal
- no recognition for discipline leadership, e.g. creating resources
- professional associations are breaking down (and greying)
Teacher professional development is broken

• professional development (PD) is a hallmark of a profession
• few pupil-free days and little expectation of “holiday” PD
• pupil-free days taken up with bureaucracy/risk management:
  • child protection, anaphylaxis, . . .
• limited budget for teachers to be trained (< $1000 pa)
• relief teaching is $400-$450 per day → 2 days max PD
• run by teachers associations, departments, companies
Australian Curriculum is a game changer

- Digital Technologies subject within Technologies learning area
- covers Foundation (kindergarten) to Year 10
- introduces computer science, information systems, software engineering, . . . , computational thinking $\Rightarrow$ informatics
- first ICT curriculum for primary in lots of places

- **ICT general capabilities** separated from Digital Technologies
- ICT general capabilities taught over all learning areas
Australian Curriculum: Digital Technologies (draft)

- actual computer science concepts right down to Year 3–4:
  4.5 Define simple problems, and follow and describe the algorithms (sequence of steps and decisions) needed to solve them;
  4.6 Design and implement simple visual programs with user input and branching

- and up to Year 9–10:
  10.8 Trace complex algorithms to predict output for a given input, develop test cases to validate algorithms against their specifications, and describe algorithms diagrammatically and in plain English;
  10.9 Collaboratively develop modular digital solutions, applying appropriate algorithms and data structures using visual, object-oriented and/or scripting tools and environments
Rebooting ICT in schools

• once in a generation opportunity to reboot ICT education
• chicken and egg problem:
  • chickens: teachers can’t deliver the curriculum we want
  • eggs: curriculum doesn’t encourage/require teacher PD

• ACARA cracked egg with an ambitious curriculum
• we must now quickly retrain the chickens

• every response in public consultation was concerned with teachers’ capacity to deliver new curriculum
Professional Development design principles

- need a combination of lead teachers and academics:
  - teachers ensure content/pedagogy is appropriate, . . .
  - academics ensure content is correct, up to date, . . .

- need a combination of in person and online education:
  - to buy time-poor teachers’ time, energy, and mental space
  - to build a community and connect academia with teachers

- combination of teaching and weekend/holiday time
Professional Development design principles

• creation and curation of *classroom-ready activities*
• need to teach teachers how to deliver these activities
• initiative should be nation-wide (curriculum is national)
• in person retraining is embarrassingly parallel
Teacher and academic/outreach pairs

- lead teaching “fellows” should ideally be:
  - visible/vocal leaders in their professional networks
  - state department/Catholic systemic/independent connected
  - young and dynamic or older and respected (or both)

- outreach/academics should have:
  - designed and delivered outreach/marketing activities
  - recent first year lecturing/tutoring experience
  - e.g. recent PhD graduate with an interest in education
    the kind of person you’d want as an associate lecturer
    or one who has gone onto a Masters of Education
Teacher/academic activities

- they run many primary and secondary teacher PD workshops
- they develop and tutor online PD activities
  - build on local (e.g. NCSS Challenge) and international MOOCs
- they develop and collect classroom-ready activities
  - utilising Scootle teaching resource site (by ESA)
- they develop activities for industry professionals to engage
- they may (time permitting) run outreach activities for students
Professional development structure

• Teachers will:
  • attend $n$ day workshop (run in universities and schools)
  • complete online courses
  • create classroom-ready activities (assessing their skills)
  • attend $n$ day workshop (as above)

• one workshop in teaching time (needs teaching relief)
• one workshop in holidays/weekend
Who is going to pay?

- industry will be the main driver (and political force)
- Westpac CIO Clive Whincup is a passionate driver
- NCSS sponsors will contribute for a one-off revolution
- plan is to build industry/university consortium first
  ➞ challenge federal government to match

- take advantage of election (and probably change)

- work with teacher support agencies:
  - Australian Institute for Teaching and School Leadership
  - Education Services Australia
What do I need from you/ACDICT?

- now: written support to take back to industry
- soon: responding to EoI for hosting a PD pair
- soon: help with political push from industry
- later: being prepared to waive indirect costs
- later: covering 50% of a pair (including indirect costs)
### Budget (over 2 years)

<table>
<thead>
<tr>
<th>Costs</th>
<th>Value</th>
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<tbody>
<tr>
<td>Staff costs</td>
<td>$11,301,252</td>
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<tr>
<td>Workshop costs</td>
<td>$11,214,000</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>$22,515,252</strong></td>
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</table>

<table>
<thead>
<tr>
<th>Contributions</th>
<th>Value</th>
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<tbody>
<tr>
<td>Universities</td>
<td>$2,929,954</td>
</tr>
<tr>
<td>Industry</td>
<td>$9,792,649</td>
</tr>
<tr>
<td>Government</td>
<td>$9,792,649</td>
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