

Teacher training to implement the Australian Curriculum

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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:
 - Accenture, Apple University Consortium, Atlassian, Compuware, Freelancer, Google, IBM, Macquarie Bank, Microsoft, Oracle, ResMed, Unisys, WiseTech Global
 - 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

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

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 \implies 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 \implies **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)

| Costs | |
|----------------|---------------------|
| Staff costs | \$11,301,252 |
| Workshop costs | \$11,214,000 |
| Total | \$22,515,252 |
| Contributions | |
| Universities | \$2,929,954 |
| Industry | \$9,792,649 |
| Government | \$9,792,649 |