



School to University: Bridging the CS Gap

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We come from ...



- The University of Leeds is (nearly) the largest single-site UK university.
- We have been teaching university level CS since the late 1950s.
- We have always taught CS as a research-active institution.

Transition

- We are interested in teaching *Computer Science* in universities.
- A key influence on our success (failure) is students' prior school experience and expectations of Computer Science and IT.

Once upon a time ...

- Students came to university with little if any professed experience of CS or IT
- School level qualifications were of limited popularity ...
- ... but they were very good academic preparation for what we do.

Something happened



Effects

- Fewer women
- Changed school-level syllabus
- Widespread “opinion” of what CS/IT are
- ... and of what university CS/IT are
- Changed (refined) opinions of what computers are

Today

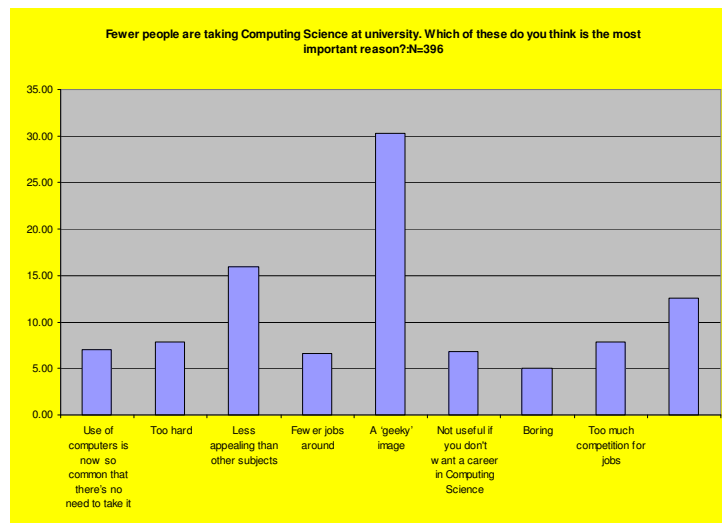
- Growing numbers of school students formally study IT at ages 16-18
- Declining numbers study CS at ages 16-18
- Plummeting numbers enter university CS courses ... *why is this?*
- Those that do are unprepared for academic CS

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Pupils say of University CS -

- ICT in schools, so no need to take computing further
- Boring
- Don't know what it involves
- Too difficult/ hard
- Other options more enjoyable
- Nature of jobs (but not job shortage)
- Teacher/ classes/equipment (very few)

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Is there an image problem?

- Lost its glamorous image
- Not special any more
- Don't know exactly what it is
- Programming too difficult
- People don't like sitting in front of a computer

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The “ICT effect”

- Use of IT now intuitive, no need for CS knowledge
- It's a modern everyday technology, no need for study
- People not interested in learning how computers work
- Already know the basics
- Not useful if you don't want a career in CS
- More people try to teach themselves to use the computer
- Not essential to know about the insides of a computer
- Seen as too common a subject
- People would rather use things than invent them
- Computing scientists are running out of ideas
- Popularity of Internet

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Teachers say:

- School Computing and CS in HE are not the same
 - Preferences of individual Principal Teachers
 - Whether CS or IS taught
 - Whether pupils take only ICT
- Threats to Computing in schools
 - Reduction in number of CS teachers & their required CS qualifications
 - Limited CPD in rapidly changing subject
 - Old equipment, slow technologies
 - Conflicting curriculum choices
 - New school faculty structure: Will CS be in business admin, technology or science?

Evidence

- We have looked at the fine-grained performance of university CS students
- We demonstrate that the “hard” bits of their study are precisely those sections not encountered in schools
- We think we can categorise the pre-university curriculum in a way that other university disciplines might not

School curriculum

- Firm foundations: WWW, elementary networking, elementary IS
- Familiar territory: introductory databases, SQL, “professional issues”, elementary architecture
- New challenges: discrete maths, artificial intelligence

Programming

- The challenge of learning and teaching programming stands apart from all this.
- School level computer programming in the UK is rarely a good foundation for sound software engineering.
- The reality of programming is a major factor in the high attrition seen from university CS.

Teachers

- We have engaged successfully with the community of school ICT teachers.
- They are generating education of a high quality, and are very open minded to suggestions and ideas.
- They are very rarely CS graduates.

What is it like to be a school student?

- School students see computers as a consumer durable
- This has consequences for people's "understanding" them

Answers

- Get more computer scientists into schools
- Get more university teachers to talk to more school teachers
- ICT teaching in more than one environment
- Computers that look and behave like computers