TOPS:
Collaboration and Competition to stretch our most able programming novices

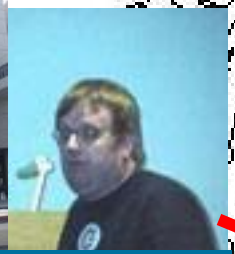
Su White*, Janet Carter,
Nick Efford, Stephan Jamieson,
Tony Jenkins

*Learning Societies Lab, ECS
The University of Southampton, UK
IEEE FIE2007 Milwaukee

Collaborate

University of Southampton

Durham University



UNIVERSITY OF LEEDS

University of Kent

University of Southampton

Common beginnings …

University of Southampton

… first year is problematic
- some students can
- some students can't

… what do we do
- try to motivate them all?
- teach to the middle?
- extra support for strugglers?

… what about our best?

TOP students

We *all* have top students

- obviously find work easy
  - programmed before
  - pick it up quickly

lectures too simple and slow

bored with mundane tasks

We all have strategies for our best students

- Ours include:
  - CSCS
  - Rocket scientists
  - Space Cadets

If you have some to share…
let us know

The project

University of Southampton

The Higher Education Academy Information and Computer Sciences

Teaching

Over

Performing

Students

£3,000 Start Date November 1 2006

The project

The project was proof of concept….

- intra-university programming competition
- collaborative problem setting

as a means of extending
the most able students in programming classes

sharing current practice
peer observations across universities

Existing competitions

University of Southampton

The IBM student competition

http://www.developer.ibm.com/university/students/contests/

The ACM student research competition

sponsored by Microsoft **http://www.acm.org/src/**

The International Imagine Cup

http://imaginecup.com/

Topcoder collegiate challenge

http://www.topcoder.com/

BCS competition

http://www.bcs.org/

Existing competitions

University of Southampton

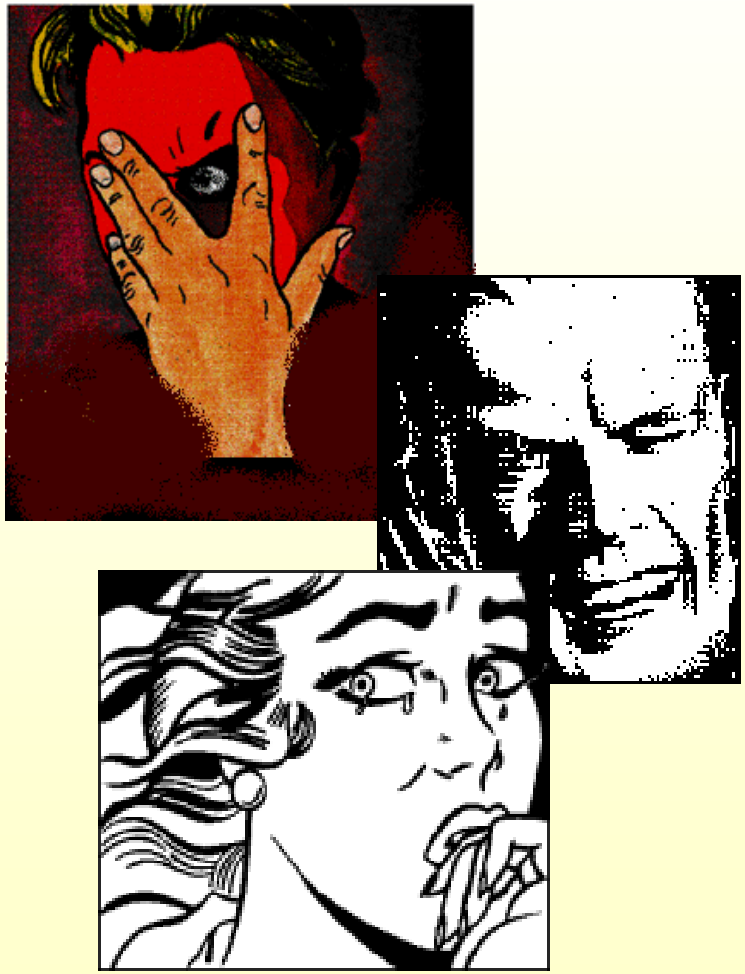
strengths

- Motivate good students
- Are only for the best
- Look good on the CV

weaknesses

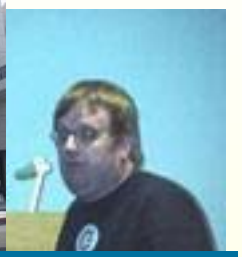
- Not linked to the curriculum
- Students don't always want extra learning
- International competitions diverge from UK curricula

How we did it ...



Collaboration, peer observation

University of Southampton



UNIVERSITY OF LEEDS

Durham University

Plan, discuss

Share current practice

Obtain a ‘sense of place’

- Meet find out:
  - what we do
  - more about our students
  - problems we encounter
  - how we want to stretch our students

University of Southampton

University of Kent

Our competition

University of Southampton

- Based upon our curricula
  - Using only what we expect our students to know
  - Set a collaborative challenge
  - Be more immediate and relevant

Authentic pair programming

- Insight into curriculum
- Extend and motivate our top students
- … Look good on the CV

Our challenges - organisation

University of Southampton

- How many students?
  - Determined by funding
    ….and rail fares!

- What student tasks
  - Write code
  - Present their work
- constraints

  Must
  - fit with all four syllabuses
  - be interesting/relevant

Our challenges - sponsorship

University of Southampton

- Sun Microsystems provided
  - Venue
  - Catering
  - Some prizes
- This fixed competition date
  - 14th March 2007

Sun microsystems

London Tech Day

Involving the students ...

Our challenges – what will the students do

- Scenario
  - Something relevent to a group of students attending a tech conference in London
- Setting a challenge task
  - Each University Student team to set one task
    - Collaborative response to brief
    - Manageable in 1-hour by 2 students pair-programming
    - Uses their ideas – motivating
  - Prize for university team who set the best challenge
    - Motivating
    - Challenges more likely to be suitable

Choose the team

- Each institution chose its team in whatever way was appropriate to them
  - Team size
    - 8 students
    - 6 students going to London
  - some students participated who otherwise couldn't
  - back-up in case anybody dropped out

Runners and Riders…

Durham

Kent

University of Southampton

Leeds

University of Southampton

Southampton

14th March …

Destination London

At the venue

University of Southampton

The students' first taste of such an event

- Most students attended James Gosling's keynote
- They had the opportunity to attend talks and browse stalls
- All properly registered with delegate badges

Competition was not hidden

- On the programme
- On direction boards
- Proper sign on the door
- Assigned a conference staff helper

Sun allowed us to use their logo on certificates

The programme for the day

University of Southampton

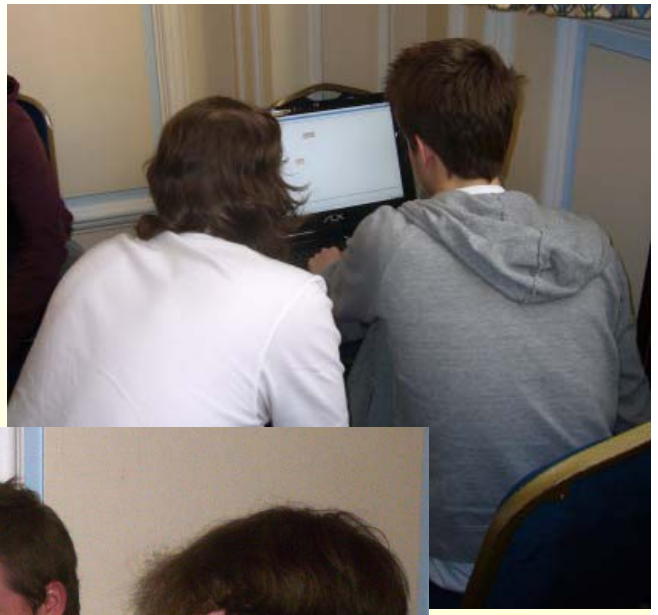
1030 – 1045	Introduction
1045 – 1145	Challenge 1
1200 – 1300	Challenge 2
1300 – 1400	Lunch
1400 – 1500	Challenge 3
1500 – 1600	Judging
1600 – 1630	Prize giving

Challenge		Team			
		Durham	Kent	Leeds	Soton
	1	K	L	S	D
	2	L	S	D	K
	3	S	D	K	L

The day itself.. Initial tension

Scoping the tasks

University of Southampton

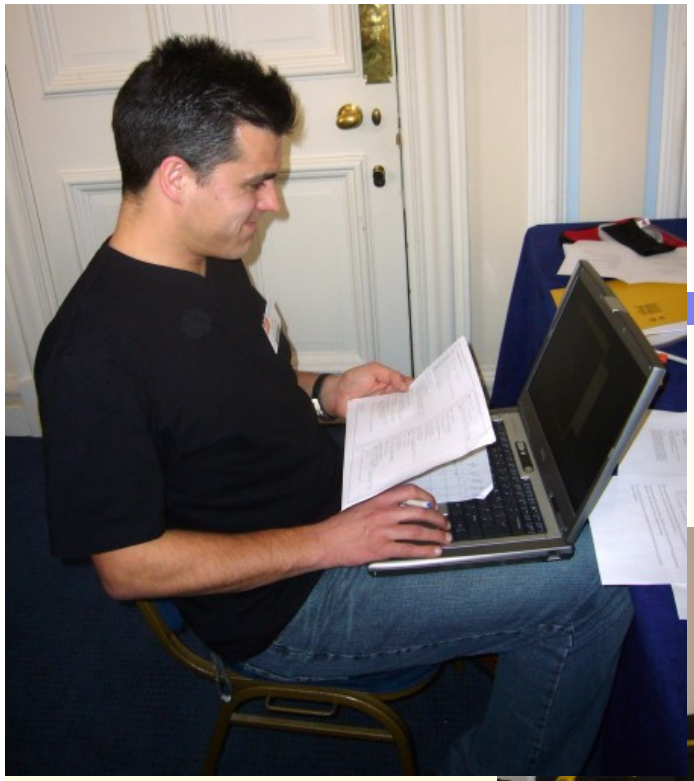


coding in pairs

University of Southampton

Settling in the environment

Marking / logistics



The winning pair (left)

The winning challenge team

It's great – thank you for organizing it

It was really intense, but great fun

Making the challenge idea was easy, but the wording and the mark scheme weren't

We've got a proper sign on the door like all the other rooms

I liked that we were supposed to work at our natural pace and that we had to think.

Working together was great. Everyone worked amazingly well in teams.

Conclusions / reflections

University of Southampton

Faculty

- Proof of concept ✓
- Peer observe across universities ✓
- Share current practice ✓

Students

- Gain insight into the curriculum ✓
- Extend and motivate programming activities ✓
- authentic time-constrained paired-programming ✓

Meeting students from other universities ☹

Scheduling into regular academic slots ☹

Keeping to budget *!*☺*!*

Workload on the competition day ☹

transformative
inspirational
challenging
fun

Reflections / conclusions

Possible solutions

- Virtual component(s)
  - but face to face is preferred
- Simplify tasks
  - But what about stretching the most able?
- Target different groups
- Additional sponsorship
  - Challenge retreat
  - Socialized learning
  - Presentations of work
  - Longer timescales ☺
  - More cash for train companies!

We intend to run this again

- The students enjoyed it
- The students benefited from it
- More generous funding

This year

- Additional sponsorship
- Post Graduate assistants for marking
- Probably teams of 5
  - 4 students going to London

Thank You ☺

University of Southampton

Acknowledge

- The support of the UK HEA subject centre for information and computer sciences

The Higher Education Academy Information and Computer Sciences

- Sponsorship from Sun Microsystems

Questions?

references

- Carr, L. A., Davis, H. C. and White, S. A., "AnnAnn - a Tool to Scaffold Learning About Programs," presented at the Fifth Annual Conference of LTSN-ICS, Ulster, UK., 2004.
- Carter, J. and Boyle, R., "Teaching Delivery Issues: Lessons from Computer Science," vol. 1, 2002, pp. 77-89.
- Carter, J., English, J., Ala-Mutka, K., Dick, M., Fone, W., Fuller, U., and Sheard, J., "How Shall We Assess This?. , . ," *ACM SIGCSE Bulletin*, vol. 35, pp. 107-123, 2003.
- Cegielski, C. and Hall, D., "What Makes a Good Programmer?," *Commun. ACM*, vol. 49, pp. 73-75, 2006.
- Davis, H. C., Carr, L. A., Cooke, E. C., and White, S. A., "Managing Diversity: Experiences Teaching Programming Principles," presented at the 2nd LTSN-ICS Annual Conference, London, 2001.
- Fincher, S., Barnes, D. J., Bibby, P., Bown, J., Bush, V., Campbell, P., Quintin Cutts, Jamieson, S., Jenkins, T., Michael Jones, Dimitar Kazakov, Lancaster, T., Ratcliffe, M., Seisenberger, M., Shinner-Kennedy, D., Wagstaff, C., White, L., and Whyley, C., "Some Good Ideas from the Disciplinary Commons," presented at the 7th Annual Conference of the Subject Centre for Information and Computer Science, Dublin, 2006.
- Kölling, M. and Barnes, D. J., "Enhancing Apprentice-Based Learning of Java.," presented at thirty-fifth SIGCSE technical symposium on computer science education,, 2004.