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Abstract

The University of Wollongong has been seeking ways by which it can attract capable students from the southern side of the States capital city, Sydney, Australia. The paper describes the concept of limiting the required daily travel to the University through an amalgam of technologies, and changes to the core teaching syllabus. Progress through 1994, and plans for full introduction in 1995, is described.

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NEAR-DISTANCE SOFTWARE ENGINEERING EDUCATION

Fergus O'Brien

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The University of Wollongong has been seeking ways by which it can attract capable students from the southern side of the States capital city, Sydney, Australia.

The paper describes the concept of limiting the required daily travel to the University through an amalgam of technologies, and changes to the core teaching syllabus. Progress through 1994, and plans for full introduction in 1995, is described.

1. Introduction

The University of Wollongong is situated one hour's drive south of Sydney, Australia, with good road and rail communications to the southern Sydney suburbs.

As a result, the student catchment area consists of two distinct geographical regions. The first is the local Illawarra area with a total population of 300,000. The second is the southern Sydney area with around 1,000,000 people.

The Department of Computer Science has been seeking ways in which advantage could be taken of intrinsic Computer Science technologies to tap into this second region.

This paper covers the issues, current solutions and proposals for 1995.

2. Issues

There are a wide variety of issues that have contributed to the ongoing activities and major designs for 1995. They include technical, performance and even ethnic issues, as noted below.

- Studies conducted by the Department of Mathematics show very clearly that students living in their home environment do better academically than those living away from home. This is formalised on entry to the University by giving local students a 5-point TER advantage, from their end of school examinations.

- Funding and other constraints preclude the opening of computer laboratories outside the 9-5 working hours of the university.

A prime reason is the need to provide staff to ensure security of the laboratories. Open laboratories on campus have proved to be too high a risk.

- The availability of relatively inexpensive workstations has meant that a high percentage of students and their families have capable systems in their homes, and it is anticipated that this will reach saturation in two years.

- The total cost, including purchase of a workstation, for a student living at home is markedly less than living away, and parents often prefer to see their offspring on a regular basis. Costs for a PC, software and modem can be recovered in one year.

- Technology now exists for the majority of our assignments to be performed on a variety of workstations, in conjunction with central departmental support.

These issues amongst others indicated that 1-2 day(s) per week attendance for lectures, complemented by at-home working for the remaining days, would be a desirable target.

Outside the purely academic issues are the needs of students to belong to the University community, and to feel that they belong. Universal access to student bulletin boards run by the students has eased the problems of communicating both serious and entertaining events on campus. However there is no substitute for regular attendance on campus.

3. Teaching Development

The Department of Computer Science has been continuously assessing the teaching in the

undergraduate degrees, specifically the way to blend languages in their own right, and as tools.

The decision has been taken for 1995 onwards to use C++ as the core language for the three-year degrees. An expanding subset of C++ has been designed, progressively adding features session by session.

This avoids the slump in progression at the start of each year when students have to learn a new language as, essentially, a tool. Of major concern has been the move from Modula-2 in first year to C in second year. Students continue to have problems in C until the end of their degree, especially with pointers. The use of C++ throughout will mean that a careful extension of features can be introduced progressively through the degrees. In parallel, language teaching is to be handled as a separate stream.

As is usual with 20 staff, 25 separate languages were proposed when a change from Modula-2 in first year was introduced.

The impact of this change is that the department can utilise the C++ environment on Macs, PCs, and Unix systems to support the on-campus laboratories, and home-based systems. First year assignments have already been trialled in these environments, and source files transferred between them.

A further development over the last two years has been the rapid increase in demand for graduates with object-based experience. Object-oriented

techniques are currently taught in third year, and used as the basis for many of the software projects. The result has been that a significant number of students now have job offers, prior to graduation.

4. Near-Distance Education

The term near-distance is used to indicate that the department is not in the distance education marketplace, but has specific problems due to the different STD telephone access regions for students. Using STD access has proved to be too expansive for students to use freely.

Current applications for programming assignments and reports permit students to access on-campus servers, primarily to file transfer assignment details work at home and then file submit or email results to the department.

This is on a limited basis as the technology is explored and relies on the availability of local call access for the southern Sydney based students.

Telstra has permitted the university to install dial-up modems at the Joint University Centre in Sydney, and this allows direct access to the Wollongong servers via the Joint Centre - University links.

This facility is being used at a rapidly increasing rate by students, and also by Sydney domiciled staff. As a result, the communications facilities are always in catch-up mode, and regularly face saturation to the extent that students, and staff, find them unusable.

5. Proposal for 1995

The university has agreed to market strongly into both the Illawarra and the South Sydney regions on the basis of this near-distance approach.

For the Department of Computer Science, the direct impact is that some 150 out of 400 students are expected to work in this mode, in 1995, with an increasing number over the next three years.

To match this, the department aims to

- Convert the first year laboratory to locally served C++ systems.
- Provide C++ environments for home systems at a nominal cost.
- Implement the file transfer software between home systems and on-campus servers.
- Provide a 7 day/24-hour support for these servers.
- Provide an email service for all these students to aid effective communications with the academic and support staff.

The designs, costing, and implementation plans for these activities are now complete, and the inevitable process of assembling funds is underway.

The funding for a 40-PC laboratory of diskless PCs with boot-ROM networked to a server, and thence to the campus network, has now been

approved by the University. The budgetary cost is \$115,000.

The University was also successful in the Quality Ranking, and internal bids have resulted in \$200,000 being approved for a microwave link between the Sydney Centre and the University.

The decision to go for C++ has been finally ratified and trialled, and schedules are now being put in place to develop the assignment and teaching material for 1995. A number of good introductory C++ textbooks are now on the market and a choice will be made for 1995.

In addition some of our software projects have been ones that were designed and built in C in 1994. The difference in quality of product obtained by moving the C++ has been most significant.

6. Conclusion

The current restricted but successful usage of near-distance facilities has enabled a strong marketing push into the southern Sydney catchment area. This push has already generated major interest in the related schools.

The simplification of core language teaching has been allied to this success to develop an overall proposal for 1995 based on effective integration of the home-based systems and on-campus servers.

This change in core language teaching also has a major impact on the software engineering components in the degrees, specifically due to the

effective use of teaching across sessions, thus permitting early introduction of software engineering concepts.