

## **Towards problem-based learning in computing: On-campus and at a distance**

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### **Abstract**

The Department of Mathematics and Computing, Central Queensland University, recently (1994) introduced a restructured applied computing degree, the Bachelor of Information Technology (BInfoTech). One of the core subjects in this new degree, Human Issues in Computing, has been developed for self-paced delivery on-campus and at a distance. This paper examines the development of this subject in some detail.

### **Background**

The new degree was several years in development and arose both in response to student suggestions and as a reaction to the 1992 Discipline Review (DEET, 1992). The three year degree requires a Foundation Year of six core subjects plus two electives before splitting into two streams:

Software Engineering, which aims to prepare graduates who understand the technologies of software development and who can work effectively, individually or in teams, to develop effective state-of-the-art software; and

System Services, which aims to prepare graduates capable of carrying out the installation, administration, and maintenance required to keep the users of computer systems operating effectively.

In designing the new degree the Department was aware that employers, the Information Technology (IT) industry, required both students and staff to adopt more of a 'user services' orientation and to improve the teaching of communication and groupwork skills.

The System Services stream was a response to the first need. It was recognised that implementation of the stream, however, would pose some problems, particularly with school leavers who lacked both any knowledge of the IT industry and a concept of 'professional' practice. As well, while the previous degree structure required students to take a 'communications' subject, students continually expressed dissatisfaction with the available subjects. In particular, students complained that the content and assignments of the existing subjects lacked relevance to IT students.

Two subjects, Human Issues in Computing (HIC) in the first semester of the first year, and Professional Issues in the third year, were proposed to meet these needs. Human Issues would provide an introduction to the relevant communications skills based around the ethical, legal and professional issues relevant to an IT professional. Professional issues, to be developed and taught by the Business Faculty, would follow once the students had achieved additional maturity and would provide further exploration of topics such as Legal Issues, Contract Law, Requests for Tenders, Tender Evaluation, and Professional Ethics.

The content of study materials at CQU is the responsibility of the teaching department. The production and delivery of materials for students studying at a distance, however, is the responsibility of the Division of Distance and Continuing Education (DDCE). Obviously, with several hundred subject offerings every semester DDCE has

established formal subject development procedures and timelines. Normally a subject is offered in an internal (on-campus) mode one year before offering the same subject in an external (to students at a distance) mode. This allows at least 12 months for subject development and revision, plus an additional 4-6 months for production (type-setting, proofing, printing and binding, etc.) prior to shipping the materials to external students.

### **Development issues**

Human Issues in Computing is a core subject in the new degree and, because it is a first year subject, is important for students attempting to transfer to the new degree from the previous degree. Accordingly, it was necessary to offer the subject (on three of the five CQU campuses) sooner than might have been normal for a new subject, and to offer the subject externally the semester immediately following the first internal offering.

A number of other issues also confronted the Department as we began developing this subject.

First, while the subject would initially be taught on campus, the largest number of students would be studying at a distance. This suggested that the subject should be designed for delivery at a distance and then modified for campus delivery rather than the more normal reverse. It also suggested that assignments should be problem-based, self-paced, and more flexible than in previous subject offerings.

Second, both the discipline review and student comments emphasised the need for currency of materials, and experience indicated that topics, assignments, and resources must be Australian-based and very relevant to the beginning IT student. This, along with the short timeline for implementation ((approximately half of that normally provided for the development of a new subject) meant that there could be problems in materials production timetables.

Third, the Department was investigating the use of team rather than individual lecturer development and this subject seemed like a good place to begin.

Finally, student comments had indicated that they found the presentation quality of our subjects to be below average when compared with the design and presentation of subjects from other institutions. Both they and the Discipline Review suggested that the Department should be using IT to teach IT. Combined these two issues had additional implications—both in terms of development costs (time and money) and in terms of subject delivery (timelines, packaging, etc.).

The subject has been developed around a number of flexible assignments with open-ended deadlines. Each assignment has a summary of requirements, a statement of purpose, criteria for marking and suggested procedures for completing the assignment. As well, each assignment has a series of comments from the lecturer which emphasise the most important aspects of the assignment, provide additional suggestions for completing the assignment, and highlight common problems experienced by students. Finally, each assignment includes a checklist of criteria and a statement to be signed verifying that the student completed the assignment as noted.

The subject resources include short videotaped 'lectures' covering technical aspects of the subject such as team building and oral presentations, issues such as ethics and computer security, and interviews with IT practitioners. Some of these topics are also covered by print-based materials.

The quality and currency of study materials was a major issue and is covered in more depth below. It was also necessary to negotiate special materials production timelines with DDCE to allow for revision following the first offering of the subject and the subsequent late delivery of study materials to DDCE's production unit.

A good materials development team normally comprises one or more instructional developers, one or more subject matter experts, and various support personnel (computer programmers, graphic artists, editors, etc.). As well, individuals representative of typical clients (students) might be included on the team.

The lecturer-in-charge for this subject (the author) was a competent instructional designer as well as being a subject matter expert and experienced with both face-to-face teaching and distance learning. The development team was accordingly less formal than might otherwise have been the case, and included a second instructional designer (from DDCE), several lecturers -in-charge of related subjects, and several recent graduates and current students. While the whole team never met together at the same time, the team did evaluate the proposed resource materials, primarily textbooks, and review the subject outline and study materials as they were developed. Because of time pressures the TVI materials were not reviewed by the team, however, they have been reviewed by HIC students during the first offering.

The presentation of subject materials continues to be a concern for the Department. The author has worked with a university graphic artist to design an iconic symbol to use with this and similar subjects and will be experimenting with packaging alternatives in coming semesters. As well, the Department is seeking funding for facilities to develop non-print materials and experiment with computer-based multimedia delivery of some study materials.



At present this icon has only been used as a heading for notices to students. Eventually, however, it is anticipated that such icons might be used to identify all materials related to the subject—subject outline, notes, videotapes, diskettes, etc.

As an aside, it is interesting to note that students on one of our off-shore campuses have apparently indicated that they find the presentation of our subject materials a bit confusing as the covers for our printed materials have a generic experimental science theme unrelated to IT.

### **Study materials selection**

The final selection of study materials includes a textbook (Dwyer, 1993), the videotaped TVI (Televised Instruction) lectures, selected print-based resources, and a selection of current magazine and journal articles. Students also receive extensive notes for each assignment. Agreeing on the selection, and mix, of study materials was perhaps the largest task faced by the subject development committee.

The author had originally proposed a selection of materials which included a book of readings and a variety of communications reference materials (dictionary, thesaurus, style guide, and single topic booklets on oral presentations, interviewing skills, etc.). This selection had the major advantage of being readily available, requiring very little effort to integrate within the syllabus. Unfortunately, the reviewers felt that the proposed book of readings was 'too dense' and 'boring' for first year students, and that a more unified approach to the communications topics was required.

Other criteria included the necessity for easy readability, the desire for at least an Australian approach, if not an Australian author, and a preference for fewer rather than more books to cover the same material.

A plea for relevant materials to all of the normal tertiary level publishers produced approximately 20 textbooks, single topic booklets, and manuals for evaluation. The evaluation team, which included two recent graduates, several current students, as well as the committee members, were unanimous in their rejection of the potential books of readings, necessitating the preparation of the selection of current articles. The evaluators were not so unanimous in their choice of a basic communications textbook, however, all of the current and recent students preferred the text finally chosen.

### **Readings—*Current Issues in IT***

As indicated above, the subject development committee totally rejected all of the proposed books of readings for the human issues component of the subject. Their major complaint was the reading level and presentation of the available materials.—essentially collections of text-based articles on legal, ethical and human issues—visually unappealing and, being books, not very current.

The solution adopted was to collect relevant articles from the weekly computer section in *The Australian*, from commercial news magazines, and from professional publications from sources such as the Australian Computer Society.

Photocopying such articles for instructional use is acceptable under the University's agreement with the Copyright Agency Limited (CAL), however, copies of newspaper articles are seldom very readable. Fortunately, CAL indicated that it would be acceptable to retype the articles for the purpose of copying them, thus we were able to retain an acceptable presentation quality.

We anticipate continuing to prepare a new collection of articles, titled *Current Issues in IT*, every semester, thus ensuring the currency of topics. Students will receive two sets of articles—the newest collection and the collection from the previous semester. While this has required special arrangements with the materials production unit—production deadlines are normally many months in advance of subject delivery—it is seen as being critical to maintain the topicality of study materials.

Students are also encouraged to obtain and read a collection of articles (Plauger, 1993) on 'software people' which originally appeared in *Computer Language*.

### **Non-Print materials**

The major non-print component of the initial study materials is the TVI videotapes, although the assignments also include some other non-print and computer-based activities. The videotapes, with one exception—an introduction to the subject, range from 10-25 minutes in length and have a single topic.

The tapes have been prepared on a minimal budget using non-broadcast quality recording equipment. Unscripted and minimally edited, the tapes either present the core materials from a classroom lecture or demonstration or are interviews with industry guest speakers. Several of the tapes have been taken on location and overall they provide a mix of male and female input.

The tapes were shown weekly in a scheduled session and copies were also available for individual viewing. While the tapes have been prepared and shown as individual tapes for the first offering of the subject, they will be repackaged and distributed to external

students on one or two tapes (a decision on the exact format and financing has still not been made at time of writing).

Planning the taped materials, doing the actual taping, editing the tapes, and organising the distribution of the completed tapes has been a major chore during the first offering of the subject as only one or two of the tapes was prepared more than 2-3 weeks in advance of use. Fortunately, the students have indicated that they found the tapes useful and interesting. Given the amount of extra work involved, it was also most encouraging that they most appreciated the 'on location' interviews.

### **Student facilities and support**

As noted above, a scheduled time and room was provided on each campus for viewing the TVI videotapes. Individual students undertook to collect and show the tape each week and, if possible, to facilitate a discussion of the tape topic. The author presented the first class on two of the campuses in person and on the third by videoconference (the introductory videotape was subsequently prepared on the basis of the questions raised during the first classes). Each class was subsequently visited in person at least once and all students had mail, telephone, FAX and email contact in the event of difficulty. As well, an academic staff member on each campus served as a contact point for the delivery of messages, assignments, etc.

A seminar room was booked for use by small groups of students on a first come, first served, basis to assist with the oral presentations and small group discussions. As well, at least 2 hours of computer lab time per student was booked to provide facilities for email use, word processing, etc.

Student support has primarily been provided through the Department's 'MCHotLine' service for first year students and the University's Communication Learning Centre.

The MCHotLine is staffed 16 hours per week, in addition to a 24 hour voicemail answering service, and responds to face-to-face, telephone, email, and FAX inquiries. The service is staffed by senior students familiar with all the Department's offerings and passes difficult queries to the lecturer involved.

The Communications Learning Centre provides group tutoring and 'by appointment' individual assistance with written and oral skills. First year students also have 8 hours per week (Saturday and Sunday) of 'hands-on' assistance with computer skills.

Marking assistance (casual part time staff) is also provided to the Lecturer-in-Charge and the marker(s) often follows up with student queries that appear as a result of assignment difficulties.

### **Initial delivery problems**

A number of the initial problems can be inferred from the discussion above—we did have difficulties delivering materials to the students on time and are experiencing additional difficulties delivering the revised materials to DDCE for use in the second offering of the subject. As well, we were unable to develop the videotapes well in advance of use and experienced some copyright problems with copying the selection of current articles on issues in IT—we had initially wanted to distribute the materials on diskette.

We experienced some difficulties with staffing the subject. More specifically, we experienced a reluctance among staff to let the students schedule their own activities

and to work unsupervised. Gradually, however, staff on all three campuses have accepted that the subject can be managed from one location with a minimum of staffing and support—even if it means that they cannot use the subject to increase their staffing allocation.

We have also experienced considerable difficulties in shipping materials—TVI tapes and assignments—from one campus to another. It sometimes takes 10 days, for example, for assignments to travel the roughly 100 kilometres from Gladstone to the author in Rockhampton in spite of the use of an overnight courier service.

In general, however, the initial difficulties have been minimal and the reaction of students has been very satisfying. Some students have not been able to schedule their assignments without deadlines, but generally they report that they have appreciated the self-paced nature of the subject and the assignments themselves.

*I found the videotapes and readings very informings and quite interesting. They opened my horizons in such a way that I now appreciate and understand the different issues and affects computers have on people...*

*Until I commenced this subject I hadn't realised there was a "human issue" aspect to computers. Nor had I been aware of the importance of teamwork in many aspects of the workplace. An activity I thought only used at an education level, or in sport. From this I find communication and Team Work on a professional level essential tools for a successful business organisation. [85138 student, 1994, hand written comment on assignment, errors uncorrected from original, 27 May]*

## References

Department of Employment, Education and Training; Department of Industry, Technology and Commerce; Information Industries, Education and Training foundation (1992). *Report of the Discipline Review of Computing Studies and Information Sciences Education*, 3 vols. Australian Government Publishing Service.

Dwyer, Judith (1993). *The Business Communication Handbook*, Third Edition. Prentice Hall.

Plauger, P.J. (1993). *Programming on Purpose II: Essays on software people*. PTR Prentice Hall.