ThinkingIS..

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Practitioner Education - Degrees of Difference?

Our institution, until this year, has been part of the New Zealand Polytechnic sector, a sector with a particular mission to provide applied learning and vocational education preparing tomorrow's practitioners, or upskilling those currently in the workforce. In the New Zealand education environment, one of the more significant changes of the 1990's has been the granting of degree awarding authority to Institutions in the Polytechnic sector [2]. Our own Institute has been active in developing over thirty new degree programmes in a period of less than a decade. The growing maturity of the Institute has led to its achieving University status from January of this year, a millennial concession from an outgoing minister of education.

For some years now we have taught a three year National Diploma, during which students were prepared for careers as practitioners in the IT industry. This programme contains a capstone course in which students undertake a major project. The project course (PJ300), constitutes of two thirds of a full semester's course of study. Typically we have run the project course as a full lifecycle software development for a live industry client. We prefer that students, rather than operating alone, work in small teams of three or four. This is a deliberate practice to develop teamwork capabilities in students and discourage the stereotype of the heroic asocial programmer. This bias is not only reinforced by the media, but perhaps at the heart of our disciplines and inherent in the rational decision making model "the model of the ‘lone actor’"[1]. My own view is that good software is created by teams, and graduates who are unable to work effectively in a team are not being adequately prepared for practitioner roles.

The three year diploma programme is now being phased out in favour of a two year diploma for software and network support technicians and a three year course of study at degree level for software developers. This course of study called the "software development pathway", is an option within our Bachelor of Applied Science Degree. It draws heavily upon the ACM IS'97 curriculum [3] and the CS '91 curriculum [4], tailored to meet the needs of our degree, the local demands of the Auckland IT scene and our graduate profile. It should be noted that students in New Zealand normally study for five years at high school and then undertake a three year undergraduate degree, as opposed to the US model of four years at secondary and tertiary levels.

The degree aims to produce a well-rounded software developer, with an understanding of the demands of professional practice, attuned to commercial products and realities, with a good grounding in the computing disciplines and the versatility to operate in diverse problem domains. As for other Applied Science degree graduates they are expected to possess a combination of academic, professional and personal capabilities. Typical examples of each are: "explaining and applying skills and fundamental knowledge"; "applying previously acquired skills and knowledge to solve problems in the workplace"; and "demonstrating a sense of responsibility to clients who are dependent on the result of his/her work".

In developing the course the challenges have been to produce a graduate educated for practice, who can in my terms "hit the floor running day one, and still be growing and learning in year five". Because of the practical nature of the course, and the expectations of the students we do not cover the traditional mathematical foundations of computer science in discrete theoretical courses. The prescribed core courses of study for all students of the Applied Science degree (chemists,

ecologists, lab technicians and software developers) are scientific communication, mathematics & statistical models and a two semester project course. The standard scientific subjects such as Physics, Chemistry and Math's are available as elective courses for software development students but they are not constrained in their choices and may elect business, electronics, languages or other topics.

An overview of the pathway is given below.

Semester of study	Course name

One	Programming	Principles of Computing & Information. Systems	Scientific Communication	IT H/W & S/W Infrastructures
Two	Programming	Information Systems & Decision Modelling	Mathematical & Statistical Models	Elective
Three	Software Engineering	Data & Process Modelling	Logical Database Design	Elective
Four	Physical software Design & Implementation	Networking and Telecomms	Physical Database Design	Elective
Five	Intelligent Systems	Human Computer Interaction	Software Project Management & Professional Practice	Project
Six	Operating Systems & Concurrent Programming	Internetworking & Web Development	Elective	Project

By way of contrast, in our Bachelor of Business degree (which is a four year degree) we have an IT major which is aimed to prepare graduates for business analyst careers. This major, typically taken as one half of a double major pairing, has a much broader focus and dips only briefly into the design and construction aspects of information systems. Graduates are expected to gain employment as some form of IT planner in a line business unit, which will involve the leading of business initiatives supported by IT. They will typically be involved in early project phases, project coordination, business unit technology support and change management and the management of vendors and services.

A slightly simplified overview of the IT major in the context of a full degree course of study is given below.

Semester of study	Course name

One	Integrated studies one - NZ Business Environment
Two	Integrated studies two - Managing Information
Three	Integrated studies three - Managing the Organisation

Four	Information Engineering	Major 2	Ethics - Business & Society
Five	Electronic Business IT Infrastructures	Major 2	Major 2
Six	Managing the IS Development Process	Human Computer Interaction	Major 2
Seven	Strategic Data Management Architectures	Intelligent Business Systems	Major 2
Eight	Cooperative Education		

One of the key issues for us has been maintaining an applied educational focus while operating within a research informed degree level course framework. We have eschewed the traditional bifurcation of the discipline into computer science and information systems, although from a CS perspective these may perhaps be considered IS degrees. But the software development pathway could also be considered more in the light of an undergraduate software engineering degree, although we have preferred the term "software development". In the New Zealand context with a largely agricultural and services based economy, the hardware variant of software engineering underpinned by math's, physics and mechanics did not seem the appropriate option for us. However, our graduates will work in the global IT profession.

So for us the bifurcation has been on a broad career track basis, blending the academic disciplines. Whether this is a more durable model remains to be seen, but in the light of Peter Denning's call to revisit "computing the discipline", to become "computing the profession"[5], it raises some very interesting questions. For instance how computer science can address the issues that arise for IT professionals in the Electronic Business domain, while continuing to exclude applications from the bounds of the discipline, is a

thorny question. But in a huge and expanding discipline, defining what should be the core, is no trivial question either.

These challenges will become more accentuated for us as we move to postgraduate provision, where the research-informed, rather than practice-informed viewpoint predominates. But therein lies the challenge for researchers in an applied discipline, advancing the discipline while remaining credible with practitioners and peers, and developing the concepts and practices which will inform future practice communities.

1. Laroche, H. (1995), From Decision To Action In Organizations: Decision-Making As Social Representation, *Organization Science* 6 (1), pp. 63 - 75.
2. Sylvester G., (1997), *Developing Research in New Zealand Polytechnics: A Sector in Change*, Australian and New Zealand Journal of Vocational Education Research, May, Vol 5:1, pp 109 - 130
3. Davis G., Gorgone T, Couger J, Feinstein D, Longenecker H, (1997), IS'97 Model Curriculum Guidelines for Undergraduate Programs in Information Systems, *The DATABASE for Advances in Information Systems* 28;1 pp. 1- 94
4. Denning, P., Comer, D., Gries, D., Mulder, M., Tucker, A.,Turner, A., and Young, P., (1989), Computing as a Discipline, *Communications of the ACM*, January pp. 9-23
5. Denning, P., (1999), Computing the Profession, *Proceedings of the 30th SIGCSE Technical Symposium on Computer Science Education*, ACM, pp. 1-2