THE GLOBAL EDUCATIONAL SYSTEM: A PERSPECTIVE ON THE STRATEGIES USED IN CURRICULUM CHANGE IN A NEW SCHOOL

Alan McPhail[1], Michele Scoufis[2], Steven J.Riley[3]

Abstract — *The globalisation of education is forcing the acceptance of the fact that students can participate in the learning process across a range of institutions and a range of programs. On 1st January 2001 a restructured University of Western Sydney became effective. The new School of Engineering and Industrial Design has been formed from four groups which were previously separate – civil and environmental engineering, computer, electrical and mechatronic engineering, industrial design and physics. This paper presents details on the how the School at the University of Western Sydney is addressing this change in the accessibility of education. The processes involved in the facilitation of change, the development of new courses and the achievement of increased efficiency in delivery in the School are presented.*

Index Terms ¾ Global education, curriculum change, accreditation, restructure.

INTRODUCTION

The University of Western Sydney (UWS) is Australia's sixth largest University, with a student population of over 27,000. The University is located in the western suburbs of the Sydney Metropolitan Area and operates from 7 campuses, 6 of which are undergraduate teaching campuses and one an innovation precinct. The University offers a wide range of disciplines at undergraduate and postgraduate levels.

Recently the University restructured, moving from a federation of three members (Nepean, Hawkesbury and Macarthur) to a unified system [1]. As part of the process of this administrative change the teaching units (which included schools, faculties, and departments) were reorganised into Schools and Colleges. Departments and Faculties no longer exist at UWS. The University now has 22 schools and 4 Colleges.

An aspect of the restructuring was the recognition that UWS was not only linked to its region, Western Sydney, but is also part of the global educational system and can not stand alone nor apart from this global system. The University recognised that future development in all aspects of the core business of knowledge development and dissemination depend on developing these global links. Not to do so would marginalise the University and relegate it to the role of a small player in the National educational system, effectively providing a service to its region in competition with more globally oriented Universities.

Against this backdrop of the need to think globally is the issue of what constitutes a University in the 21st Century. The emergence of private Universities, company-sponsored Universities [2], the flexibility of delivery afforded by the Web, the change in workplace demands, and varying perspectives on the educational background of employees has forced a rethink of the nature of the modern University. It is highly likely that the core business of knowledge development and dissemination will define a University of the future, but the physical and collegial nature will probably change significantly. Cloistered halls, large libraries and academic processions are being replaced by computer-controlled data relay stations, web accessible library collections, and posted testamurs. There will be room in the educational industry for all forms of Universities, and many of today's Universities are likely to become hybrids, or maybe the better expression is poly-morphs, exhibiting a range of forms depending on the student's (client's for some) needs [3].

The University of Western Sydney is undergoing change. To predict exactly what it will look like in 20 years time is not possible, but it is more likely to be a poly-morph rather than an institution with a fixed and unique structure.

THE NEW SCHOOL'S DISCIPLINE STRUCTURE

One of the four colleges in the new UWS is the College of Science, Technology and Environment. This college comprises four schools;

Science Food and Horticulture,
Agriculture and Environment,
Computer and Information Technology, and
Engineering and Industrial Design.

[1] Alan McPhail, School of Engineering and Industrial Design, University of Western Sydney, Locked Bag 1797, Penrith South DC, NSW 1797, Australia a.mcphail@uws.edu.au
[2] Michele Scoufis, Educational Development Centre, University of Western Sydney, Locked Bag 1797, Penrith South DC, NSW 1797, Australia m.scoufisl@uws.edu.au
[3] Steven R. Riley, School of Engineering and Industrial Design, University of Western Sydney, Locked Bag 1797, Penrith South DC, NSW 1797, Australia s.riley@uws.edu.au

There is some overlap between each of the schools – no discipline is without transitional boundaries into other disciplines. For example, Engineering involves a substantive component of computing in its teaching programs, especially in Mechatronics, Telecommunications, Electrical and Computer Engineering.

The School of Engineering and Industrial Design comprises the disciplines of Engineering, Industrial Design and Physics. This is not an unusual combination nor unexpected. One of the strengths of the School is the association of the disciplines around the themes of design, materials science and systems.

Embedded within the school are the directors and key staff of two of the University's 12 Key Research Centres. These research centres, while not directly linked to the school in terms of support and management (they report to the Dean of the College), are nevertheless integral to the school in that they provide foci for research and research support. The school also has a number of research groups that are developing their research profiles. These groups may become components of existing centres or may develop their own centres.

It should be noted that recent research has suggested that the link between teaching and research is not a strong one, contrary to popular belief [4]. Good researchers are not necessarily good teachers and academic units with poor research records may be excellent centres of teaching. There can never be a full separation of teaching and research because for some of our undergraduate students there is a pathway to research through their association with research-active teaching staff. As long as undergraduates experience the dynamics of the research active staff there is no need to force a link between teaching and research.

THE IMPERATIVE FOR CHANGE

The imperative for change in the University and in our School is financial as well as academic. The new structure of the school has forced a re-think on how the school will present its teaching program. The financial stringencies that the school and the University face (which are common throughout the whole world) have resulted in the need to be more efficient and focused in our mission.

When the new school first examined its teaching program at the end of 2000 it was clear that the ratio of subjects (now called units) to teaching staff of 8 to 1 was unsustainable. Furthermore, there were a number of subjects with small numbers of students, reflecting more the desire of staff to teach their specialty areas rather than student demand. The school set the dual objectives of less than 4 units per staff member (on average) and more than 20 students in each unit.

There was considerable discussion about these two objectives. There are still a number of academic staff who believe that the mission of the university centres around the skills of its academic staff and that they should be allowed freedom to teach their specialty areas. Unfortunately, if you don't have the money then you cannot teach what you like. As in most planning exercises compromises were presented. The directions of the teaching programs take account of the expertise of the academic staff as much as possible.

THE EDUCATIONAL PHILOSOPHY

In the new structure for the University the courses are the responsibility of the Board of Studies of the relevant college. While the primary responsibility of Schools at UWS is units (subjects) they are still major contributors to the shaping of courses, particularly for those schools where the courses are accredited, as in the case of the School of Engineering and Industrial Design.

The School's philosophy and response to the need to rationalise was to open the structure of its core courses as much as possible. This would provide a wider experience for students. Students would interact with more staff drawn from a wide range of expertise and professional practice. We have introduced a near common first year program with common units at subsequent years.

The programs were also developed within a Quality Assurance (QA) structure built around ISO9000 protocols. There has been considerable debate in Australia about the quality of tertiary education [5][6] and Universities are seeking means of assuring the quality of their programs. We are obliged within our professional accredited courses to meet quality assurance standards that will be robust within externally-driven audits. For engineering we must meet the standards of the Institution of Engineers Australia, a signatory of the Washington Accord. The school wants to have verifiable Quality Management Systems, as it means that we can demonstrate in a verifiable and independent manner the quality of our courses. QA is critical if courses are to be marketed in the international arena. As explained below, it also assists in developing programs of collaborative degrees with other Universities.

For engineering in particular, but for all our courses, we seek to meet the objectives recently outlined by the Institution of Engineers Australia, the British review of Engineering and the American Society of Civil Engineers. The Institution of Engineers Australia's (IEAust) review of Engineering Education (Changing the Culture, Engineering Education into the Future, 1996) clearly states that

> "Engineering Education must become more outward looking, more attuned to the real concerns of communities. Courses should promote environmental, economic and global awareness, problem solving ability, engagement with information technology, self-directed learning and life long learning, communication, management and team work skills…". [7]

Ethics is a large and vital part of our educational philosophy. Ethical behaviour is one of the generic competences we must demonstrate in our graduates. Our graduates will occupy positions of significance in the workplace. Civil Engineers must not compromise the standards of materials in construction, computer engineers should not be involved in hacking, industrial designers must develop products that do not harm society or the environment. These professions are significant areas of responsibility – people can die in large numbers if our graduates operate unethically in their chosen profession. The school has no illusions about its ability to influence the behaviour of its graduates, but at least it can point to the emphasis in its courses on assuring that students know and have engaged with issues of ethical practice and the consequences of unethical practices.

ACCREDITATION

Accreditation is critical for courses delivered by the School of Engineering and Industrial Design. The School and University cannot always assure the quality of the students that enter our courses. In fact, the University has a defacto "opportunity to succeed" policy (equity in access to education). However, we can and must control the quality of the graduate. This University, like most others, does not want to see bad news items that feature their graduates.

Our accrediting bodies exercise a significant role in both course design and quality assurance. The Institution of Engineers Australia undertakes regular reviews of courses, auditing the assessment material as well as the units and their contents, to ensure that there is an international standard. The school has adopted an international-based standard of quality assurance to ensure that the processes, record keeping, and checks on performance are both functioning and acceptable to any quality review process.

Our quality assurance process has to be "transportable" if we wish to engage with other Universities in collaborative degree programs. No individual University would want to loose control of the quality of the units and courses. To do so would put at risk the reputation of the University and the staff delivering the units. Hence, our quality assurance program is designed to be applied even in a collaborative environment. We also have to accept the QA that other Universities would want to apply to our units and courses in collaborative programs. Ultimately a global standard of QA in education programs is likely to develop as the collaborations between institutions blossom. Our view is that this will be biased towards professional accreditation procedures and internationally recognised standard systems, like ISO.

GLOBAL VIEWS ON EDUCATION

There is no doubt that education will become a global activity. Recently Massachusetts Institute of Technology (MIT) announced that it would put free to the web its course material. Other Universities are likely to follow suit. This is equivalent to making free to the whole world the text-books for courses. Students will be able to pick and chose units from different institutions around the world. The challenge will be the recognition of the mixture of units that students put together to make a degree. Just how flexible can a University be in the units that it recognises in its awards?

The next question is whether students will want to obtain an award. For some it may be sufficient to receive official recognition that they have completed a series of coherent units even if those units together fail to meet the requirements of University regulations. In the professionally-oriented degrees the issue will become one of what is acceptable in order to practice the profession. Students may be able to take a number of units in computer architecture, but both the University and the professional accrediting body will probably not recognise such a limited set of units as acceptable for a professional engineering degree in computing. As outlined above, there are areas of competency such as ethics that must be included in such degrees if a competent professional is to be graduated

In technologically-oriented degrees there will always be the demand for access to laboratories for purposes of demonstration and training in the practicalities of the technology. It is unlikely, even with virtual laboratories, that the link between the infrastructure and the training will be broken for many years. This link limits the number of sites at which degrees can be delivered. However, variations in teaching programs will arise, for example there are already teaching programs where students come in from remote sites for intensive periods of practical training. Ultimately, the global pattern of technological training is likely to be a network of sites with the necessary infrastructure. These sites, or nodes, will be shared amongst Universities and will be the attractors to students into particular programs – they may well define which Institutions award degrees to the students.

QUALITY CONTROL – THE ESSENTIAL ELEMENT OF A GOOD PARTNERSHIP

The quality assurance program involves the following:

1. review by course advisory panel composed of practitioners in the discipline areas
2. reviews of individual units and the course as whole by academics of international standing
3. student assessments of the units
4. recent graduate reviews of the course as a whole
5. review of graduate skills and competencies by employers of recent graduates
6. reviews of staff qualification and professional development programs
7. benchmarking of marking scales for assessment components against those at other universities
8. maintenance of web-accessible records on the progress of the QA process
9. maintenance of files on assessment materials and other QA files for auditing processes, with a five-year archiving cycle.

The feedback from employers and ex-students can be used in public relation exercises, with appropriate permissions.

An important aspect of the QA processes is the feedback into the unit and course development processes. It is one thing to understand that there is a problem needing correction. It is another to ensure that the corrections are made and that the impact of the correction processes is as intended. The Course Advisory Committee and the Board of Studies of the College have the responsibilities for ensuring that the feedback is acted upon.

PROCESS OF IMPLEMENTING THE DEGREES

The school did not start with a "fresh slate" in developing its new degree programs. It already had most of the degrees in place. However, the University wanted us to achieve two prime objectives:

a. reduce the number of units taught in order to reduce workloads on staff and improve the efficiency of the teaching program
b. decrease the number of stand-along courses.

The two objectives could not be achieved as separate exercises. The policy that was adopted was to embed "key areas" in the core degrees. In engineering this meant that we now have only one degree, the Bachelor of Engineering. However, it has a number of key areas: computing, telecommunications, electrical, mechatronics etc which have the near common first year program and from there develop their particular specialties. Amongst the key areas there is some common areas. For engineering these common key areas are:

1. Electrical, Computer and Telecommunications (3 key areas)
2. Civil, Building and Environmental (3 key areas)
3. Mechatronic and Design (2 key areas)
4. Management

Students receive a testamur which specifies the key area. The accreditation for the Engineering Degree with the Institution of Engineers is on the basis of each key area The degree is a vehicle for the presentation of these key areas.

For industrial design the objectives were achieved by embedding a three-year degree (Design and Technology) in a four year degree (Industrial Design). This allows students who wish to go into areas of High School Teaching in Design and Technology to complete the essential theory of the course while students who do the four year program undertake a major project which tests the industrial application of their skills.

We achieved the objectives of the University by adopting this approach, without compromising our accreditation.

Once the key areas were defined and the staff commitment to a near common first year was achieved, the subject matter of the new units and modified and new courses, benchmarked against the requirements of the accrediting bodies and the competency needs, was assessed. In some cases existing units were judged to be valuable and retained. In other cases the units were abandoned and new units created. There were situations in which new units were created from an amalgam of existing units.

The revised course structure comprises four subjects a session, each worth 10 Credit Points (320 credit points are required in a four year degree). The older programs had a mish-mash of credit points, ranging from 2 to 13. This created timetabling, workload, examination and articulation problems, adding to the stress of both staff and students.

In general the reaction of staff was positive. The economic and efficiency arguments were powerful persuaders and were "put on the table" at the very beginning of discussion, in the context of achieving good educational outcomes for the students in professional programs that would be accredited and of which we would be proud.

The major objections raised to change were:

a. Programs were established and there would be destabilisation of students and staff if they were changed.
b. Fear of loss of accreditation

c. Loss of "personal and favourite units" aligned with the specialties of staff
d. A standard 4 subject session was poor educational method and reduced student choice
e. Loss of control on a number of units that had a "value" and could be used in arguments of staff workloads in the school
f. Implementation of the new programs
g. Inability to define a common first year program and discipline-based protection of particular degree programs.

Each of these objections was discussed. The school formed a group responsible for the changes. This group reported back to their discipline areas and through this process involved the whole school in the process of change.

Complicating the process was the fact that a small group of engineers had elected to join another school. After much debate they rejoined Engineering and Industrial Design, but towards the end of the process of developing the new courses. Hence, they had a lesser input into the change process than the majority of the school.

a. Programs were established and there would be destabilisation of students and staff if they were changed.

This objection was countered with the argument that one of the areas of engineering, Civil, Environmental and Building had three years previously gone through a process of rationalisation of units and development of a common first year. This had been very successful, had reduced staff workloads and students programs of study were not interrupted despite the fact that students in all years were, at one time, switched into the new program. The evidence of the success of the previous change convinced the majority of staff that it would work and there would be little, if any, destabilisation of programs.

b. Fear of loss of accreditation

This objection was countered by the fact that we had to comply with the professional accrediting body guidelines and as long as we stayed within these guidelines there would be no compromising of the accreditation. The school's engineering programs will be reviewed by the Institution of Engineers Australia at the beginning of 2002, the first year of the changes. Any problems with the new programs will thus be identified very early.

c. Loss of "personal and favourite units" aligned with the specialties of staff

In the end most staff accepted that we cannot teach "everything". The school has to concentrate on those areas that are aligned to the programs and within the limits of our available infrastructure. There was a University approved program in B Eng (Biomedical) but it was new and the cost of providing infrastructure for it led all concerned to agree that it could not be delivered until such time as substantially more funding was provided to the school.

d. A standard 4 subject session was poor educational method and reduced student choice

This argument was counted with the practice adopted across the whole of the University, which had moved to 4 unit sessions some years ago. The delivery of a variety of programs in a range of disciplines had not been compromised by this model. Engineering was unlikely to be an exception.

e. Loss of control on a number of units that had a "value" and could be used in arguments of staff workloads in the school

The Head of School has the view that the teaching load of the school is a school-based activity and no-one in the school gains from teaching units with larger student cohorts than other staff have. The school provides additional teaching support (demonstrators and tutors) for units with large classes, so the workloads with large classes do not increase linearly with the class size. In addition, all units contribute to the teaching program, and the person who teaches core units with smaller numbers of students is making as significant a contribution as those teaching units with large class sizes. If the core units are not taught then the courses cannot run. In summary, the view is one of a collegial approach to teaching, not a number of individual academic staff "doing their own thing".

f. Implementation of the new programs

The change over in the Civil, Environmental and Building program three years earlier had demonstrated the success of the change-over process.

g. Inability to define a common first year program and discipline-based protection of particular degree programs.

This involved a considerable amount of negotiation and in the end some key areas in engineering had one or two subjects not common in the first year program. Allowance was made for one subject, that which defined the introduction to the Key area of teaching, but this was not enough for some people. This issue will be revisited in two years, by which time it will also be possible to judge whether the commonality can be moved to the second year of the programs.

CONCLUSION

The School of Engineering and Industrial Design, as a result of the restructuring of the University of Western Sydney, has developed a number of new programs that are incorporated into a quality assurance program. The courses within the School are accredited and this has imposed strict guidelines on the QA of the programs.

REFERENCES

[1] Reid, J., *Shape of the future*. University of Western Sydney, Office of the Vice Chancellor, 1999.

[2] MacDonalds Hamburger University, http://www.media.mcdonalds.com/secured/company/training/

[3] Inayatullah, S and Gidley, J. (eds) . *The university in transformation : global perspectives on the futures of the university*, Bergin & Garvey, Westport, 2000, 270pp.

[4] Marsh, personal communication, 2001

[5] Message of Minister of Education: http://www.autc.gov.au/ba/ba_mi.htm

[6] Australian Universities Teaching Committee http://www.autc.gov.au/ba/ba_hi.htm

[7] The Institution of Engineers Australia's (IEAust), *Changing the Culture, Engineering Education into the Future*. Canberra, Australia, 1996, p7.