



## The Engineering 'Hubs and Spokes' project: Institutional cooperation in educational design and delivery

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The emergence of blended course techniques that embrace a combination of face-to-face and online learning environments offers a raft of opportunity for flexibility in education. While much writing has focused on the opportunities for flexibility for the students and teachers, this paper focuses on the opportunities for effective sharing of expertise and effort between institutions.

The Engineering 'Hubs and Spokes' project is a collaboration between The Australian National University and the University of South Australia. It draws on the strengths of each to improve the range and quality of educational opportunities for students. Two components of the project are underpinned by blended courses: sharing of courses at the advanced undergraduate level; and development of an integrated graduate development program.

We describe choices made, benefits identified, and the challenges encountered in the early stages of the project. We discuss recommendations for the future of cooperation in educational design and delivery, and comment on the opportunities that arise for structural reform of the higher education sector.

**Keywords:** cross-institutional cooperation, blended learning, collaboration

### Introduction

Australia is confronting an engineering skills crisis. Demand for graduate engineers across all disciplines within Australia and internationally is at an all time high with no sign of slowing. The emphasis on technological solutions to climate change places demand on appropriately trained engineers, yet more engineers are leaving the workforce than joining (Galloway, 2007).

Australian universities offer engineering programs over many specialisations. In many cases the area of specialisation is appropriate to local and regional industry needs. However, competing priorities in research and education mean that individual institutions are often not able to provide the full range of specialist subjects they would like to offer. Moreover, Australian undergraduate students tend not to travel interstate to study, so they have trouble accessing their desired education if specialisation in higher education means that the local university does not offer the subjects in which they are interested.

Postgraduate students employed in the engineering workforce have different mobility issues – while employers may support their pursuit of further study as part of their professional development agenda,

attendance at regular on-campus activities such as weekly lectures is difficult to coordinate with the demands of professional employment.

The Engineering Hubs and Spokes project is a joint venture between the Australian National University (ANU) and the University of South Australia (UniSA) that seeks to address the engineering skills crisis by institutional cooperation in educational offerings. The project allows ANU and UniSA to share courses that complement each others' existing programs to meet industry demands, and share facilities for local delivery. The project commenced in 2009, and pilot undergraduate courses were delivered in 2010.

In this paper we focus on the course sharing aspects of the project. We describe choices made, benefits identified, and the challenges encountered in the early stages of the project. We discuss recommendations for the future of cooperation in educational design and delivery, and comment on the opportunities that arise for structural reform of the higher education sector.

## **Methodology**

### **Selection of courses for sharing**

Eight undergraduate courses have been identified for sharing. The courses are third and fourth year courses, containing specialised material and generally smaller numbers of students than early year courses. In most cases, a version of the course was already being offered at one institution (referred to as the 'delivering institution'). Joint (re-)development and delivery of these courses allows us to provide a broader choice to students at the alternate institution (the 'receiving institution'). Students are able to access domain experts who are not locally available, without expensive duplication of effort at their home university.

Sharing blended courses has allowed the ANU to introduce a new Major in Manufacturing and Management within the Bachelor of Engineering Degree from 2011. This major relies on three manufacturing courses from UniSA. It is also anticipated that the ANU will offer a new Major in Sustainability, which relies on one course from UniSA and a new ANU course being developed as part of this project. At the UniSA, ANU sourced courses offered in blended mode strengthen the Sustainable Systems, Renewable Energy and Optical Engineering streams within the Bachelor of Engineering.

In addition, the project has enabled both institutions to offer a new Master of Engineering Practice (MEP) from 2011. This new employer-sponsored program aims to develop the professional capabilities of engineers and managers within the context of their organisations. By drawing on the respective strengths of the two institutions, the MEP is able to offer specialisations in engineering systems management, defence systems, sustainability, and solar energy, without wasteful duplication of courses already offered in other programs.

### **Blended course mode**

A blended face-to-face and online delivery style has been employed to facilitate the sharing of courses. Courses run over a number of weeks and students are supported using a combination of face-to-face learning experiences, online content delivery, mediated online discussions and e-learning techniques.

Different approaches have been deemed appropriate to undergraduate and postgraduate courses. In general, undergraduate courses will be run within the standard semester format at each institution, with weekly on-campus learning activities such as tutorials and practical laboratories. The weekly meetings are considered necessary to build the learning community for undergraduate students. On the other hand, the face-to-face components of MEP courses generally take the form of an intensive workshop towards the beginning to the course delivery period. This format suits professionals who find it easier to timetable and resource absences from work for a day or two in a six month period, rather than commit to a few hours each week. Moreover, short intensive sessions minimise students' travelling time and costs.

One of the first courses offered under this project is the final year undergraduate 'Solar Energy Technologies'. This course has been offered at the ANU for many years, but was extensively redeveloped in 2010 for the Hubs and Spokes project. The course is structured around four types of learning activities: online interactive Lectures; online Quizzes; face-to-face Tutorials and Exercises replicated at each institution; and a Group Project that incorporates students from both institutions into cross institutional groups (Blackmore & Kane, 2010).

## **Cooperation in course design**

The course re-design process is undertaken by a course development team, including the lead academic from the delivering institution, a course co-convenor from the receiving institution, and educational developer(s). Additional academic staff (post docs and PhD students) contributed course components within the overall design, such as Exercises and recorded lectures. The high level of contribution from researchers is characteristic of the ANU's "research-led teaching" ethos.

The course redevelopment process commenced with a face-to-face workshop, and continued via weekly synchronous online meetings. It was found that these meetings enabled highly effective collaboration, and facilitated agreement on course design decisions.

Both the ANU and UniSA have recently adopted the same learning management system (LMS), so our collaboration was facilitated by a common level of familiarity with the Moodle environment. An EDNA group site was set up for the Engineering Hubs and Spokes project, and in the early stages of course development this was used effectively to share documents about the course design and development. Later, as the active course site in the LMS was developed, collaboration tools were created in staff-only sections of the LMS.

## **Cooperation in course delivery**

Throughout the semester, the teaching team was essentially the same as the course development team, with some researchers who created course resources dropping out, and additional tutors brought in. It was found helpful for the educational developer from the delivering institution to maintain an overseeing role while the teaching staff adjusted to the new delivery techniques. Weekly (synchronous, online) team meetings focused on planning and reporting on the weekly face-to-face sessions, allowing the tutors to provide an equivalent learning experience across the two institutions. Lesson plans for tutorials and labs were collaboratively constructed. The course convenor at the delivering institution was responsible to oversee all marking, with the co-convenor at the receiving institution was responsible for moderation.

Two alternatives were identified for enrolment in the courses – cross institutional enrolment and creation of shell courses at the receiving institution. For students, the two options raise different expectations about the degree of integration of the course into their program. For institutions, the two options have significantly different implications for funding. It was decided that the weight of the decision must rest on the students' perceptions, and a shell course mechanism was most suitable for undergraduate courses (and core Masters' courses), since students receive local academic support and attend local face-to-face learning activities.

Course materials and online activities and communication are made available to students via a course website in the LMS of the delivering institution. Since students are enrolled in a shell course at their home institution, and not at the delivering institution, we created new paperwork and procedures to give students access to the LMS. We also replicated resources such as e-readings and course feedback, as receiving students did not have full online access to these at the delivering institution. Shell LMS sites were created at the receiving institution, which link to the course site in the delivering institution and give students additional information relevant only to 'away' students.

## **Reflections on the experience**

### **Benefits**

The primary benefit of this course-sharing project is that students have access to wider range of subjects, but students enjoy a number of other benefits. In particular, the blended mode combines the benefits of face-to-face interaction and online learning (Garrison & Kanuka, 2004). Integrated use of online collaboration tools, particularly formation of cross-institutional study groups and project groups gives students experience in distance communication skills which are becoming increasingly important in the professional working environment of engineers.

Students also benefit from the increased networking opportunities, with both students and teaching staff at the 'away' institution. In particular, students interested in a research career are able to access a wider range of research experts, with potential for them to find their niche in a project at the 'away' institution.

The course-sharing projects have also had benefits for staff, including cross-institutional networking and professional development in educational design and delivery to support discipline-experts as they embraced new teaching and learning technologies and practices.

## **Issues**

A number of practical issues have arisen in the course of the design and delivery of the pilot courses. Interim solutions were found, but further work needs to be done to devise robust long term solutions.

The complication of having two institutions involved has imposed a requirement to begin course development well before the course is to be delivered (four months or so), and ensure all materials are ready prior to the beginning of the course. Regular cross-institutional communication throughout the course delivery is necessary.

Differences in the academic calendar and timetables of the two institutions must be accounted for. The 13 week semesters at the two institutions are offset by a week, and the teaching break is also offset. Consequently we have compacted the standard 13 week course structure into the common 11 weeks, including one week of material to be covered by students at some time during the three weeks that covers the two teaching breaks. The half hour time difference between Canberra and Adelaide increases the difficulty of scheduling synchronous meetings. We have elected to minimise cross-institutional synchronous meetings for students to avoid the difficulties of interacting with two timetabling systems.

The Assessment practices of the two institutions also required consideration. Course work was assessed by local tutors, so that feedback could be provided face to face, and moderated during weekly tutor meetings. Examinations by the delivering institution were re-formatted by the receiving university into the local format to reduce confusion to students. The grading system also differed between institutions, e.g. a score of 82 is a Distinction at one institution and a High Distinction at the other. This has yet to be resolved.

Current government regulations discourage collaboration in course delivery. HECS funding goes to a single institution and quotas govern undergraduate enrolments. Course development costs have been covered by project funds, but we have not yet resolved how to account for delivery costs. All income goes to the student's home institution, whereas the majority, but not all, of the work is done by the delivering institution.

## **Evidence of success**

Two pilot courses have run so far, one from each institution, with 15 'away' students enrolled in each, plus higher numbers of 'home' institution students. Student feedback was gathered throughout the course and at the end of semester through online quizzes. In general responses were favourable. Students at both institutions particularly liked the convenience of viewing lectures online, the flexibility to choose when to study, being able to pause and replay lecture material, and the logically arranged and detailed, practically-oriented content.

While teaching staff were initially cautious about the new course design, particularly the effort of creating the online content resources, and the reduced face-to-face contact with students, they are now more positive. A number of new staff are interested in exploring new blended course projects, so the pilot courses have been successful in promoting the idea of blended courses as a teaching and learning approach within each institution.

The collaborators have developed effective mechanisms to work cross-institutionally to quickly resolve issues related to sharing blended courses. Strategic face to face meetings, regular online communication and the inclusion of project managers and administrative staff in the team have greatly assisted in the establishment of agreed shared course practices and processes that can be applied to the development of new shared courses.

## **Recommendations**

Institutional cooperation in course design and delivery offers considerable scope for structural adjustment in higher education, allowing institutions to specialise and share rather than compete. The success of our model for sharing relies on the perception that the quality of the shared course is as good as, or better than, the single-institution alternative.

Significant reduction of face-to-face contact, and meeting with a tutor rather than the (possibly remote) course-convenor, places greatly increased emphasis on the quality of each face-to-face meeting. Tutorials need to be highly interactive and engaging. Formal lesson plans need to be devised and executed. The course convenor must take on increased responsibility for the standard of delivery by the tutor. The institution must place increased emphasis for professional development of the tutor.

In addition, the course convenor or tutors must become skilled in creating a functional online community of practice among students. These are new skills to be learned beyond the traditional lecture style that many staff experienced when they were students (Phillips, 2005) Students also must be taught collaboration skills explicitly and any online collaboration tools must be integrated into the course from the beginning to ensure students are not hindered from interacting within their learning in these new environments. The institution must provide training for staff and students in these new collaboration tools and practices (Stacey & Gerbic, 2008).

For the two institutions, cooperation in delivering blended courses offers many benefits to both students and staff, and holds the potential for cost savings. There is considerable educational incentive to share courses in this way. However there are also significant administrative and regulative hurdles that need to be addressed by institutions and government, to do with timetabling and academic calendars, moderation and standards, to name a few. Fair funding arrangements must account for the work of the convenor, co-convenor and tutors, administration at both institutions, pastoral care and facilities provided to the student at the home institution, and marketing and student services, and so on. Resolving these issues will be crucial to ensuring that this three year project leads to genuine structural reform.

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