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LESSONS LEARNED FROM THREE PROJECTS TO DESIGN LEARNING ENVIRONMENTS THAT SUPPORT 'GENERIC' SKILL DEVELOPMENT

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Abstract

Efforts to ensure that graduates leave university with the skills needed for career wide lifelong learning have been the focus of much activity at universities both nationally and internationally for over a decade. In this paper, we describe three projects aimed at developing student skills as part of the discipline content in line with current theory and research. Projects required instructors to reflect on their current practice and, where necessary, to change learning environments from content to process oriented and from teacher to student centred, and to align learning outcomes, learning activities and assessment tasks. We describe each project and, using models of change management and the findings from investigations of teaching and learning innovations in Higher Education, identify the design features that supported or constrained each project's success. Based on the lessons learned from these three projects and those of others reported in the literature, we make recommendations for the design of projects that will have a good chance of success in creating effective learning environments that support skill development.

Keywords

'Generic' skill development, curriculum design, project implementation, change management

Context

Universities, in line with trends around the world, have for some time recognised the value that graduates, professional bodies and employers place on skills often referred to as 'generic' such as communication, problem-solving, critical thinking, information literacy and team-work (ACNielsen, 2000; McColl, 2003). Given the rapidly changing job market, which is characterised by new types of employment, increased globalisation, and new technologies, employers are seeking flexible, multiskilled employees willing and able to continue learning (Dunne, 1999). It is now common practice for universities to include in their strategic plans reference to the skills that graduates will develop during the course of their study and in some cases to provide lists and descriptors of the skills their students will develop as part of their study. Moreover, graduates and employers expect universities to develop these skills as part of gaining an education (ACNielsen, 2000; Rosenman, 1996).

Many staff and students understand the value of developing such skills. For example, in a study by Haigh and Kilmartin (1999), staff and students reported that they considered developing

careerbelated 'personal transferable skills' such as teamwork, communication and time management to be an important aspect of gaining a degree. Moreover, both staff and students agreed that it was worthwhile to include the development of these skills in their subjects. Indeed, Candy (2000, p. 276) argues that "[u]niversities have a distinctive and enduring educative role in the production of lifelong learners and of graduates capable of informed action".

If students are to leave university with skills needed for work and life, they need to develop them as part of their program of study. Current research and theory suggests that skills are best developed as part of regular discipline study and embedded into the curriculum rather than as *ad hoc*, stand alone, out of context, add on, and perhaps designated as 'remedial', courses (Hattie, Biggs & Purdie, 1996). The development of skills should permeate the whole curriculum to avoid the 'one-shot' or inoculation model of learning since knowledge is fundamentally situated, that is, it is a product of the activity, culture and context in which it is developed (Brown, Collins & Duguid, 1988). This approach recognizes the centrality of disciplinary culture and language, and ways of knowing and doing (Becher & Trowler, 2001; Donald, 2002). In fact, Haigh and Kilmartin (1999, p.2) state that "…it is very difficult to teach many such skills out of context" noting that 97% of third year Geography students and all the staff surveyed in their study agreed that skills should be taught as part of subject content. Similarly, Eilersten and Valdermo (2000, p. 97) assert that "…teaching [skills] in a non-contextual way and with no follow-up is futile".

Most Australian universities have identified fostering the development of generic skills or graduate attributes as a key institutional goal and have developed lists of attributes incorporating those that are both generic and discipline specific including in some cases for postgraduate students (Carroll, 2005; Chanock, 2004). A number of universities have initiated projects aimed at supporting the development of skills through changes to the curriculum.

Undertaking such projects usually requires considerable change to knowledge of skill development, and processes and practices at both individual and institutional levels. There is an extensive literature on change management that can inform such projects (see for example, Kotter, 1996; 2002; Wycoff, 2004). There have also been a number of reviews undertaken specifically looking at the effectiveness of dissemination and implementation of innovations in teaching and learning in Australia and overseas (McKenzie, Alexander, Harper & Anderson, 2005; Scott, 2003; 2004, July; Southwell, Gannaway, Orrell, Chalmers & Abraham, 2005).

Kotter (1996) proposes a model of change management for those responsible for leading change in organisations in the form of an eight stage process aimed at ensuring lasting change. The eight stages are: establishing a sense of urgency; creating the guiding team; developing a vision and strategy; communicating the change vision; empowering broad-based action; generating short-term wins; consolidating gains and producing more change; and anchoring new approaches in the culture. More recently, Kotter & Cohen (2002) has emphasised the role of emotions that hinder or facilitate change within the model.

Wycoff (2004) focuses on why most initiatives do not succeed and outlines the ten main reasons for their failure. These include: not creating a culture that supports innovation: not getting buy-in and ownership; not having a widely understood system-wide process; not allocating resources; not tying projects to strategy; not spending time and energy on scoping the internal and external environment; not building sufficient diversity into the process; not developing criteria and metrics; not training and coaching innovation teams; and not having a system to capture and manage ideas.

McKenzie et al (2005) undertook a literature review on issues related to adopting, adapting, implementing and sustaining teaching and learning innovations and identified and analysed 14 successful innovations undertaken in Australia or internationally. Innovations were deemed successful if they had been successfully implemented beyond the original context. The innovations ranged from very large scale to small, individual projects. Based on their findings, the authors concluded that successful innovations were supported by: supportive and proactive leadership; people with capability in change management, staff development, project management, technical competence and student focused understanding of teaching and learning; events and other

processes for sharing ideas and making contact including professional and disciplinary and cross-disciplinary systems/associations/networks; perceptions that teaching, teaching innovation and the scholarship of teaching and learning are valued including through funding and recognition and reward; support and advice for adaptation and implementation including appropriate workloads, policies in place and appropriate technical infrastructure.

Southwell et al (2005) investigated the effectiveness of Australian and international learning and teaching grant schemes for achieving large-scale change. They undertook an extensive literature review and identified and analysed a number of Australian and international teaching and learning grant schemes. Based on their research, they identified five key conditions that were effective in disseminating project outcomes to bring about changes in practice in new contexts. The five conditions were: effective multi-level leadership and management; climate of readiness for change; availability of resources; comprehensive systems in institutions and funding bodies; and funding design that demands, encourages and supports risk-taking, change and dissemination.

Scott (2003; 2004, July) presents a number of lessons on effecting change drawn from research, action research projects and practical experience in a number of projects in Higher Education in Australia and internationally. The nine key change lessons that underpin change management and leadership in universities, are: more options for innovations are available than resources to address them; change is not an event but a learning/unlearning process for all; culture is a powerful influence on motivation; enhancements in learning programs generate a need for improvement in infrastructure and systems; successful change is a result of team effort and with most appropriate and best positioned people involved; change is a mix of external forces and individual action; the change process is cyclical not linear; viable ideas and solutions are outside as well inside the institution; and change must be led.

An analysis of the two change management models and the findings of the three investigations in Higher Education outlined above, revealed similar factors that contributed to successful outcomes of projects aimed at bringing about change. Using Kotter's eight stage model as the organising framework, the factors from the other studies were aligned to those of Kotter. In addition, Wycoff's ten reasons for failure were converted into positive statements that support innovation to align them with the way the statements were presented in the other studies (see Table 1).

Table 1 Matrix of factors identified as central to effective change activities

Kotter (8 stages of successful change)	**Wycoff (10 innovation supports)**	**McKenzie et al (5 Institutional factors that facilitate project success)**	**Southwell et al (5 conditions for effective project success)**	**Scott (9 key change lessons)**
Establishing a sense of urgency				Change is a mix of external forces and individual action
Building the guiding team	Getting buy-in and ownership from business unit managers Building sufficient diversity into the process	Supportive and proactive leadership People with capability in change management, staff development, project management, technical competence and student focused understanding of teaching and learning	Effective multi level leadership and management	Successful change is a result of team effort and with most appropriate and best positioned people involved Change must be led
Getting the vision right	Tying projects to company strategy Spending time and energy on scoping the internal and external environments Developing criteria and metrics in advance		Funding design that demands, encourages and supports risk taking, change and dissemination	More options for innovations are available than resources to address them Viable ideas and solutions are outside as well as inside

Communicating for buy-in	Having a widely understood system wide process Having a system to capture and manage ideas	Events and other processes for sharing ideas and making contact including professional and disciplinary and cross-disciplinary systems/ associations/ networks		
Empowering action	Allocating resources to the process Training and coaching innovation teams	Perceptions that teaching, teaching innovation and scholarship of teaching and learning (SoTL) are valued including through funding and recognition and reward Support and advice for adaptation and implementation including appropriate workloads, policies in place and appropriate technical infrastructure	Comprehensive systems in institutions and funding bodies in place Availability of resources	Enhancements in learning programs generate a need for improvement in infrastructure and systems
Generating short term wins				
Consolidating gains and producing more change				Change is not an event but a learning/unlearning process for all Change process cyclical not linear
Anchoring new approaches in the culture	Creating a culture that supports innovation		Climate of readiness for change	Culture is a powerful influence on motivation

As Table 1 shows, there is a high degree of consistency across most of the factors that have been identified as central to successful change and innovation. Only one factor – generating short terms wins – appears only in Kotter's model.

In the sections below, each of the projects aimed at supporting the development of skills, namely Scientific Communication in Physics, Professional Skills in Business, and Capability-driven Curriculum is described, and using the matrix of factors as outlined above, the design features that supported or constrained each project's success are identified.

The three projects varied in scale from a single course, to a degree program with multiple majors, to all programs across a whole university. They ranged from individual instructor led and initiated in Physics, through a faculty wide initiative in Business, to a whole of institution approach to curriculum change across a broad range of disciplines. All three projects took place at large multi-campus, universities of technology with strong vocational orientations, the first two took place in one institution and the third, in another. The two institutions involved have heterogenous student populations from diverse cultural and language backgrounds including large numbers of international students. Their mix of disciplines is similar and includes Sciences, Business, Humanities, Design and Engineering, and they offer programs from undergraduate bachelor to postgraduate doctoral levels. All three projects involved instructors identifying the skills important for their discipline and integrating these into regular teaching through changes to subject content, teaching, learning and assessment.

Scientific Communication in Physics project

An instructor teaching in a Department of Applied Physics, in response to personal reflection and student feedback, decided to revise a semester-long physics course, Scientific Communication. The course was a core undergraduate course for first and second year science students and had an enrolment of approximately 30-35 students. Student feedback suggested that the course lacked relevance and was not effective in developing their communication skills. In order to make the course more effective as a means of developing students' communication skills in the context of Physics and to include a range of skills important to future physicists, the course was transformed into one in which students organised a one-day physics conference at which they each presented a paper. In designing the new course, the instructor worked with two educational designers whose

role included advice on the curriculum design, support for implementation of the course including development of learning activities and resource materials, session facilitation, student assessment and course evaluation.

The course focused on designing a learning environment in which students were helped to develop skills such as collecting, analysing and organising information; communicating ideas; planning and organising activities; working with others and in teams; solving problems; and using technology effectively (Zadnik, de la Harpe & Radloff, 1998; Zadnik & Radloff, 1995). The conference format was selected because it gave students an opportunity to be involved in an 'authentic' learning activity relevant to their career aspirations; allowed them to research and write about a physics topic that they found personally interesting; encouraged active student engagement in learning and ownership of and responsibility for, their own learning; and provided a vehicle for students to develop a range of skills.

The course comprised weekly classes consisting of a two-hour instructor led seminar and a one-hour student-led group meeting. The seminar included activities such as short presentations, discussions and guest speakers on topics about writing a conference paper, preparing an oral presentation and working effectively in groups. Student-led group meetings focused on activities related to the conference including establishing committees responsible for publicity, catering, finance, publication, etc. and the process for reviewing papers, practising presentations and supporting one another. Students decided on the conference theme, logo, keynote speaker, and format of proceedings. Each student chose a topic to present, researched it, wrote the paper, had it peer reviewed, revised it in response to feedback and presented it at the conference. Students were assessed on oral and writing skills and on their contribution to committees (Radloff, de la Harpe & Zadnik, 1998). Student feedback was positive and showed that the majority of students believed that the course had helped them develop relevant skills and that they valued the opportunity to take ownership of the course and their learning (Radloff, 1994).

The Scientific Communications course ran for three years as a core course as described above under the co-ordination of the instructor. Due to program changes, which resulted in the need to reduce the number of core courses, the course became an elective. The course continued as an elective for six years with various modifications such as the introduction of poster presentations and web based conference proceedings. Finally, the program was revised to include a common first year across the sciences based on large class instructional model and it was considered that the Scientific Communications course could not be run in this model.

The design features (as outlined in Table 1 above) that supported this project's effectiveness included:

- a **strong sense of urgency** driven by the instructor's desire to respond to the student feedback that the course was not relevant or effective in developing their communication skills;
- the **building of a guiding team** through the instructor taking leadership of the project, seeking advice and input from colleagues with strong educational and curriculum experience and expertise and initiating a team-teaching approach with them, and getting support from the Head of School for the innovation;
- **getting the vision right** through responding to the debate around skills needed by scientists, specifically communication skills, and selecting an innovative learner-centred approach to the project;
- **empowering action** by sourcing help and resources to run the student conference and capitalising on the Head of School's interest in and support for, educational innovation;
- **generating short term wins** through positive feedback from students, increased enrolments in the course and recognition by peers within and outside the institution; and
- **consolidating gains and producing change** through ongoing refinement of the course and ensuring it was available to students for nine years.

The design features that constrained the project's ongoing sustainability included:

- lack of attention to **communicating for buy-in** by focusing at the individual course level rather than attempting to involve other staff from the discipline and to instigate systemic change across the program and school; and
- difficulty with **anchoring the new approach in the culture** in that there was not a critical mass of staff involved in the initiative to maintain the innovation when a common first year was introduced across all science programs and when the instructor moved to another position and was no longer directly involved in its teaching**.**

Professional Skills in Business project

The then acting Dean of the Business School commissioned a project aimed at ensuring graduates from the three year Bachelor of Commerce degree developed skills that employers valued. The degree involves a single or double major offered across six schools, namely Accounting, Business Law, Economics, Information Systems, Management and Marketing.

The project was initiated in response to feedback from employers and graduates and involved identification and embedding of skills into the BCom degree. It was designed in line with the literature on skill development and based on educational principles that have been shown to lead to effective student learning and improved transfer of learning to new contexts. These included an emphasis on learners as informed, active and self-directed partners in learning; curriculum that is developmental, integrated and relevant; instruction that is in context, collaborative and promotes reflection; and assessment that is formative, constructive and authentic. In addition, the development of a Professional Skills Portfolio was included in the design to develop, assess, document and showcase students' professional skill development over the three year undergraduate program. The Portfolio was included to help students become more aware of themselves as lifelong learners; to identify key skills relevant to their discipline and to their professional goals; to document development of these skills over the course of their study; to plan for continuous improvement of their skills; to reflect on their skill development; and to showcase their achievements for employment purposes.

The project was an ambitious one, which was planned eventually to involve over 5,500 undergraduate students and approximately 200 full time academic staff, and numerous sessional staff teaching in the undergraduate program. The project design included a phased approach to implementation across the three years of the degree. The acting Dean appointed a senior Business School staff member as project director and another with expertise in teaching and learning as a project champion to work with an educational developer to implement the project.

The project began with the identification of the skills relevant to business graduates. This was done through a task force that met regularly over eight months with input from the subject areas, research literature and employers. The task force comprised representatives from each of the six schools, employers, students, the university centre responsible for educational support, and the library. Five skills were agreed, namely communication (including writing, presenting and speaking out), computer literacy, information literacy, team working and decision-making (CBS Professional Skills Task Force, 1999).

These skills were then integrated into the first year courses. First year co-ordinators met regularly and, assisted by the project champion and the educational developer, undertook to develop a plan for how professional skills would be integrated into their courses and how the Portfolio would be used as a learning tool and to demonstrate skill development; to produce a matrix showing in which core courses of each major, professional skills would be taught and assessed; to develop integrated discipline appropriate curriculum materials, instructional strategies and formative and summative assessment activities that were linked to the development of the Student Professional Skills Portfolios; and to participate in staff development and mentoring.

Course co-ordinators were asked to select from the skill set agreed by the task force the skill or skills that they believed were most suited to be integrated into their course and to ensure that the

skill or skills were included in a learning objective or objectives in the course. In line with Biggs (2003), co-ordinators were asked to ensure that the learning objective(s) and associated teaching and learning activities and assessment tasks were aligned. In addition, coordinators were asked to include an icon in the weekly program that indicated when the skill or skills would be taught and when they would be assessed. They were also asked to prepare marking guides that clearly explained the criteria by which the skill or skills would be assessed and the allocation of marks for both the skill and content components of each assessment task. Finally, they were asked to document skill development clearly enough for Course Committees of other courses to know what had been done.

In addition to the above work, a sub-group of the Professional Skills Task Force and the first year co-ordinators collaboratively developed a standard course outline template. This provided a framework for the curriculum changes and a standard way to communicate skill development to students. For coordinated integration of the skills over the degree and to ensure development of skills progressively over the degree, schools were asked to consider the skill requirements for their majors and to document these in a matrix, completion of which would show which skills were taught in each unit and across the whole program.

Resources were made available to support staff to undertake the integration of skills into their courses. These included staff time-release to work on the integration of skills and to make the necessary curriculum modifications, monitor the impact of the changes made, engage in professional development and document and disseminate their experiences. In addition, one-on-one support, a seminar series, discipline based meetings and access to teaching and learning resources specific to each skill was also provided to help and encourage staff undertake the task (de la Harpe & Radloff, 2000).

The request to integrate skills into subjects through changes to curriculum materials, teaching and learning activities and assessment tasks was met with mixed reactions from the course co-ordinators (de la Harpe, Radloff & Wyber, 2000). While there were examples of excellent curriculum change, a number of staff objected and refused to integrate skills into their courses. Objections centred on staff beliefs about their role as discipline experts, about who is responsible for skill development, and about the entry level of students, as illustrated by the quotes below.

> *"I don't know how to teach this. I'm an expert in X and can't be expected to teach anything else."*
> *"I shouldn't have to teach this – it should be taught in a specific skills unit."*
> *"If we had decent students in the first place, there would be no need to teach these skills."*

Staff who objected were supported in the main by their Head of School. At the same time a new Dean was appointed to lead the Business School.

The new Dean was supportive of the project and requested that it continue following revitalization. As part of the revitalization, the Business School Executive considered alternative models for a way forward. The Executive agreed that the project would move forward from the previous top down, centrally driven model to a combined school based and central one. This model involved each school determining, in collaboration with the project director, how it would integrate the agreed skills into its courses, which staff would be involved, who would be accountable and what quality assurance mechanisms would be used. Each Head was accountable for the project outcomes to the Dean through the Professional Skills Project Director. Shortly after this, the educational developer moved to another position and a year later, the Project Director retired.

The Australian Universities Quality Agency (AUQA) audit report for the university noted that the results of a university wide review in 2001 showed that the integration and alignment of skills in course outlines "…had been patchy, and depended rather on the enthusiasm (or otherwise) of individual staff" and that "momentum in this area appears to have been lost" (Australian Universities Quality Agency, 2002a, pp. 32-33).

The design features that supported this project's effectiveness included:

- **getting the vision right** through the project responding to the debate around skills needed for business graduates in line with employer feedback and ensuring that the project design was based on sound educational principles for developing professional skills in the context of the discipline;
- **communicating for buy-in** in phase one was exemplary and included the establishment of the task force to identify and agree to the skills relevant to the disciplines, engaging industry support through an official project launch, ongoing publicity in the form of widely distributed posters outlining the project and the professional skills to students, and creating a professional skills website; and
- **empowering action** by allocating extensive resources to the project, developing a unit guide template, recognising and rewarding staff participation in the project, and providing a funding scheme for research on skill development in the discipline and conference attendance to present findings.

The design features that constrained the project's ongoing sustainability included:

- lack of a **strong sense of urgency** within the institution other than through the then Dean;
- lack of a sustained **guiding team** in that the initial appointment of champions was strong but did not flow to the Heads and there was a lack of sustained leadership in the face of resistance and a change of Dean (who initiated the project) and project director early in the project;
- lack of **short term wins** in that initial negative reactions of some staff overshadowed positive responses from others and many staff failed to take up the professional development available;
- failure to **consolidate gains and produce change** despite an attempt to revitalise the initiative and reposition ownership and leadership of the project at school level by the incoming Dean; and
- difficulty with **anchoring the new approach in the culture** given the prevailing beliefs about responsibility for skill development and a teacher-centred, content focused approach to teaching and learning, as well as competing demands and priorities such as teaching offshore, consultancy work, research output and external accreditation demands.

Capability-based curriculum project

In 1995 a set of graduate attributes was incorporated into the university Teaching and Learning Strategy 1995-1997. The attributes included being knowledgeable, creative, critical, responsible, employable, lifelong learners and potential leaders.

Faculties were asked to incorporate these attributes into curricula and a number of university-initiated projects were undertaken to determine their applicability in selected programs. From 1997, as part of the Educational Quality Assurance system, new programs were required to demonstrate how these attributes were to be developed and assessed. A program renewal process for integrating graduate attributes into existing programs was developed.

More recently, the university has adopted a capability-driven approach to curriculum development that requires programs to ensure that they develop graduates who are able to act as professionals, reflect as citizens and learn from their experience. In line with university guidelines, new and renewed programs must develop their own graduate capability statements in consultation with the relevant industry. These must include, in addition to professional expertise, generic outcomes linked to vocational accreditation and targeted at meeting the needs of industry, professions, and individual student career wide and lifelong learning. Further, the capabilities need to be validated by employers and students.

Responsibility for developing capability curricula rests with a designated leader and the program development team who may seek assistance from relevant university committees and central groups. For each program, the development team is required to develop "a statement of graduate

capability outcomes for the program" and a capability matrix showing how the capabilities are to be developed within the courses that make up the program. The team also needs to produce a Reference Guide for each course that identifies the capabilities and suggests appropriate learning activities and assessment tasks for different modes and contexts in which the course will be offered, and a student course guide that includes information about the capabilities students are expected to develop in each course.

Support for development teams to undertake this work was initially provided by staff in a central Program Renewal group but is now provided by staff in portfolios (portfolios consist of groupings of up to eleven schools).

To date, a large number of programs have been renewed in line with a capability based curriculum approach. Achievement in embedding capabilities into the curriculum through program renewal has varied across the University. There are some examples of exemplary capability maps and curriculum innovation at the design and documentation stage. Much institutional effort is now being put into responding to new national imperatives such as the research quality framework and the need to ensure financial sustainability through reducing the number of programs and courses and simplifying program structures.

The design features that supported this project's effectiveness included:

- **getting the vision right** through responding to the call from industry and the professions for universities to produce graduates with skills for work and life and ensuring that the project design was based on sound educational principles around capability based curriculum development and aligning the project to the university vision and strategic plan, and its reputation for producing vocationally oriented graduates;
- **consolidating gains and producing change** through the leadership of the then Vice Chancellor who showed strong commitment to a capability approach and through refinement of the project to ensure its continuation despite changes in leadership; and
- **anchoring the new approach in the culture** through tying the project to university policies and approval procedures for program development and renewal, modifying course guides to incorporate capabilities, reporting regularly to council on progress and having clear accountabilities at program, school and Pro Vice Chancellor levels, and an ongoing focus on shifting to a student-centred approach to teaching and a commitment to responding to student feedback on teaching quality.

The design features that constrained the project's ongoing sustainability included:

- lack of a **strong sense of urgency** within the institution as a whole given its size despite strong messages from the then Vice Chancellor;
- lack of a **guiding team** with limited effort to gain ownership and leadership support at the School and faculty executive levels with a perception of a top down approach to the project;
- lack of initial co-ordinated **communication for buy-in** with project design accountabilities and timelines not clearly articulated and disseminated, resulting in a lack of shared understanding of the capability agenda and its aims;
- patchy efforts in **empowering action** including over ambitious project targets and timelines, lack of resources available to the project for implementation and staff development, including limited help for staff to develop an understanding of a capability based curriculum, the process for identifying graduate attributes and developing such curricula, and to change their conceptions of teaching and teaching practice, and lack of school and faculty budgets for staff time release and resource development; and
- limited **short term wins** in that reactions of many staff suggest that they perceive the process of developing capability based curricula as onerous, complex and compliance driven.

There were positive aspects to each of the projects described above. The Scientific Communication in Physics project was initiated and owned by the instructor who was committed to the continual development and improvement of the course; help to develop the course was

provided in context; the course was educationally sound, and collaborative and team taught; the value of developing skills and the importance for students' future careers was emphasised throughout the course; and there was early positive support from the leadership in the department. The Professional Skills project had strong leadership support from the beginning; had involvement of stakeholders; used a collegial approach to deciding on the skill set; and had resources allocated to the project, including generous provision of staff development and financial incentives to undertake research on skill development. The Capability based Curriculum project had leadership from the very top for the development of graduate capabilities; it was embedded in the institutional Teaching & Learning Strategy; and was linked to university program development and renewal processes and procedures.

The three projects also had aspects that constrained their sustainability. For the Scientific Communication in Physics project the main constraints were lack of focus on upscaling the project beyond the individual instructor, a lack of critical mass of support for the innovation and dependency on only the instructor as leader. In the case of the Professional Skills project, the main constraints were around lack of a widely perceived need for change, lack of sustained leadership, poor buy-in by staff, the need for major cultural change and staff movement. The Capability-based Curriculum project was constrained by a lack of ownership and shared understanding, limited resources, a lack of sustained leadership, competing demands on staff time and energy and staff movement.

The challenges the three projects have experienced in attempting to design learning environments that support skill development are not unique. Despite the effort and energy that has gone into skill development internationally and nationally, to date there has been at best only modest progress (Coaldrake & Steadman, 1998; de la Harpe & Radloff, 2003; Fallows & Steven, 2000).

These constraints are in line with findings from a number of studies aimed at designing and implementing skill development projects reported in the literature (Atlay, 2003; Auger, 1998; Crockett, 2003; Dunne, 1999; Fallows & Steven, 2000; Hopkins & McKeown, 2001). For example, Auger (1998) identified similar constraints in a project to integrate world of work skills into an agricultural degree program. Further, Hopkins and McKeown (2001, p. 243) reporting on integrating sustainability education across the curriculum, identified qualities that institutions should have for successful implementation, including the "…ability to make changes with the institution; experienced staff with the expertise to undertake changes; …an infrastructure for decision making; financial resources and sufficient control of the budget to allocate resources to the project".

Further, the role of conceptions of teaching and learning may also impact on successful implementation of skill development projects. The ability of staff to support skill development is predicated on them being able and willing to change their beliefs about teaching and learning and about themselves as teachers. Skill development requires a sophisticated understanding of student learning, and a student centred and process oriented approach to teaching. Kember (1998) points out that there is considerable evidence that changes in beliefs are extremely difficult to achieve even with extensive encouragement and support. Thus, it is not surprising that attempts to embed skills into the curriculum often create tension, dissonance and resistance**.**

In Australia, an analysis of twelve Australian Universities Quality Agency audit reports published in 2002 and 2003 suggests that Australian universities have more work to do in developing student generic skills. Although the majority have identified a set of skills that they want their graduates to develop, there was no evidence that any of the twelve universities has successfully implemented skills across their institution and, in many cases, there was evidence that it was at the implementation stage that most problems were encountered and projects stalled or were modified.

For example, auditors found that the University of Newcastle has a set of Core Skills, which "have not yet been developed in a way that will inculcate in students a set of valued skills…", that "many staff…were unaware of the University's Core Skills" and that "the university's experience with developing and embedding core skills is still in its embryonic stages, but that steps are being

taken to make progress in this area" (AUQA Audit Report, 2003d). At Southern Cross University, auditors noted "the relatively slow progress in relation to the work on Graduate Attributes" (AUQA Audit Report, 2003c) and at Macquarie University, they found that skills have not been embedded into courses and noted that they had "met some staff with teaching responsibilities who are either unaware of the Generic Skills, or if they are aware, do not know what to do with them" (AUQA Audit Report, 2003b). Even at The University of Queensland, which was commended for its efforts in mapping graduate attributes and the support provided by their staff development group for this work, the Audit Panel concluded that "there is still some way to go in the mapping, and it now requires further definition of the relevant learning activities" and that "to maintain staff commitment and achieve effective use it will be necessary for the utility of the mapping and the positive consequences of the effort to become apparent. This may need more explicit education" (AUQA Audit Report, 2003e). A recent report identifying messages from the AUQA audit reports published to date, reinforces these findings (Stevens, 2005).

Recommendations for practice

Based on the lessons learned from the three projects described in this paper and those of others reported in the literature, we make eight recommendations for the design of projects that will have a good chance of success in creating effective learning environments that support skill development. The first recommendation is to identify and make explicit compelling internal and external reasons for embedding skills into the curriculum and to use these to create a sense of urgency and an imperative to act.

The second recommendation is to allocate sufficient time and effort to building the team that will provide leadership for the project and will drive its implementation. The leadership team should comprise staff who are chosen for their knowledge, influence and capabilities, and who have the authority to effect change. Every project needs a leader who champions the project and has the drive, energy and enthusiasm to overcome obstacles and keep the leadership team going.

The third recommendation involves careful design of the project to ensure that it is aligned to the institutional context, explicitly tied to strategic directions, and includes opportunities for both top down and bottom up input. The design needs to include strategies for measuring progress and achievement of outcomes. Care needs to be taken to ensure that projects are realistic in terms of their conceptual framework and timelines required to complete them, and reflect a good understanding of what it actually takes to implement them successfully. Projects need to take into account staff capability and the institutional culture and readiness for change. Students need to be included as partners in the design and implementation and ongoing evaluation and modification of the curriculum to support skill development.

The fourth recommendation centres on ensuring that the project including its aims, approach and outcomes, is widely communicated to all stakeholders in many ways and using different media and forums. Messages must be clear, consistent and compelling.

The fifth recommendation involves aligning institutional policies, resources and infrastructure, staff development, and recognition and reward to the project goals. Given financial constraints on universities and the need for efficiencies and productivity gains, the issue of class sizes, student-staff ratios, contact hours and the number and variety of assessment tasks must be addressed in order to ensure project viability. Elimination of barriers to project implementation and change efforts including staff perceptions of the value of 'generic' skills and the need to integrate them into *their* curriculum, is required. Typically staff value content over skills and see their role primarily in teaching their discipline content. Some staff may need support to take ownership for helping students to develop skills, to overcome anxiety about their ability to teach skills and to make the necessary changes to the curriculum. Further, disciplinary differences including variation amongst 'hard' and 'soft' disciplines to the degree to which the development of 'generic' skills is accepted as a legitimate part of the curriculum, must be acknowledged and respected.

Students may also need help to value attempts to change curricula to include a focus on skill development, particularly when the concept is new to them, when they have not had previous experience with such activities, and when they have not experienced courses which include skill development consistently across their university study. It is also critical that competing priorities are managed so that they do not get in the way of making curriculum change possible.

The sixth recommendation revolves around the value of creating and celebrating short term wins that recognize achievement of small steps towards project goals. Emphasis should be on team recognition and sharing the kudos.

The seventh recommendation focuses on keeping the project momentum going over time and continuously adapting and refining the project in response to the changing context and challenges that arise such as staff resistance, changes in institutional leaders and staff movement.

The final recommendation centres on embedding the change into the fabric of the institution so that the innovation becomes normal practice and results in the creation of a change in the culture of the institution. Embedding change in universities means finding ways to achieve parity of esteem for activities aimed at improving teaching, including skill development in line with those for activities related to research and consultancy. In addition, the culture needs to reflect a view that the whole institution is accountable for ensuring positive student learning outcomes.

In summary, successful projects require a sense of urgency, effective and ongoing leadership, educationally sound design, communication to gain commitment, ownership and a shared understanding, removing barriers to empower action, celebrating short term wins, keeping going and ensuring that change sticks through cultural change. However, ultimately, given the ephemeral and fragile nature of change, at the heart of all efforts to design learning environments that support skill development is having a critical mass of people who have the vision, the passion and the drive to make it happen.

> The right people will find a way to make something work and be successful over time. The wrong people can take a fantastic product in a red-hot market and drive everything into the ground.
>
> (Hornik, 2004).

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