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Good practice report: technology-enhanced learning and teaching

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Contents

Overview

Background

The ALTC has awarded a total of 264 projects and 52 fellowships (as at 1 December 2010) (ALTC website). These projects and fellowships represent the vibrancy of higher education learning and teaching across the sector since 2005. This good practice report (GPR) on technology-enhanced learning and teaching is one of 11 GPRs commissioned by ALTC as an evaluation of the projects' and fellowships' useful outcomes and good practices. The 11 GPRs include: assuring graduate outcomes; blended learning; curriculum renewal; supporting students' transition into higher education; work-integrated learning; assessment of science, technology, engineering and mathematics; innovative Indigenous learning and teaching; revitalising the academic workforce; technology-enhanced learning and teaching; clinical teaching; and support for international students. This GPR focuses on examining best practice across 25 complete projects (including three fellowships) and 8 ongoing projects (including one fellowship) on technology-enhanced learning and teaching. In February 2011 an initial report was delivered by the ALTC at the DEHub Summit which provided an overview of the ALTC funded projects in the area of technology-enhanced learning.

Technology-enhanced learning and teaching

Our perspective of technology-enhanced learning (TEL) and teaching aligns with Laurillard, Oliver, Wasson & Hoppe (2009) who suggest that the "role of technology [is] to enable new types of learning experiences and to enrich existing learning scenarios" (p. 289). In addition, they also suggest that "interactive and cooperative digital media have an inherent educational value as a new means of intellectual expression" and creativity (p. 289). Laurillard et al. (2009) also suggest that "the route from research to innovation, then to practice, through to mainstream implementation requires the following:

- an understanding of the authentic professional contexts that will influence the curriculum, pedagogy and assessment practices that need technology enhancement
- congruence between innovation and teacher values
- teachers having time to reflect on their beliefs about learning and teaching because TEL requires a more structured and analytical approach to pedagogy
- teachers and practitioners need a sense of ownership through their involvement in co-development of the TEL products and environments.
- TEL research must be conducted to reflect the interdependence between researchers and users
- education leaders need more support for the radical change of institutional teaching and learning models needed, if technology is to be exploited effectively
- teachers need to be more closely engaged in the design of teaching that uses technology, collaborating with peers and exchanging ideas and practices" (Laurillard et al. 2009, p. 304).

Approach

Our approach to the development of the GPR has involved a meta-analysis of the 33 projects. We initially developed a matrix for the comparison of projects as well as a means to thematically analyse the 33 projects. A subsequent analysis determined ten outcomes that represent best practice for technology-enhanced learning and teaching. Keywords for the literature were derived from these outcomes which guided the subsequent literature review. We also developed ten recommendations and described a range of exemplar projects in technology-enhanced learning.

Outcomes for best practice in TEL

1. A focus on learning design allows academics to model and share good practice in learning and teaching
2. Authentic learning provides a means of engaging students through all aspects of curricula, subjects, activities and assessment
3. Successful academic development focuses on engaging academics over sustained periods of time through action learning cycles and the provision of leadership development opportunities
4. Engaging teaching approaches are key to student learning
5. Technology-enhanced assessment provides flexible approaches for academics to provide feedback to students
6. Integrating technology-enhanced learning and teaching strategies across curriculum, subjects, activities and assessment results in major benefits to the discipline
7. Knowledge and resource sharing are central to a vibrant community of practice
8. Academics require sophisticated online teaching strategies to effectively teach in technology-enhanced higher education environments
9. Academics need a knowledge of multi-literacies to teach effectively in contemporary technology-enhanced higher education
10. Exemplar projects focused on multiple outcomes across curricula integration, sustainable initiatives, academic development and community engagement.

1. A focus on learning design allows academics to model and share good practice in learning and teaching

Learning design focuses on the design of activities, subjects, assessment and curricula. Projects focused on learning design allow academics to model and share good practice in learning and teaching. A focus on learning design varied from discipline specific (e.g. German language, engineering), multi-disciplinary (e.g. eSimulations) and generic (e.g. role plays, technology-supported learning designs, blended learning). Learning design projects also represent a sustainable approach to learning and teaching as they provide shareable learning designs and design principles. A focus on learning design engages academics and builds the capacity of staff to design quality learning and teaching in higher education. Several examples of projects which focus on learning designs include:

- role-based learning environments (CG6-39)
- online curriculum development for collaborative programs in German (CG6-34)
- web-based lecture technologies (WBLT) (CG6-22)
- promoting the sharing and reuse of technology-supported learning designs (Ron Oliver 2006)
- using eSimulations in professional education (CG8-771)
- immersive learning environments for process engineering (CG6-21)
- using mobile technologies to develop new ways of teaching and learning (CG6-33).

2. Authentic learning provides a means of engaging students through all aspects of curricula, subjects, activities and assessment

Authentic learning experiences focus on real-world activities that value the application of knowledge to solving real-world problems. Authentic learning is meaningful as it engages and immerses students in activities, subjects, assessment and curricula that are directly relevant for their profession and allows a transition to

the workplace setting. Authentic learning experiences vary from viewing histology slides in the online environment, immersing students in process engineering plants, simulations, role plays and 3D environments that mirror real-life activities. Engaging academics in designing authentic learning activities such as mobile learning also provides academic development for staff. Several examples of projects which focus on authentic learning include:

- immersive learning environments for process engineering (CG6-21)
- using eSimulations in professional education (CG8-771)
- role-based learning environments (CG6-39)
- integration of web 3D technologies with university curricula (CG7-488)
- virtual microscopy for enhancing learning and teaching (CG7-398)
- online report writing in the sciences and engineering (CG6-30)
- using mobile technologies to develop new ways of teaching and learning (CG6-33)
- online writing for undergraduate engineering students (CG10-1713)
- using serious video game technology in the built environment (CG10-1691).

3. Successful academic development focuses on engaging academics over sustained periods of time through action learning cycles and the provision of leadership development opportunities

Action learning focuses on engaging academics to explore pedagogies as they design and evaluate learning and teaching within their own discipline. In addition the sharing of these learning designs enhances the ability of the academics to articulate and share pedagogies within their community of practice. The aim is to work collaboratively and reflect and share ideas and experiences. A focus on building a community of practice at university, state and national levels encouraged the uptake of online role-based learning environments and utilised a cascade model of leadership. Organisational capacity-building was the focus of the eSimulations project. A cycle of action learning and action research of planning, action, evaluation and reflection enhanced the process. Several examples of projects that focus on academic development include:

- using mobile technologies to develop new ways of teaching and learning (CG6-33)
- role-based learning environments (CG6-39)
- using eSimulations in professional education (CG8-771)
- promoting the sharing and reuse of technology-supported learning designs (Ron Oliver 2006)
- web 2.0 authoring tools in higher education (PP9-1350)
- building capacity in emerging technologies through cascade and viral leadership (LE9-1231).

4. Engaging teaching approaches are key to student learning

Student engagement has been defined as “active and collaborative learning, participation in challenging academic activities, formative communication with academic staff, involvement in enriching educational experiences, and feeling legitimated and supported by university learning communities” (Coates 2007, p. 122). Aligning pedagogical, technical and administrative issues is also a necessary condition of success for creating an engaging learning environment. In addition, the emergence of game-like virtual worlds offers opportunities for enhanced interaction in educational applications within higher education courses. Engaging students in active, interactive and student-centred authentic learning environments is a central theme of each of the projects listed below:

- online report-writing in the sciences and engineering (CG6-30)

- investigating the application of social software to support networked learning (CG6-36)
- educating the net generation (CG6-25)
- remotely accessible laboratories: enhancing learning outcomes (CG6-40)
- using eSimulations in professional education (CG8-771)
- role-based learning environments (CG6-39)
- integration of web 3D technologies with university curricula (CG7-488)
- virtual microscopy for enhancing learning and teaching (CG7-398)
- using mobile technologies to develop new ways of teaching and learning (CG6-33)
- participation of Indigenous knowledge holders in tertiary teaching (Michael Christie 2008).

5. Technology-enhanced assessment provides flexible approaches for academics to provide feedback to students

Assessment has a key role in teaching and learning because students define the curriculum or subject according to the assessment. The assessment also sends explicit and implicit messages to students about what is considered important. Assessment should be designed to identify the quality of students' learning and how teaching can be more effective. Technology-enhanced assessment provides flexible, diverse and interactive approaches to student assessment. The quantitative skills project focused on a software tool which produced 138 templates of mathematical questions and worked examples. The ReMarks project developed a method for providing feedback on electronic assessment submissions and an eSubmission system. The fellowships focused on enhancing approaches to eAssessment through the articulation of an eAssessment design model and the collection of disciplinary examples of interactive eAssessments. Several examples of projects that focus on assessment include:

- electronic marking - ReMarks PDF & ReMarks PDF – Stage 2 (PP7-542; PP9-1593)
- a new enabling technology for learning and teaching quantitative skills (CG6-24)
- web 2.0 authoring tools in higher education (PP9-1350)
- rethinking assessment in web 2.0 environments (Geoffrey Crisp 2011)
- raising the profile of diagnostic, formative and summative eAssessments (Geoffrey Crisp 2009)
- VirtualPREX: using a 3D virtual world with pre-service teachers (PP10-1775)
- the eOSCE: improving learning and assessment reliability (PP10-1628)
- online clinical assessment of practical skills (eCAPS) for web-based courses (PP8-893).

6. Integrating technology-enhanced learning and teaching strategies across curriculum, subjects, activities and assessment resulted in major benefits to the discipline

Successful projects embedded the initiative in the curriculum, IT infrastructure and professional practice of academics. In addition, embedding an initiative into the wider curriculum is likely to lead to a more sustainable change than confining the initiative within a course or subject. This approach also begins to address barriers to new initiatives within the university environment. The virtual microscopy project worked with course coordinators to maximise integration, whereas the Web3D project focused on an action learning approach with staff to integrate the exemplars into the practice of the academic. This approach was highly effective in empowering academic staff in virtual worlds. The eSimulation project integrated simulations into the curriculum of three universities, and the engineering project focused on integration with a focus on curriculum review, graduate attributes and capabilities in

line with industry expectations. Graduate attributes are descriptions of the core abilities and values which a university community agrees all its graduates should develop as a result of successfully completing their university studies. The Australasian Council on Open, Distance and E- Learning (ACODE) benchmarks raised awareness of and familiarisation with benchmarks and their use within institutions. Several examples of projects that focus on integration include:

- using mobile technologies to develop new ways of teaching and learning (CG6-33)
- integration of web 3D technologies with university curricula (CG7-488)
- virtual microscopy for enhancing learning and teaching (CG7-398)
- using eSimulations in professional education (CG8-771)
- teaching and assessing meta-attributes in engineering (CG6-23)
- encouraging benchmarking in eLearning (G17-630)
- creating resources to support occupational therapy competencies (PP10-1774)
- web-based lecture technologies (WBLT) (CG6-22)
- curriculum renewal for eHealth capability in health professional degrees (PP10-1806)
- histology learning and teaching resource for students (Geoffrey Meyer 2009).

7. Knowledge and resource sharing are central to a vibrant community of practice

Communities of practice are successful ways of building and sharing a scholarly approach to enhancing learning and teaching practice. A community of practice could be defined as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger, McDermott, Snyder 2002, p. 4). The following projects represent a selection of projects that share, interact and want to do things better within their community of practice:

- virtual microscopy for enhancing learning and teaching (CG7-398)
- adoption, use and management of open educational resources (CG10-1687)
- learning to teach online(CG9-1091)
- using eSimulations in professional education (CG8-771)
- rethinking assessment in web 2.0 environments (Geoffrey Crisp 2011)
- raising the profile of diagnostic, formative and summative eAssessments (Geoffrey Crisp 2009)
- role-based learning environments (CG6-39)
- using mobile technologies to develop new ways of teaching and learning (CG6-33)
- histology learning and teaching resource for students (Geoffrey Meyer 2009)
- integration of web 3D technologies with university curricula (CG7-488)
- Promoting the sharing and reuse of technology-supported learning designs (Ron Oliver 2006).

8. Academics require sophisticated online teaching strategies to effectively teach in technology-enhanced higher education environments

Academics need engaging approaches to develop their online teaching strategies. They need to be conversant in a wider range of skills to teach effectively in online environments. These skills focus on being able to engage the learner in an effective learning environment that is learner-centred, knowledge-centred, assessment-centred and community-centred (Bransford, Brown & Cocking 1999). "In many ways, learning and teaching in an online environment are much like teaching and learning in any other formal educational context: learners' needs are assessed, content is negotiated or prescribed, learning activities are orchestrated, and learning is

assessed. The pervasive effect of the online medium, however, creates a unique environment for teaching and learning" (Anderson 2008b, p. 343). Several examples of projects that focus on online teaching strategies include:

- learning to teach online (CG9-1091)
- rethinking assessment in web 2.0 environments (Geoffrey Crisp 2011)
- raising the profile of diagnostic, formative and summative eAssessments (Geoffrey Crisp 2009)
- role-based learning environments (CG6-39)
- using mobile technologies to develop new ways of teaching and learning (CG6-33)
- integration of web 3D technologies with university curricula (CG7-488)
- promoting the sharing and reuse of technology-supported learning designs (Ron Oliver 2006)
- using eSimulations in professional education (CG8-771)
- web 2.0 authoring tools in higher education (PP9-1350)
- immersive learning environments for process engineering (CG6-21).

9. Academics need a knowledge of multi-literacies to teach effectively in technology-enhanced contemporary higher education

To effectively participate in the modern world, students need to develop the skills needed to be multi-literate through providing educational experiences that embrace linguistic, visual, auditory, gestural and spatial modes of communication. Literacy for both academics and students in the digital age has now become multi-faceted, and its diversified nature means that global citizens require a range of skills to effectively communicate and interact in the modern world. Several examples of projects that explore multi-literacies include:

- investigating the application of social software to support networked learning (CG6-36)
- educating the net generation (CG6-25)
- role-based learning environments (CG6-39)
- using mobile technologies to develop new ways of teaching and learning (CG6-33)
- integration of web 3D technologies with university curricula (CG7-488)
- promoting the sharing and reuse of technology-supported learning designs (Ron Oliver 2006)
- rethinking assessment in web 2.0 environments (Geoffrey Crisp 2011)
- raising the profile of diagnostic, formative and summative eAssessments (Geoffrey Crisp 2009)
- learning to teach online (CG9-1091)
- participation of Indigenous knowledge holders in tertiary teaching (Michael Christie 2008).

10. Exemplar projects focused on multiple outcomes across curricula integration, sustainable initiatives, academic development and community engagement

The following projects represent best practice projects as they traverse multiple outcomes as described above. For example the virtual microscopy project demonstrated best practice in outcomes 2, 4, 6 and 7. The mobile technologies project demonstrated best practice in eight of the nine outcomes described. Several examples of projects that represent best practice include:

- role-based learning environments (CG6-39)
- educating the net generation (CG6-25)

- learning to teach online (CG9-1091)
- virtual microscopy for enhancing learning and teaching (CG7-398)
- using mobile technologies to develop new ways of teaching and learning (CG6-33)
- promoting the sharing and reuse of technology-supported learning designs (Ron Oliver 2006)
- rethinking assessment in web 2.0 environments (Geoffrey Crisp 2011)
- raising the profile of diagnostic, formative and summative eAssessments (Geoffrey Crisp 2009)
- histology learning and teaching resource for students (Geoffrey Meyer 2009)
- using eSimulations in professional education (CG8-771).

Literature review of Australian and international scholarly research and publications

The literature review for the technology-enhanced good practice report focuses on the key outcomes from the evaluation of the complete and ongoing projects and fellowships. The literature review elaborates the core concepts of each outcome as highlighted in bold below.

Outcomes

1. A focus on **learning design** allows academics to model and share good practice in learning and teaching
2. **Authentic learning** provides a means of engaging students through all aspects of curricula, subjects, activities and assessment
3. Successful **academic development** focuses on engaging academics over sustained periods of time through action learning cycles and the provision of leadership development opportunities
4. **Engaging teaching** approaches are key to student learning
5. Technology-enhanced **assessment** provides flexible approaches for academics to provide feedback to students
6. **Integrating** technology-enhanced learning and teaching strategies across curriculum, subjects, activities and assessment results in major benefits to the discipline
7. Knowledge and resource sharing are central to a vibrant **community of practice**
8. Academics require sophisticated **online teaching strategies** to effectively teach in technology-enhanced higher education environments
9. Academics need a knowledge of **multi-literacies** to teach effectively in contemporary technology-enhanced higher education

1. A focus on **learning design** allows academics to model and share good practice in learning and teaching

Learning design has been defined in numerous ways within the literature. It can focus on the design of activities, subjects, assessment and curricula. For the purposes of this report learning design is defined as: “a methodology for enabling teachers/designers to make more informed decisions in how they go about designing learning activities and interventions, which is pedagogically informed and makes effective use of appropriate resources and technologies. This includes the design of resources and individual learning activities right up to curriculum-level design. A key principle is to help make the design process more explicit and shareable. Learning design as an area of research and development includes both gathering empirical evidence to understand the design process, as well as the development of a range of resources, tools and activities” (Conole forthcoming, 2012, p. 8). Agostinho (2009) suggests that learning design “is gaining momentum in the e-learning literature as a concept for supporting academics to model and share teaching practice” (p. 1). She suggests that a learning design “represents and documents teaching and learning practice using some notational form so that it can serve as a description, model or template that can be adaptable or reused by a teacher to suit his/her context” (p. 19). The aim of a learning design is to provide a means of communication, a language for documenting and describing a learning experience so that other teachers can reuse the design. The learning design should provide guidance to other teachers. Goodyear and Yang (2009) further suggest the concept of design patterns which assists teachers to understand educational design of their own teaching. Educational design is defined as “the set of practices involved in constructing representations of how to support learning in particular cases” (p. 169). Goodyear and Yang (2009) focus on both an *understanding* of educational design by teachers as well as the *performance* of teaching to enhance the

educational experience of students. They also suggest that “better design performance is only worthwhile if the resulting designs and their underpinning conceptions of learning fit the emerging needs of the autonomous lifelong learner” (p.183).

Within this report we suggest that curriculum design and learning design involve similar approaches. The obvious difference is the level of granularity. Conole (forth-coming, 2012) suggests that curriculum design is an aspect of learning design. In this case curriculum design looks at the learning interactions across the degree program as opposed to the experience of the student at the subject level. Curriculum design often focuses on the use of principles as these need to be pervasive across numerous subjects and across three to four years of the curriculum. Principles may include environmental, social and financial sustainability; ethics and global citizenship; internationalisation; professional and practice-based education; blended and flexible learning; Indigenous curriculum guidelines; and first year curriculum principles (Charles Sturt University 2010). Myers and Nulty (2009) suggest that we need to scaffold the learners’ experience across the curriculum. The concept of constructive alignment (Biggs & Tang 2007) is another principle that underpins curriculum design. It suggests that students construct meaning through their interactions in learning and teaching and that all aspects of the learning context should be aligned to achieve the desired learning outcomes. For this reason the learning environment, curriculum, degree, learning and teaching activities, assessment and learning outcomes should be designed in conjunction with each other to guarantee the richness of the student experience.

Many of the ALTC projects mention **blended learning** which we consider as a specific approach to learning design which can be implemented at the curriculum, subject, activity and assessment levels. The blurring of face-to-face learning and teaching and online learning may involve a significant shift for both students and staff of universities. In addition, there is a growing acceptance that learning occurs in different places, which presents both exciting and challenging opportunities for higher education. Blended learning involves the integration of both on-campus face-to-face learning and teaching and on- or off-campus virtual learning environments, utilising the affordances of each environment to enhance the student experience. For the purposes of this report, flexible learning provides *opportunities* to improve the student learning experience through flexibility in time, pace, place (physical, virtual, on-campus, off-campus), mode of study (print-based, face-to-face, blended, online), teaching approach (collaborative, independent), forms of assessment and staffing. It may utilise a wide range of media, environments, learning spaces and technologies for learning and teaching. Blended and flexible learning is a design approach that examines the relationships between flexible learning *opportunities*, in order to optimise student engagement regardless of mode of study (Keppell 2011).

Gerbic and Stacey (2009) provide a rationale as to why blended learning is often misunderstood in higher education. They suggest that the introduction of blended learning is challenging, as “the face-to-face setting is foundational in all contexts, and has a historical and experiential legitimacy” (p. 302). They also suggest that “it is far more difficult to create or develop the same kind of fidelity, comfort or social presence in online spaces” (p. 302). Other perspectives suggest that blended learning is “a design approach whereby both face-to-face and online learning are made better by the presence of each other” (Garrison & Vaughan 2008, p. 52). Blended learning and teaching can occur at four levels of granularity. These comprise activity-level blending, subject-level blending, course-level blending and institutional-level blending (Graham 2006). A blended learning design may also be enabling, enhancing or transformative. Enabling blends would address issues of access and equity to provide equitable opportunities in face-to-face, print-based, blended and fully online learning environments. Enhancing blends involves incremental changes to the existing teaching and learning environment.

Transformative blends focus on a major redesign of the teaching and learning environment (e.g. online, problem based learning). Littlejohn and Pegler (2007) suggest that "blended e-learning offers the possibility of changing our attitudes … as to *where* and *when* learning takes place" (p. 2). In addition it offers an "integration of *spaces*" (p. 2) and allows flexibility in the time when learners are involved in subjects or courses.

2. **Authentic learning** provides a means of engaging students through all aspects of curricula, subjects, activities and assessment

Although, as stated in Herrington, Oliver, and Reeves (2003), "some argue it is impossible to design truly authentic learning experiences" (p. 60), committed educators strive to provide the best learning experience for their learners. It is also essential that the learning design is "informed from its inception by some model of learning and instruction" (Koschmann, Kelson, Feltovich, & Barrows 1996, p. 83). Authentic learning experiences focus on real-world activities that value the application of knowledge to solve real-world problems. Authentic learning has its foundations in situated learning or situated cognition. Collins (1988) defines situated cognition as "the notion of learning knowledge and skills in contexts that reflect the way the knowledge will be useful in real life" (p. 2). Authentic learning could also be called meaningful learning, as learning is embedded in the context in which it will be utilised. Cognitive apprenticeships focused on authentic tasks allow the student to transition to the real-world because learners have access to experts and a community of practice. Herrington and Oliver (2000) suggested nine principles for authentic learning designs:

Providing an authentic context that mirrors the way the knowledge will be used in real life
The context needs to be all-embracing and be complex and ill-structured so that it immerses the learner. The learner should be involved in the context over a sustained period of time. For this reason it is essential that the context is not oversimplified.

Authentic tasks
Tasks should have real-world relevance, be ill-defined, allow a sustained period of time to be engaged, and allow the learner to discern relevant and irrelevant information and be able to be integrated across content areas.

Access to expert performances and processes
Experts provide guidance in the learning process and allow novice learners to examine the thinking processes of experts as they solve problems. The apprenticeship model is an example of mentoring and inviting the learner into the community of practice of the expert. Learners need access to expert thinking, other learners at different levels of expertise and the opportunity to share stories within the community.

Provides multiple roles and perspectives
Students need to examine an authentic task from multiple perspectives. The task needs to allow the student to examine the task from different points of view as real-world problems are complex and ill-structured.

Supports collaboration
Through collaboration, students solve a problem or create/produce projects that require input from all members to achieve an outcome. Tasks need to be completed in pairs or groups and there needs to be incentives for collaborating on group projects.

Promotes reflection
Reflection is both an individual process and a social process, since the learner needs to articulate their thoughts through dialogue with another person. This process naturally occurs in collaborative projects. Allowing learners to compare themselves with experts and other learners develops reflection.

Promotes the articulation of tacit knowledge
By verbally articulating ideas in collaborative projects, learners develop and finetune their ideas.

Provides coaching and scaffolding by the teacher
The teacher needs to scaffold learning for the learner so that they can extend their abilities to complete a task or activity which they were unable to achieve without the coaching and guidance of the teacher.

Provides authentic assessment
A key aspect of authentic assessment is that it needs to be seamlessly integrated with the activity. It should embrace all aspects of collaboration, reflection and other aspects mentioned above. (Herrington, Reeves & Oliver 2010).

3. Successful **academic development** in projects focuses on engaging academics over sustained periods of time through action learning cycles and the provision of leadership development opportunities

There are numerous approaches to academic development, ranging from traditional seminars and workshops through to sustained involvement in action learning, leadership development projects and fellowships. The changing global context of learning and teaching in higher education, the changing nature of students, and the impact of technology on learning and teaching all influence a need for teachers in higher education to continually learn through professional development and academic development. In addition there is growing acceptance of lifelong and life-wide learning (Jackson 2010). Lifelong learning encompasses both formal and informal learning, self-motivated learning, self-funded learning and universal participation (Watson 2003). We can no longer assume that school leavers are the major demographic group that universities need to cater for as mature age students are increasingly represented in higher education settings. The complexity of the higher education environment suggest that university teachers need to be involved in academic development parallel to their research and community work. Academic development "is used to refer to the developmental activities informed by the discipline of teaching and learning in higher education. This discipline is underpinned by research into university teaching and learning" (Fraser 2005, p. 5).

The increasing prevalence of technology-enhanced approaches to learning and teaching has exposed a number of critical issues to be addressed in academic development. Among these, a number of which are identified in the 2009 JISC report "Higher Education in a Web 2.0 World", is the importance of developing professional knowledge, understanding and expertise of the teacher. This is predicated on knowledge of the technologies, but is overarched by the need for relevant pedagogical knowledge. The challenge facing ALTC-funded projects with respect to technology-enhanced learning is to ensure that they are implemented as widely as possible so that they embrace academic development as an integral aspect of the project through sustained approaches such as action learning and leadership development opportunities. Action learning involves action and reflection cycles in relation to professional practice. Parrish et al. (2008) evaluated the development of leadership capacity through the leadership capacity development framework (LCDF) for teaching and learning in higher education. Four Australian universities were involved in the project that involved mentoring of academic

participants. The evaluation of the project suggested that successful aspects of the LCDF included: professional development activities; authentic learning activities; reflective practice; dialogue; and cultivating appropriate professional networks. Lefoe (2010) suggested five critical factors for leadership for change in the area of assessment: implementation of strategic faculty-based projects; formal leadership training and related activities; opportunities for dialogue about leadership practice and experiences; and activities that expanded current professional networks (p.189). Keppell et al. (2010) concluded that distributive leadership was a catalyst for curriculum change. A teaching fellowship scheme at Charles Sturt University demonstrated how Teaching Fellows, through mentoring and sustained professional development, instigated strategic change. The Teaching Fellowship Scheme transformed teaching and learning using blended and flexible learning. By focusing on redesigning subjects and courses, Fellows engaged in innovative and relevant research to enhance their own professional development and pedagogical scholarship as well as achieving University goals in relation to learning and teaching.

Laurillard et al. (2010) suggested that "a scholarly approach to implementing innovation can be more successful with academics" (p. 292). In addition, "TEL [technology enhanced learning] requires a more structured approach to designing learning and that the traditional 'transmission' approach is not effective" (p. 293). The approach they suggest is one of engagement with and involvement of the wider stakeholder groups. They suggest that there needs to be more active involvement by the group(s), and this includes being involved in the innovative project from the beginning so that the target groups have ownership of the process and the outcomes. To embed the findings and enhanced practices arising from innovative projects requires active engagement in academic development activities. This good practice review found that there did not seem to be strong evidence of widespread adoption and uptake of the skills, expertise, strategies, tools and understandings arising from the ALTC projects. Despite dissemination goals and activities and the promotion of dissemination strategies, the uptake of projects seemed, in general, to be limited to a specific context.

This issue is not confined solely to TEL, but seems to be endemic across the higher education teaching and learning domain. According to Feixas and Zellweger (2010) it is essentially a cultural issue. They state that: "often faculty members face cultural and structural barriers to more seriously invest into the quality of teaching" (p. 86). These authors see the issue as reflective of the place of academic development within the higher education organisational domain in general. They suggest a comprehensive approach to faculty [academic] development by proposing a 'conceptual framework' which they suggest will provide a more holistic approach to academic development. Their approach also encompasses environmental factors which Feixas and Zellweger suggest are critical. A 'new learning culture' (p. 93) to support the development of changed practice for teachers is necessary. The challenge for academic development related to the uptake and embedding of technology-enhanced learning projects and initiatives is commensurate with the challenges associated with all academic development, and consideration of the options and strategies is identified in reports such as the ALTC-funded project "The Development of Academics and Higher Education Futures" undertaken by Ling & CADAD: http://www.altc.edu.au/resource-development-academics-higher-swinburne-2009

4. **Engaging teaching** approaches are key to student learning

Student engagement within higher education and technology-enhanced learning environments is a key goal for teachers. Student engagement has been defined as "active and collaborative learning, participation in challenging academic activities, formative communication with academic staff, involvement in enriching educational

experiences, and feeling legitimated and supported by university learning communities" (Coates 2007, p. 122). Coates (2007) also stated that engagement is a multidimensional phenomenon. He suggested that student engagement measures intrinsic involvement, assesses student engagement, measures educational outcomes, measures students involvement in learning, considers the quality of university education on student learning, examines students interactions with their universities and student engagement information can assist in decision-making in relation to resource allocation.

Krause (2005a) suggested that student "engagement refers to the time, energy and resources students devote to activities designed to enhance learning at university. These activities typically range from a simple measure of time spent on campus or studying, to in- and out-of-class learning experiences that connect students to their peers in educationally purposeful and meaningful ways" (p. 3). Krause (2005a) also suggested that it is necessary to take a wider view of engagement so it encompasses multidimensional aspects. It is also suggested that students need to be supported and empowered to make engagement meaningful. The introduction of strategies to assist students to actively engage and manage difficult circumstances in engagement with higher education also need to be considered. Krause (2005b) suggested ten strategies for success for enhancing engagement for first year students, since student engagement "in learning and in learning communities is a key to success in the first year of university" (p.1). The ten strategies for success are:

- create and maintain a stimulating intellectual environment
- value academic work and high standards
- monitor and respond to demographic subgroup differences and their impact on engagement
- ensure expectations are explicit and responsive
- acknowledge the challenges in students' lives
- foster social connections
- provide targeted self-management strategies
- use curriculum structures, assessment and feedback to shape the student experience and encourage engagement
- manage online learning experiences with care
- support and engage teaching colleagues (Krause 2005b).

The Curtin University Guidelines for Student Engagement use a rubric to assist teachers to implement student engagement. They examine learning resources, learning activities, communication and collaboration, student support and assessment and feedback. Student engagement may be enhanced by encouraging students to develop their own learning resources, which may involve designing a video or a website related to the assessment of a subject. Authentic learning activities focus on engaging students in real-world, ill-structured activities that mentor the student into their professional field of practice. For example, online scenarios may encourage a physiotherapy student to understand how they should communicate with potential patients. A student-organised conference would be an example of encouraging students to engage in communication and collaboration as they collaborate with each other to run the conference. Student support would be fostered through the utilisation of an e-portfolio to gather relevant material focussed on their synthesis of learning across the degree program. Authentic assessment may encourage students to investigate an issue in their local community in which they live and develop a plan as to how they may address the issues.

5. **Technology-enhanced assessment** provides flexible approaches for academics to provide feedback to students

Boud and Associates (2010), in developing 'Assessment 2020', articulated seven propositions to reform higher education. The three principles that underpin the

propositions comprise: assessment is a central feature of teaching and the curriculum; assessment is the making of judgements about how students' work meets appropriate standards; and assessment plays a key role in both fostering learning and the certification of students. Assessment has been most effective when:

- assessment is used to engage students in learning that is productive
- feedback is used to actively improve student learning
- students and teachers become responsible partners in learning and assessment
- students are inducted into the assessment practices and cultures of higher education
- assessment for learning is placed at the centre of subject and program design
- assessment for learning is a focus for staff and institutional development
- assessment provides inclusive and trustworthy representation of student achievement (Boud & Associates 2010).

Assessment has long been seen as a major area of interest within the broader field of technology-enhanced learning. James, McInnis and Devlin (2002) suggested a number of reasons for the use of technology to support assessment including "to diversify assessment tasks, broaden the range of skills assessed and to provide students with more timely and informative feedback on their progress" (p. 23). They also suggested that technology-enhanced assessment approaches would "meet student expectations for more flexible delivery and generate efficiencies in assessment that can ease academic staff workload" (p. 23).

The overarching significance and importance of technology-enhanced assessment has been highlighted in the review of the literature on online formative assessment conducted by Gikandi, Morrow and Davis (2011). This comprehensive review "provided evidence that online formative assessment has the potential to engage both teacher and learner in meaningful educational experiences" (p. 2347). The review identified the important dimensions of online formative assessment including: "variety of ongoing and authentic assessment activities, appropriate learner autonomy, effective formative feedback and teachers role in fostering shared purpose and understanding of learning goals, content and outcomes" (p. 2347). It also reinforces the importance of embedding assessment in the learning dynamic and of assessing both process and product for those teaching online.

JISC (2009) described the potential benefits of technology within the area of assessment. The JISC report encourages assessment designers to "reflect on how technology-enabled practice, grounded in principles of good assessment and feedback, might enhance the quality of assessment and feedback" (p. 5). Technology-enhanced assessment may provide the following benefits:

- greater variety and authenticity in assessment designs
- improved learner engagement
- choice in the timing and location of assessments
- capture of wider skills and attributes not easily assessed by other means e.g. ePortfolios
- efficient submission, marking, moderation and data storage processes
- consistent, accurate results with opportunities to combine human and computer marking
- immediate feedback
- increased opportunities for learners to act on feedback, for example by reflection in e-portfolios
- innovative approaches based around use of creative media and online peer and self-assessment
- accurate, timely and accessible evidence on the effectiveness of curriculum design and delivery (JISC 2009, p. 9).

6. **Integrating** technology-enhanced learning and teaching strategies across curriculum, subjects, activities and assessment resulted in major benefits to the discipline.

Successful projects embedded the initiative in the curriculum, IT infrastructure and professional practice of academics. In addition, embedding an initiative into the wider curriculum is likely to lead to a more sustainable change than confining the initiative to within a course or subject. This approach also begins to address barriers to new initiatives within the university environment. To effectively integrate technology-enhanced learning and teaching across the curriculum, subjects, activities and assessment, the teacher needs to have a knowledge of 'technological pedagogical knowledge'. "Technological pedagogical knowledge is an understanding of how teaching and learning change when particular technologies are used. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies. It requires building a deeper understanding of the constraints and affordances of particular technologies and the educational contexts within which they function best" (Harris, Mishra & Koehler 2007, p. 1). The technological pedagogical content knowledge (TPCK) framework provides a mechanism for the integration of technology-enhanced learning related to technology, pedagogy, content and teachers knowledge. This knowledge is essential for understanding that technology has changed what is considered to be disciplinary content, and that the type of technology influences the type of cognition (Harris, Mishra & Koehler 2007). Wang (2008) suggests a model of ICT integration that includes pedagogy, social interaction and technology. He focuses on the pedagogical affordances, social affordances and technological affordances when designing technology-enhanced learning and teaching environments.

Another perspective in which to view integration centres on graduate attributes. Graduate attributes are descriptions of the core abilities and values a university community agrees all its graduates should develop as a result of successfully completing their university studies. Graduate attributes are learning outcomes that may also be described as qualities, capabilities, competencies and graduate employability (Oliver 2010). Graduate attributes are specifically defined as "the skills, knowledge and abilities of university graduates, beyond disciplinary content knowledge, which are applicable to a range of contexts" (Barrie 2004). They are generic attributes that are often embedded and assessed as learning outcomes across subjects and degree programmes. Barrie, Hughes, & Smith (2009) in the ALTC 'National Graduate Attributes Project' (GAP) identified eight categories. These include three enabling attributes (scholarship, global citizenship, and lifelong learning) and five discipline specific translation attributes (research and inquiry, information literacy, personal and intellectual autonomy, communication, and ethical, social and professional understanding). Farrell, Devlin and James (2007) developed nine principles to underpin The University of Melbourne's teaching model. They are:

1. an atmosphere of intellectual excitement
2. an intensive research and knowledge transfer culture permeating all teaching and learning activities
3. a vibrant and embracing social context
4. an international and culturally diverse learning environment
5. explicit concern and support for individual development
6. clear academic expectations and standards
7. learning cycles of experimentation, feedback and assessment
8. premium quality learning spaces, resources and technologies
9. an adaptive curriculum.

Curriculum design often focuses on the use of principles as these need to be pervasive across numerous subjects and across three to four years of the curriculum. Principles might include environmental, social and financial

sustainability; ethics and global citizenship; internationalisation; professional and practice-based education; blended and flexible learning, Indigenous curriculum guidelines and first year curriculum principles (Charles Sturt University, 2010). Myers and Nulty (2009) suggest that we need to scaffold the learners experience across the curriculum.

Benchmarks provide universities with a mechanism to self-assess. The ACODE benchmarks raised awareness of and familiarisation with benchmarks and enhanced the use of the benchmarks within institutions. Benchmarking is an area of ongoing and growing activity in the field of technology-enhanced learning. The term and the operationalising of benchmarking processes with respect to eLearning is a relatively recent innovation. A brief overview of the background to eLearning benchmarking can be found at http://www.elrc.ac.uk/download/publications/Briefing-Benchmarkingv0.9.doc. Benchmark initiatives and tools have appeared in Australasia, the United Kingdom, Europe and more recently in the USA. Within Australasia there are two major, different, but complementary benchmarking tools in use: the ACODE Benchmarks; http://www.acode.edu.au/benchmarks.php and the eMaturity Model (eMM); http://www.utdc.vuw.ac.nz/research/emm/. The eMM (Marshall, 2010) is widely used in the New Zealand context and has largely been funded by government agencies. The ACODE Benchmarks have had greater use in Australia and have been focused on Institutional self-assessment. Both these methodologies were early developments and have been used to considerable effect across the higher education sectors in both New Zealand and Australia. In the United Kingdom a pilot for a 'Benchmarking of e-learning exercise' was undertaken by the Higher Education Academy in association with JISC commencing in 2004. This project employed a range of benchmarking methodologies including: Bacsich's "Pick and Mix" methodology http://www.matic-media.co.uk/benchmarking.htm; the Observatory of Borderless Education methodology http://www.obhe.ac.uk/documents/view_details?id=10; the MIT90; and the ELTI methodologies. A bibliography of benchmarking methodologies can be found at: http://elearning.heacademy.ac.uk/weblogs/benchmarking/?cat=14. Within Europe, a major benchmarking initiative, the Re.ViCa project, explored the 'critical success factors' associated with Virtual Campuses. Details of the overall project can be found at http://www.virtualcampuses.eu/index.php/Main_Page, with the critical success factors found at http://revica.europace.org/files/results/Critical%20Success%20Factors_final.pdf. The aims of the Re.ViCa project centred on evaluating and comparing virtual campuses.

7. Knowledge and resource sharing are central to a vibrant **community of practice**

A community of practice could be defined as "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (Wenger 2009). To create a vibrant community of practice within higher education there needs to be knowledge and resource sharing such as Open Educational Resources (OER) or the sharing of practices across the higher education sector. Communities of practice need to be cultivated to achieve the sharing of practices. Wenger, McDermott & Snyder (2002) derived seven principles for cultivating communities of practice that should be considered in knowledge and resource sharing: design for evolution; foster open dialogue between inside and outside perspectives; invite different levels of participation; develop both public and private community spaces; focus on value for community members; combine familiarity and excitement to sustain the community; and create a rhythm for the community members (p. 51). In addition, networks and communities of practice provide opportunities for targeted potential adopters to meet together, share practice, address challenges and build their practice. Networks and communities can be face-to-face, online, intra- or inter-institutional, and may also involve industry,

the professions and students. In developing a community of practice it is often useful to access existing professional networks that already exist. JISC (2009) suggested that a major area of interest is the use of technology to enhance communication and engagement with respect to the development of communities of interest and networks. The ability to access and use social web tools and software may "provide gateways to a multiplicity of interactive resources for information, entertainment and, not least, communication" (JISC 2009).

McDonald (2010), in relation to her ALTC Fellowship, noted that communities of practice (CoPs) are cited in higher education literature and ALTC applications as a successful way of building and sharing a scholarly approach to enhancing learning and teaching practice. However, there is still limited evidence of effective implementation approaches in higher education. It was clear that many of the technology-enhanced learning projects funded by ALTC endeavour to incorporate both an engagement and a sustainability dimension into their projects through the development of communities of practice. Without exception these communities of practice were predicated on the development of a web presence, both for the location of resources and the establishment of virtual spaces for engagement with the content and with colleagues. However, in a survey of online communities of practice "the greatest problem with virtual communities is withdrawing, or attrition. This problem can be reduced somewhat through good facilitation techniques and adequate scaffolding, especially in the cases of online communication techniques and technical support" (Johnson 2001, p. 47).

Conole and Culver (2009) support the difficulty in sustaining communities of practice. They suggest that the majority of teachers do not have the technological knowledge and/or skills to contribute to the sort of online environments that are essential to sustain online communities of practice. They also note that teachers are not able to engage in the 'radical rethink' (p. 679) required to make maximum use of the technologies available. This is reflected in their conclusion which states that their highly interactive 'cloudworks' site http://cloudworks.ac.uk/ has not achieved its broader vision of becoming a conduit for sharing teaching and learning despite this site being actively managed. It is not surprising that when projects establish a website as part of the dissemination process, little activity will occur unless it is facilitated in a purposive manner. The ALTC has recognised the issue and has funded three projects aimed at enhancing dissemination. The 'D-Cubed Dissemination Project InDesign Resources' defined dissemination strategies as "any activities or processes designed to distribute an innovation, but also the activities that occur between the development of an innovation and its application in an appropriate setting" (Bywood, Lunnay & Roche 2008). The transfer or application of the innovation in another context is at the core of the ALTC strategic goals with the 2008 guidelines and funding agreements mandating the availability of web resources for at least three years following the completion of fellowships and projects.

What may be needed to sustain communities of practice are new ways of learning through networks and ecologies (Siemens 2006). The implication of this change is that improved lines of communication need to occur. "Connectivism is the assertion that learning is primarily a network-forming process" (p. 15). It is a theory of learning in the digital age that attempts to filter and offload knowledge to trusted members of a personal network. Some of the principles of connectivism include: learning requires a diversity of opinions; learning is a network formation; knowledge rests in networks; the capacity to know more is essential; and the capacity to remain current is valued (Siemens 2006). Wenger, White and Smith (2009) suggest that the convergence of technology and community requires "technology stewardship" (p. 24). In addition the "role is important in helping communities construct and live in suitable digital habitats" (p. 24). Technology stewardship is a perspective, practice and activities that some individuals utilise to maintain and sustain the community of

practice through digital networks. Gleick (2011) aptly comments on the importance of networks and technology by suggesting that “more and more, the lexicon is in the network now – preserved, even as it changes; accessible and searchable. Likewise, human knowledge soaks into the network, into the cloud” (p. 419).

8. Academics need sophisticated **online teaching strategies** to effectively teach in higher education environments

“Today, online learning is the most accessible pathway to the new knowledge economy and related jobs for the majority of working people. To be effective for the next generation, online learning has to include mobile learning, eGaming, online communities, and learning management systems that engage each user” (Pannekoek 2008, p. i). As suggested earlier, student engagement is a key goal of teaching and learning in the online environment. Teachers need to be conversant in a wider range of skills to teach effectively in online environments. These skills focus on being able to engage the learner in an effective learning environment that is learner-centred, knowledge-centred, assessment-centred and community-centred (Bransford, Brown & Cocking 1999). Anderson (2008a) argues that learning-centred is a more appropriate term than learner-centred. A learning-centred online environment involves understanding the learner in terms of their attitudes, knowledge, perspectives and preconceptions about learning in an online environment. Online teachers need to get to know their students to enhance their participation and interaction in the online teaching environment. Knowledge-centred learning focuses on understanding the world through the lens of the discipline knowledge. Shulman (2005) refers to these unique approaches as the signature pedagogies of the professions. “A signature pedagogy is a mode of teaching that has become inextricably identified with preparing people for a particular profession” (Shulman 2005, p. 5). A signature pedagogy has a number of unique characteristics. Firstly, it is an approach distinctive to the profession (e.g. clinical rounds in medicine). Secondly, the approach is pervasive in the curriculum and thirdly, the approach is pervasive across institutions and therefore essential in the education of the profession. In addition the affordance of the online environment allows learners to enhance their knowledge through a connection to people, communities, ideas and knowledge via the online environment (Siemens 2006). Assessment-centred activities in the online environment need to focus on formative and learning-oriented assessment (Keppell & Carless 2006; Carless 2007) activities that encourage reflection and authenticity related to future career aspirations. The affordances of the online environment also encourage peer learning and collaboration, and project-based learning. Community-centred learning focuses on creating new knowledge in a community of practice. “The challenge for teachers and course developers working in an online learning context, therefore, is to construct a learning environment that is simultaneously learner-centred, content-centred, community-centred, and assessment-centred (Anderson 2008a, p. 67)”.

In addition, interaction is a key concept in learning to encourage meaningful learning. Information access (course and subject expectations) conveys/delivers information to the individual learner through the learning management system. This may include course design information as well as the subject related requirements in relation to subject information, learning outcomes, assessment and a rationale for the use of online tools. Information access allows easy access by learners to information or resources and the ability to review the content at any time through the learning management system. Interactive learning (learner-to-content interactions) determines the blends that are appropriate at subject level, taking into account factors such as the learning space (on-campus, at a distance, workplace learning, the level of learner engagement with the resources within the learning management system environment, and other connected environments such as ePortfolio, Web 2.0 tools, online meeting spaces and so on). It involves an individual interaction with the resources. These resources would be embedded within the online environment

or may involve standalone CD-ROMs, DVDs which are delivered to distance education learners or utilised by learners in face-to-face classes. Networked learning (learner-to-learner, learner-to-teacher interactions) enhance communication between learners, and between learners and teachers within the learning management system, and other connected environments such as ePortfolio, Web 2.0 tools, online meeting spaces and so on. Peer learning is central to this approach, where it is expected that there would be two-way dialogue/feedback between learners and/or two-way dialogue/feedback between learners and the teacher. Within the learning management system this may include: forums, chat, group tasks, reflective journals, blogs, online debates, online presentations, virtual tutorials, and wikis. Student-generated content (learners-as-designers, assessment-as-learning) emphasises the design, development and presentation of products and artefacts which may also be associated with the formal assessment of the subject. These artefacts may include student-generated reflective journals, digital stories, presentations, e-portfolios, group projects as well as photographs, video and audio artefacts and web 2.0 technologies. Individual, partner and group developments may be utilised in this approach (Keppell 2011).

"In many ways, learning and teaching in an online environment are much like teaching and learning in any other formal educational context: learners' needs are assessed, content is negotiated or prescribed, learning activities are orchestrated, and learning is assessed. The pervasive effect of the online medium, however, creates a unique environment for teaching and learning" (Anderson 2008b, p. 343). The community of inquiry (CoI) framework (Garrison, Anderson & Archer 2000) is one of the most popular models of online learning. It is based on a critical thinking and practical inquiry model. A successful online learning community needs the integration of social presence, teaching presence and cognitive presence. Social presence focuses on the engagement of the student in the online learning environment. Teaching presence focuses on the actions of the teacher such as facilitation, design and organization, whereas cognitive presence focuses on critical and creative thinking (Anderson 2008b; Shea 2011). Teachers design and organise the learning experience by determining what will be learnt and the activities that will be undertaken in the online spaces before teachers and students actually meet. They also choreograph the discourse interactions. Anderson (2008b) suggests that interactions include student-student, student-content, student-teacher, teacher-content, teacher-teacher, content-content, learner-group and teacher-group interactions. The teacher is also an authority on the content and has a 'discipline pedagogy' that adds value to the teaching and learning experience. "The CoI model represents a powerful framework for understanding online learning in collaborative pedagogical environments. While it represents an ideal in which teachers and learners perform the same roles (expressed as teaching presence), it ignores some of the real world dynamics that shape and constrain much of online learning in practice. Learners and instructors do not perform identical roles and thus must engage in different behaviors to succeed" (Shea et al. 2011, p. 2561). For this reason Shea et al. suggest the addition of learning presence to the CoI model. Edwards, Perry and Janzen (2011) suggested that exemplary online educators were challengers, affirmers and persons of influence. Challengers referred to online educators who demanded high standards and had high expectations for the students. Affirmers were online educators who encouraged and respected their students throughout the course of their study. Online educators were considered a person of influence when they had subject matter expertise and a strong online presence.

Another area of increasing importance in higher education is **mobile learning,** where learning design is critical for optimising the learning experience of mobile learners or mobile device users. The use of mobile technology such as Smartphones and iPods represents a promising area to examine online learning. Mobile technologies may provide further flexibility to the student experience in

higher education and may become increasingly important as students and academics traverse physical, blended and virtual learning environments. “With its strong emphasis on learning rather than teaching, mobile learning challenges educators to try to understand learners’ needs, circumstances and abilities even better than before. This extends to understanding how learning takes place beyond the classroom, in the course of daily routines, commuting and travel, and in the intersection of education, life, work and leisure” (Kukulska-Hulme 2010, p.181). The Horizon Report (2011) suggests that there is a shift in the means by which users are connecting to the internet due to: “the growing number of internet-capable mobile devices, increasingly flexible web content, and continued development of the networks that support connectivity.” It is also suggested that 100 per cent of university students utilise mobile phones and that their portability and ubiquity are powerful tools for learning and teaching. Their ability to be used as electronic book readers, annotation tools, image, video and audio capture tools, and for creation, composition and social networking is becoming increasingly sophisticated (Horizon Report 2011).

In addition “learning when mobile means that context becomes all-important, since even a simple change of location is an invitation to revisit learning, in both a literal sense (to apply it, reflect on it, reinforce it, share it) and metaphorical, to reconsider what constitutes learning or what makes it effective in a given situation” (Kukulska-Hulme 2009, p. 159). Conversely, it is possible to argue that the context becomes immaterial when mobile technologies make any place a learning space. Sharples, Taylor & Vauoula (2009) suggest that mobile learning needs to be considered from two perspectives. The first perspective focuses on mobile devices (smartphones, ipads, laptop computers, etc) that allow the user to be mobile due to the power of the technology to allow learning wherever they are. The second perspective focuses on the mobility of the people who travel across time and space and utilise technology at various places as they travel via ‘walk and use’ information terminals. They also focus on learning conversations within a mobile world that require negotiation of language and context. Macdonald and Creanor (2010) suggest that students may study at home, in a student residence, when travelling, in the library or public access area and at the workplace.

9. Academics need a knowledge of **multiliteracies** to teach effectively in contemporary technology-enhanced higher education

Citizenship increasingly necessitates the use of a diverse range of new technologies and modes and mediums of communication to be able to effectively learn and operate within the context of the 21st century and beyond. Thus, being “literate is vital for learning and working, possibly more so in the digital age than in the industrial age, given society’s reliance on digital technologies” (Pullen, Gitsaki & Baguley 2010 p.xiii). Rapidly evolving communications media and the multitude of platforms for learners to share and shape meaning requires new forms of digital, cultural and communicative literacies (McLoughlin 2011, p. 471). The DigEuLit Project, an initiative of the eLearning Programme of the European Commission, proposed three levels of digital literacy: 1 - Digital Competence: Mastery of basic skills and competence; 2 - Digital Use: Using digital tools for professional and personal needs; 3 - Digital Transformation: Creative use of technologies, including the development of knowledge and new tools (McLoughlin 2011, p. 473).

Beetham (2010) defines being digitally literate as possessing “the functional access, skills and practices necessary to become a confident, agile adopter of a range of technologies for personal, academic and professional use”. Other similarly used terms include eLiteracy, electronic literacy, media literacy, information literacy, visual literacy, ICT Literacy, technological literacy and technoliteracy. With the interconnectedness of digital technologies, technology and communication come together to form another literacy commonly referred to as technoliteracy (Walker,

Huddlestone & Pullen in Pullen, Gitsaki & Baguley 2010). This diversity of definition and plural nature of such literacies elucidates the multiliterate and complex nature of the concept (Pullen, Gitsaki & Baguley 2010; McLoughlin 2011).

Multiliteracies extends to the use of social software which may describe technologies such as weblogs, forums, RSS feeds, social bookmarking or wikis. The social aspect of such technologies often arises through a blended approach to utilising such technologies in combination to result in the formation of communities (Anderson 2005). Social interaction is fundamental to the pursuit of high quality thinking and learning outcomes according to social constructivist theorists (Vygotsky 1978) and social software promotes such exchanges through the development of online communities with a multitude of communication channels. These interactions can take several forms, including one-to-one (instant messaging or email), one-to-many (blogs or web pages) and many-to-many (wikis). The term educational social software is defined as “networked tools that support and encourage individuals to learn together while retaining individual control over their time, space, presence, activity, identity and relationship” (Anderson 2005, p. 4).

Conclusion

The analyses of the 33 ALTC technology-enhanced learning projects have identified a number of inspiring approaches and pedagogies that have informed or been developed through the projects. These pedagogies align with the perspective of Kreber (2010) where she notes:

> "pedagogy emphasises three core premises: students are validated in their ability to know, learning is situated in the students experience, and the concept of learning underpinning it is one of mutually constructing meaning. These three premises describe … a *constructive developmental pedagogy (CDP*)" (p. 173).

These premises are pervasive throughout the 33 projects and are the genesis of the outcomes identified which inform the recommendations for this good practice report.

A focus of a number of projects has been on the development of strategies and initiatives that have enhanced engagement of students through the use of interactive technologies to foster self-directed learning and improve learning outcomes. These include: Role-based learning environments (CG6-39), Immersive learning environments for process engineering (CG6-21), Educating the net generation (CG6-25), Web3D technologies with university curricula (CG7-488) and Virtual teacher practicums (PP10-1755).

Associated and complementary to the engagement of students is the incorporation and use of authentic approaches and activities which enhance understanding of real-life interactions through the involvement and engagement of staff and students in immersive environments that replicate authentic learning environments. These include: Role-based learning environments (CG6-39), Web3D technologies with university curricula (CG7-488), Online clinical assessment (eCAPS) (PP8-893), Immersive learning environments for process engineering (CG6-21), eSimulations for professional education (CG8-771), Virtual microscopy (CG7-398) and Virtual teacher practicums (PP10-1775).

Action learning was integral to a number of projects to enhance engagement, involvement and ownership of the learning process by academics and to facilitate greater access to and use of the learning resources. The Action Learning approach is also reflected in university-wide activities that integrated pedagogy with institutional dimensions such as planning, staff development and infrastructure provision. These include: Learning to teach online (CG9-1091), Teaching quantitative skills (CG6-24), Benchmarking (G17-630), Assessing meta-attributes in process engineering (CG6-23), eSimulations for professional education (CG8-771) and Remotely accessible laboratories (CG 6-40).

Pedagogies associated with curriculum and learning design and the alignment of staff and student expectations are significant themes that have emerged from the analysis. These involve identification of the efficacy of learning approaches and assumptions of student readiness to engage with technologies. These include: Remotely accessible laboratories (CG6-40), Educating the net generation (CG6-25), Web-based lecture technologies (CG6-22), Virtual microscopy (CG7-398), Immersive learning environments for process engineering (CG6-21), Cascade and viral leadership (LE9-1231) and Web 2.0 authoring tools in higher education (PP9-1350).

An increasing use of social software and the evolution of the pedagogy associated with the software use (multi-literacies) is evident and this enables greater opportunities for peer-to-peer discussion and student-generated content that emphasises the student-as-designer. These include: Role-based learning

environments (CG6-39), Web3D technologies with university curricula (CG7-488), Social software to support networked learning (CG6-36) Online report writing (CG6-30), Virtual teacher practicums (PP10-1775) and Web 2.0 authoring tools in higher education (PP9-1350).

The development of a community of practice, the sharing of re-usable learning objects and practices and the benefits for learners arising from this objective involve a number of projects focused on enhancing engagement. These include: Web3D technologies with university curricula (CG7-488), Educating the net generation (CG6-25), reusable learning designs (Oliver's Fellowship) and Cascade and viral leadership (LE9-1231).

A key pedagogy involves interactivity, with a wide range of projects including the enhancement of interactivity and the promotion of interactive strategies and initiatives such as eAssessment and feedback on electronic submissions as key outcomes. These include: Remotely accessible laboratories (CG6-40), Social software to support networked learning (CG6-36), Educating the net generation (CG6-25), Remarks PDF (PP7-542), Remarks PDF – Stage 2 (PP9-1593), Teaching quantitative skills (CG6-24), Online clinical assessment (eCAPS) (PP8-893) and Web 2.0 authoring tools in higher education (PP9-1350).

Finally, the meta-analysis of the technology-enhanced learning projects has identified ten outcomes (p. 2). These outcomes represent the major themes reflected in the 33 projects reviewed. Each of these outcomes is elaborated in the literature review (p. 42). The outcomes represent the identifiable best practices of the 32 projects incorporated into projects or arising from project successes. Each outcome is a synthesis of the effective practices and pedagogies represented across the 33 projects reviewed. This triangulated approach reinforces the validity of both the outcomes and the recommendations.

The outcomes provide evidence-based good-practice guidance available to inform institutions and individuals seeking to introduce and implement technology-enhanced learning initiatives. The projects in turn provide exemplars of technology-enhanced learning initiatives.

These outcomes have resulted in ten recommendations focused on specific audiences involved with technology-enhanced learning. These recommendations provide a framework for enhanced practice which individuals and institutions might utilise when implementing technology-enhanced learning initiatives. The concept maps in (Appendix A: Figures 1-10) provide a graphical representation of the outcomes and associated projects. The concept maps provide the linkages between each outcome and the associated projects and provide a roadmap for the reader to examine sustainable and successful approaches to project development and implementation.

Overall the projects are framed by ALTC's overarching values and principles of: excellence, sustainability, inclusiveness, diversity, and collaboration. http://www.altc.edu.au/system/files/ALTC%20Strategic%20Plan%202010-2013.pdf

Recommendations

In analysing the projects and investigating the literature, we concluded that there was a range of conditions and factors which contributed to successful project outcomes addressing one or more of the overarching values and principles of: excellence, sustainability, inclusiveness, diversity, and collaboration as articulated by the ALTC. These factors led to the development of a set of recommendations representing a framework for success for implementing technology-enhanced learning initiatives. The recommendations reflect the underlying pedagogies implicit in the projects as noted above. They also reflect the explicit outcomes of the projects.

The recommendations provide guidelines that academic practitioners, institutions and sponsors might consider when implementing strategies on both a macro and a micro scale within the university and higher education sector. It was disappointing to observe that when the funding ceased for many projects, enthusiasm and commitment to the work appeared to dissipate. The recommendations therefore provide essential guidance for sustainable communities of practice.

The recommendations provide a framework for enhanced practice and the beginning of pathways to success, sustainability and the attainment of positive outcomes for projects. They also encourage the beginning of the journey described by Laurillard et al. (2009) who suggested that "the route from research to innovation, then to practice, through to mainstream implementation" (p. 304) is essential for enhancing learning and teaching in higher education through technology-enhanced learning.

Recommendation 1:
The active engagement and involvement of **senior management** is critical to institutional integration and uptake of technology enhanced learning and teaching initiatives.

Recommendation 2:
Project **sustainability** is enhanced when there is engagement with an active (existing) community of practice.

Recommendation 3:
Embedding a technology-enhanced learning and teaching initiative into the wider **curriculum** is likely to lead to a more sustainable change than confining the initiative to within a single course or subject.

Recommendation 4:
To ensure continuity and ongoing value from **repositories and websites**, they must be actively managed and maintained both during and beyond the required three years post completion of the project.

Recommendation 5:
The development of tools for use within a technology-enhanced context must be accompanied by rigorous **evaluation** across a range of relevant contexts.

Recommendation 6:
Assessment considerations should be an integral component of all technology-enhanced learning and teaching initiatives.

Recommendation 7:
Academic development activities need to focus on sustainable, immersive strategies that allow teachers to enhance their own discipline teaching.

Recommendation 8:
Academic teachers should be encouraged to model and share **learning designs** within their own university, partner institutions and symposiums and conferences in higher education.

Recommendation 9:
Teachers need to learn the language of the internet, new media and new thought processes, as **multi-literacies** in the digital age require a new set of skills in order to effectively communicate and interact in the modern world.

Recommendation 10:
Projects should consider the inclusion of **postgraduate students** (Honours, Masters, PhD) to research the technology-enhanced learning initiative.

Completed ALTC projects and fellowships

Innovation with quality assurance: online curriculum development for the University of New England's multi-institutional collaborative programs in German at New England, James Cook and Newcastle universities (CG6-34)

Status: Completed, 2009

Institutions: University of New England (lead), James Cook University, The University of Newcastle

Project team: Kerry Dunne (Project Leader), Beat Lehmann, Jennifer Evans, Inge Wormleaton, Iain MacKay

Keywords: German grammar, blended learning, deutsche-rklärt, eTutoring, vodcast, podcast

Project website: http://tlc.une.edu.au/deutsch-erklaert/
ALTC overview and project report: http://www.altc.edu.au/project-innovation-quality-assurance-une-2006

Project aim: To use a blended approach to deliver German curriculum for distance learners through the use of new technologies and an iterative developmental approach.

Academic development: The eTutor manual was developed to build staff capacity through the provision of guidelines for inducting tutors into online teaching. This was relevant to all academics using materials and virtual learning environments (VLEs). The most common challenges are addressed and suggestions focus on strategies that can be effectively employed to create a community of practice with learners.

Findings and outcomes: The structure of components and modules, use of visual materials and guidelines outlined in the eTutor Manual are applicable to a variety of disciplines exploring distance or flexible learning.

The conventional style of grammar delivery accompanied by illustrative pictures is a technique that could contribute to language learning.

Resources: Project website: This website provides access to 15 online modules, each consisting of between 11 and 13 components addressing the grammatical topics in a sequential manner. Each module contains: a video exposing students to authentic language, interactive web based activities and games, podcasts, practice exercises, transcripts and learning strategies that permit their use with a variety of textbooks and teaching curriculum.

The eTutor Manual: This manual provides guidelines for tutors of online teaching using online materials and virtual learning environments (VLEs) to teach a language other than English (LOTE). It is a highly valuable accompaniment to the actual online curriculum project “Deutsch e-rklärt”.

New technologies, new pedagogies: using mobile technologies to develop new ways of teaching and learning (CG6-33)

Status: Completed, 2008

Institution: University of Wollongong

Project team: Jan Herrington (Project Leader), Tony Herrington (Project Leader), Brian Ferry (Project Leader), Ian Olney (Project Leader), Jessica Mantei, Geraldine Lefoe, Rob Wright

Keywords: mLearning, action learning, design-based research, new technologies, pedagogy, learning design, authentic learning, academic development

Project website: http://mlearning.uow.edu.au/ & http://ro.uow.edu.au/newtech
ALTC overview and project report: http://www.altc.edu.au/project-new-technologies-new-pedagogies-using-uow-2006

Project aim: To develop innovative pedagogies using mobile technologies to enhance teaching and learning in higher education.

Academic development: Professional development (PD) workshops were held regularly with project members, IT and PD personnel working collaboratively, reflecting and sharing ideas and experiences through a group learning process where teaching ideas were discussed, trialled, evaluated and refined.

Teachers were engaged directly from a Faculty of Education using an action learning professional development framework to explore and invent pedagogies appropriate to the use of a mobile device in completing a complex task within an authentic learning environment.

Findings and outcomes: The methods developed for the professional development workshops will be applicable not only to other new and emerging technologies, but to a range of other contexts requiring a self-reliant action learning approach.

Mobile technologies were integrated into adult, early childhood, environmental, information technology, language and literacy, mathematics, physical education, science, visual arts and reflective practice.

A two-day conference was held at the end of the second year of the project after the cases had been implemented and evaluated.

Resources: Edited eBook titled 'New technologies, new pedagogies: mobile learning in higher education' that explores the use of mobile devices in learning in higher education, and provides examples of good pedagogy.

Project website provides access to succinct case study descriptions and exemplars of the pedagogies developed for the mobile learning devices.

Project EnRoLE: encouraging role-based learning environments (CG6-39)

Status: Completed, 2009

Institutions: University of Wollongong (Lead), Macquarie University, The University of New South Wales, The University of Sydney, University of Technology Sydney

Project team: Sandra Wills (Project Leader), Elizabeth Rosser, Elizabeth Devonshire, Andrew Vincent, Elyssebeth Leigh, John Shepherd

Keywords: eLearning, evaluation, ICT-based teaching, internationalisation, learning design, learning objects, new technologies, peer review, role-play, simulation, community of practice

Project website: http://enrole.uow.edu.au/
ALTC overview and project report: http://www.altc.edu.au/project-project-enrole-encouraging-rolebased-uow-2006

Project aim: To encourage the uptake of online role-based learning environments by building a community of practice at university, state and national levels. The project also addressed the issue of designers working in isolation and failing to integrate findings.

Academic development: The project developed an effective cascade model for creating a community of practice. This was however, contingent on the adequate provision of infrastructure to support staff by way of access to technical knowledge, time allowances, learning design knowledge, and professional development.

Findings and outcomes: It is essential that the use of online role based learning approaches are integrated into mainstream curriculum development cycles. Peer review processes form part of this iterative process.

There needs to be appropriate and sustained acknowledgement of the investment required by academics to take risks in doing things differently.

The project developed a community of practice for the new field including 21 partnerships in the reuse of existing role plays and 22 EnROLE Fellows to carry on the work.

Dissemination activities included 43 EnROLE events involving 816 participants in three Australian states, including a masked ball as a unique professional development model.

Resources: Frameworks included: EnROLE Dissemination Model, EnROLE Fellowship Framework, EnROLE Peer Review Framework, EnROLE Partnerships Framework, EnROLE Uptake Model, and EnROLE Research Agenda.

Documentation: This includes a definition of role based learning, 128 role based learning activities and a catalogue of 158 role play designers, 50 role play descriptions, 17 EnROLE Family Trees and a Generation Matrix.

Publications include: 68 refereed publications, eight related forums for publication, 23 quality assurance recommendations, international co-authored book, forthcoming international edited book and the BLUE Report.

Remotely accessible laboratories (CG6-40)

Status: Completed, 2008

Institutions: University of Technology Sydney (Lead), Curtin University

Project team: David Lowe (Project Leader), Steve Murray, Dikai Li, Euan Lindsay

Keywords: Remote access, laboratories, engineering, pedagogy, eSimulation, authentic learning, engagement, learning design, virtual laboratory, student perceptions

ALTC overview and project report: http://www.altc.edu.au/project-remotely-accessible-laboratories-%E2%80%93-uts-2006

Project aim: To investigate factors that influence student reactions to, and engagement with remote laboratories especially relating to group dynamics and student trust in outcomes.

Academic development: An ongoing cyclical process with specific training was required for laboratory staff members who were required to act in both a consultative role and as an interrogator in their engagement with student-users.

Findings and outcomes: Increasing costs associated with the provision of laboratory facilities prioritises the exploration of remotely accessible laboratories for institutions and students.

A mixed approach to learning involving some laboratory and some remote provision was a more effective option; however, the literature review exposed the lack of research relating to the pedagogies associated with laboratory teaching.

The project strengthened relationships between partner, national and international institutions including MIT (Boston, USA), Carinthia (Villach, Austria), Stevens (New Jersey, USA), and Leeds (UK).

In addition the project contributed to an enhanced understanding of the importance of student preferences to blended approaches, tutor support delivered remotely, group work conducted remotely and the importance of trust and authenticity.

Trust and authenticity were shown to be critical factors in the design of the laboratories.

Resources: A set of shareable resources related to the pedagogy and effective utilisation of remote laboratories was shared with a number of institutions. These projects materials can be accessed through direct contact with the project team leaders.

A significant literature review, student survey and a number of publications were developed (See report for details).

The impact of web-based lecture technologies on current and future practices in learning and teaching (CG6-22)

Status: Completed, 2009

Institutions: Macquarie University (lead), Murdoch University, Flinders University, University of Newcastle

Project team: Maree Gosper (Project Leader), Margot McNeill, Karen Woo, Rob Phillips, David Green, Greg Preston

Keywords: Web-based lecture technologies (WBLT), digital literacy, learning design, curriculum design, engagement

Project website: http://www.cpd.mq.edu.au/teaching/wblt/overview.htm
ALTC overview and project report: http://www.altc.edu.au/resource-impact-webbased-lecture-technologies-macquarie-2008

Project aim: To discover how learning and teaching is influenced by the use of web-based lecture technologies (WBLT), specifically Lectopia (currently known as Echo360) and the integration of such technology into the curriculum.

Academic development: WBLT was seen as a disruptive technology and challenged staff pedagogical understandings and the traditional design and development of curriculum. By better understanding the educational impacts of its use for academics and their teaching, the design and delivery of curricula, establishment of effective learning environments and provision of professional development could be improved.

Findings and outcomes: There was a clear discrepancy between student and staff perceptions and experiences of WBLT. The impact and integration of such technologies requires considerable context-specific consideration.

Most students (67 per cent) reported positive experiences toward the use of WBLT, especially the flexibility in access and support for learning it offered, whilst only 30 per cent of staff perceived the same importance toward WBLT.

The use of WBLT was found to contribute to a more blended relationship between face-to-face and distance modes and lowered in-class attendance, resulting in a blurring of the lines between distance and internal students.

The passive nature of lectures raised questions as to the validity of lectures as a mode of teaching.

The introduction of WBLT has professional and organisational implications especially in the areas of curriculum design, infrastructure and support services.

Resources: Project website provides access to many resources including informative vignettes, case studies and publications.

Staff Guide: 'Making the most of lectures through iLecture'. This assists staff to enhance their usage of WBLT (iLecture).

Guide for Students: to help students make the most of WBLT (iLecture).

The seamless integration of Web3D technologies with university curricula to engage the changing student cohort (CG7-488)

Status: Completed, 2010

Institutions: University of Southern Queensland (Lead), Central Queensland University, Web3D Consortium (International)

Project team: Peter Albion (Project Leader), Janet Taylor, Penny de Byl, David Jones

Keywords: Learning design, eSimulation, authentic learning, academic development

Project website: http://www.web3d.org/
ALTC overview and project report: http://www.altc.edu.au/project-seamless-integration-web3d-usq-2007

Project aim: To examine new approaches to the development of virtual worlds that are responsive to needs and limited in their resource requirements that can be utilised by staff without technical expertise.

Academic development: A project officer worked with participating academics to support the teaching of significant elements of courses within Second Life™. This approach was successful in producing examples of good practice that could be shared with and emulated by other academics. The focus was on supporting participants with academic development in the technology and exploring appropriate pedagogy for the new environments.

Findings and outcomes: The project pioneered the use of Second Life with academic staff by assisting academics to plan and implement teaching in existing virtual worlds that provided relatively easy-to-use tools for customising an environment.

The project has been a catalyst for the development of a national network of educators involved in Second Life and this project was highly successful in fostering a community of practice.

The popularity of computer games, especially among the younger students, and the emergence of networked games and game-like virtual worlds offers opportunities for enhanced interaction in educational applications within distance education courses.

Resources: Project website is a comprehensive resource about the project.

Web 3D Wiki provides access to a wide range of Web 3D information.

Digital learning communities (DLC): investigating the application of social software to support networked learning (CG6-36)

Status: Completed, 2008

Institutions: University of Canberra (Lead), Queensland University of Technology, RMIT University

Project team: Robert Fitzgerald (Project Leader), Stephen Barrass, John Campbell, Sam Hinton, Yoni Ryan, Mitchell Whitelaw, Axel Bruns, Adrian Miles, James Steele, Nathan McGinness

Keywords: Social software, peer learning, digital literacies, community of practice

ALTC overview and project report: http://www.altc.edu.au/project-digital-learning-communities-dlc-uc-2006

Project aim: To apply an evidence-based approach to increase student engagement with peers and group learning through innovative applications of social software in university teaching.

Academic development: Pilot projects fostered staff engagement

Findings and outcomes: University students need to learn new network and software literacies to become digital citizens. They also need to learn how to collaborate with each other and the wider community.

University ICT professionals need to examine new ways to support lecturers' experimentation, development and wider introduction of new software and network services to support student learning.

University administrators, ICT professionals and lecturers need to understand that while students may *browse* the internet rather than actively *contribute* through producing and sharing content, there are strong indications that this is changing, particularly with respect to social networking applications.

Resources: A set of pilot reports and practical guides for the application of social software techniques in Australian university teaching were outlined in the project report.

Learning Manifesto**:** recognises that students and lecturers will increasingly move towards a model of co-production where education and its institutions will need to become more open.

Social Software Cookbook: contains a collection of recipes to help users understand social software, Web 2.0 services, and educational practices that use network literacies in context.

These resources were made public through an online wiki (http://wiki.mashedlc.edu.au/index.php/CookBookManifesto), they are however, no longer accessible at this web address. For more information please contact a member of the project team.

Creating a student centred online learning environment for report writing in the sciences and engineering (CG6-30)

Status: Completed, 2009

Institutions: The University of Sydney, The University of New South Wales

Project team: Peter McGee (Project Leader), Helen Drury, Janet Jones, Peter O'Carroll, Richard Massey, Natassia Goode, Pam Mort, Sue Starfield, Melinda Cook, Kathy Kuzmanovic, Aida Yalcin

Keywords: Report writing, graduate attributes science, engineering, digital resources, learning design

Project website: http://www.usyd.edu.au/learningcentre/wrise/
ALTC overview and project report: http://www.altc.edu.au/project-creating-student-centred-online-sydney-2006

Project aim: To develop, implement and disseminate an online learning environment to improve student report writing in the discipline areas of science and engineering, where traditionally students are known to struggle with their writing.

Academic development: The project facilitated an exchange of knowledge and skills in the formation of collegial links across and within institutions. The project also developed competencies in the area of learning and an ongoing commitment and intent in developing learning resources to improve students' written communication.

Findings and outcomes: Students experienced improved understanding and confidence in report writing and discipline content after having used the website.

In general, users gained better marks than non-users, although differences were not significant except in one instance. However, when marks were pooled across disciplines, on average, report marks of those who used the website were significantly higher than those who did not.

Students understood discipline content better and there was an increase in their confidence where report writing is concerned.

The majority of users had an in-depth approach to using the site, visiting it on a number of occasions and spending at least an hour on the site. Data showed strong site use with active usage reflecting dates for report submission.

Resources: Project website provides access to course specific sites of both report writing information space and topic area space across nine different discipline areas: biology, molecular biology year 2 and year 3, chemistry, microbiology, physiology, chemical engineering, civil engineering and mining engineering.

Guide for Students provides information about accessing, navigating, using and learning using write reports in science and engineering (WRISE) for students.

Guide for Staff provides information for staff about introducing WRISE to students, using the WRISE site and a student handout.

Increasing the participation of Indigenous knowledge holders in tertiary teaching through the use of emerging digital technologies, Professor Michael Christie (2008 ALTC National Teaching Fellow)

Status: Completed, 2010

Institutions: Charles Darwin University, Yolŋu (East Arnhemland Aboriginal) knowledge authorities

Project team: Michael Christie worked with a significant number of contributors from the Yolŋu (East Arnhemland Aboriginal) knowledge authorities, and international experts in the use of digital technologies for knowledge work and eTeaching, higher education teachers and students in Indigenous studies and a national Indigenous reference group.

Keywords: Student engagement, distance education

Project website: http://www.cdu.edu.au/tfc
ALTC overview and project report: http://www.altc.edu.au/altc-national-teaching-fellow-michael-christie#program-summary

Project aim: The project addressed the fundamental issue of mobilising digital technologies so that Indigenous knowledge can be actively and effectively incorporated into higher education teaching programs while remaining faithful to the ancestral practices and protocols which govern them.

Academic development: A series of teacher training workshops were undertaken; however, no distinction was made between the social and technical, and individual approaches to technology use were developed.

Findings and outcomes: Students involved in the program felt that it facilitated the empowerment of Yolŋu knowledge, learning styles and authorities in the teaching in the Yolŋu Studies. They also developed an enhanced understanding of Yolŋu pedagogy and what it meant to be a learner.

The strength and sustainability of the program was reliant upon the Yolŋu authority's proper recognition and support by the CDU staff.

A two day symposium and major workshop were undertaken in 2008. In these workshops Yolŋu teachers were recorded on video and participants developed websites using 'Webpress'.

An international seminar was held in July 2009 which discussed the program's progress and perspectives of those involved or invited to attend. The papers presented at the international seminar are being collected for publication in a book.

Resources: Project website provides access to information about the 'Teaching from Country' program, ongoing developments and the teaching resources developed.

'Teaching from Country' sessions: These are time-coded videos of the 'Teaching from Country' sessions including audio transcripts.

Encouraging benchmarking in eLearning (G17-630)

Status: Completed, 2011

Institution: University of Southern Queensland

Project team: Alan Smith (Project Leader), Christine Goodacre, Jodie Gunders, Louise Williamson, Marisa Parker

Keywords: eLearning, benchmarking, community of practice, ACODE

Project website: http://www.acode.edu.au/benchmarks.php
ALTC overview and project report: http://www.altc.edu.au/project-encouraging-benchmarking-elearning-usq-2007

Project aim: To raise awareness and familiarity with the eLearning benchmarks developed by the Australasian Council on Open, Distance and ELearning (ACODE). Secondly, to enhance the uptake of the benchmarks and provide training in their use for assessing university performance as well as improving practice (in eLearning) through workshops and web-based activities.

Academic development: The dissemination of information aimed to develop champions of the benchmarks within institutions. Training was provided for a group of staff from the Innovative Research Universities Australia (IRUA) group of universities in the use of the benchmarks and a case study was developed that was disseminated as part of the workshops and posted on the ACODE website.

Findings and outcomes: Raised awareness and familiarisation of the benchmarks, enhanced uptake and use of the benchmarks within institutions and attempted to create communities of practice.

73 representatives from most Australian universities, as well as the vocational education and training (VET) sector attended workshops. These were delivered in Brisbane, Sydney, Perth, Adelaide and Melbourne.

A targeted workshop and follow-up activities were conducted for the IRUA group.

An evaluation was completed by 82 per cent of participants. Of these, 96 per cent felt that workshop outcomes had been realised, and 86 per cent of respondents indicated their intention to use some or all of the benchmarks (54 per cent within the institution only and 46 per cent with partners). Value was placed on the usefulness of the peer review process for sharing evidence of practice.

The independent evaluation showed 30 per cent had used the benchmarks mainly for internal self assessment.

Resources: The ACODE Benchmarks reside on a dedicated section on the ACODE website.

Virtual microscopy for enhancing learning and teaching (CG7-398)

Status: Completed, 2009

Institution: The University of New South Wales (UNSW)

Project team: Rakesh Kumar (Project Leader), Gary Velan, Patrick de Permentier, Paul Adam, Stephen Bonser, Michel Beal

Keywords: Digital repository, science, redesign, digital resources, community of practice, authentic learning, virtual microscopy

Project website: http://virtualslides.unsw.edu.au
ALTC overview and project report: http://www.altc.edu.au/project-virtual-microscopy-enhancing-unsw-2007

Project aim: To create high-resolution microscopy slides to enhance learning outcomes for the health professions through increased accessibility of resources and consistency of approach and understanding.

Academic development: The importance of peer review in the development of digital open-access resources was recognised throughout the process. Furthermore, a major teaching reform was required in redesign of practical classes for the simultaneous teaching of normal histology and histopathology through team teaching by staff from anatomy and pathology.

Findings and outcomes: There was a statistically significant improvement in the marks of students in a virtual slides practical compared to a traditional class setting indicating improved learning.

In a student evaluation on a scale from one to five, mean ratings above four for effectiveness, quality of images, ease of use and capacity for promoting discussion by students were achieved.

Over 80 per cent of students described virtual slides as fun and almost 90 per cent rated them as better than traditional microscopy.

The standardisation of delivered material and the ability for students to review at a convenient time offers benefits to students and teachers.

The use of virtual slides enabled vision-impaired students to take classes previously not possible due to the move away from microscope-centred learning.

Resources: An online digital repository with free access, designed for educational staff to use in developing subjects at a school, TAFE/VET and tertiary level. This repository houses 600 virtual slides for use in learning and teaching in human anatomy (histology), human pathology (histopathology), comparative anatomy/zoology and plant ecology/evolution.

Examples and worksheets are also available to help practitioners effectively incorporate these virtual slides into lessons, moving away from traditional teaching and learning practices.

Click here to watch a YouTube clip about the use of virtual microscopy at UNSW.

Educating the net generation: Implications for learning and teaching in Australian Universities (CG6-25)

Status: Completed, 2009

Institutions: The University of Melbourne, The University of Wollongong, Charles Sturt University

Project team: Gregor Kennedy, Barney Dalgarno, Sue Bennett, Kathleen Gray, Terry Judd, Jenny Waycott, Rosemary Chang, Andrea Bishop, Karl Maton, Kerri-Lee Krause

Keywords: Net generation, digital literacy, technological literacy, digital natives, digital immigrants

Project website: http://www.netgen.unimelb.edu.au/
ALTC overview and project report: http://www.altc.edu.au/project-educating-net-generation-melbourne-2006

Project aim: To empirically document and compare technological experiences and preferences of net generation students and their teachers. Secondly, it aimed to identify how technology-based tools may be successfully used by practitioners to facilitate and enhance students' learning experiences.

Academic development: A lack of staff knowledge and skill in the use of technology and its use in teaching prompted the development of key resources for facilitating staff capacity building. Guidance and time commitment by staff was needed to develop skills in the design and development of learning tasks. These tasks involved new and emerging technologies and integration into undergraduate studies.

Findings and outcomes: Little empirical evidence supports the rhetoric that university students are digital natives and university staff are digital immigrants; thus, staff and student development in the use of technologies is required.

The learning and technical preferences and skills of students and staff are quite different.

Aligning pedagogical, technical and administrative issues is a necessary condition for success.

Resources: Educating the Net Generation: A Handbook of Findings for Practice and Policy provides a set of practice and policy guidelines developed from the project findings.

Educating the Net Generation: A Toolkit of Resources for Educators in Australian Universities includes adaptable research instruments for researchers investigating student and staff use of new technologies, or educators planning and evaluating implementations of new technology-based activities in higher education.

Workshops: In 2009 a series of workshops enabled Australian universities to engage more fully in 'Educating the net generation'.

An online community was established to complement workshops undertaken in 2009.

Development, deployment and educational assessment of an advanced immersive learning environment for process engineering design operations (CG6-21)

Status: Completed, 2009

Institutions: The University of Queensland (Lead), Curtin University, Monash University, The University of Melbourne, The University of Sydney

Project team: Ian Cameron, Caroline Crosthwaite, David Shallcross, John Kavanagh, Geoff Barton, Nicoleta Maynard, Moses Tade, Andrew Hoadley

Keywords: Learning design, eSimulation, authentic learning, 3D visualization, engineering, process systems engineering

ALTC overview and project report: http://www.altc.edu.au/project-development-deployment-educational-uq-2006

Project aim: To use high fidelity digital imaging to create two 3D walk-through environments at process and chemical engineering plants.

Academic development: Collaboration with industry and institutions was critical in creating the authentic learning environments.

Findings and outcomes: The development of the immersive learning environment required strong industry engagement as access to real operating sites and use of spherical digital photography was critical. This required an excellent working relationship with the industry partners who, in this case, included BP Refinery (Bulwer Island), Brisbane, Queensland and Coogee Energy, Laverton, Victoria.

The 3D environments have important applications within industry and secondary education to inform, enthuse and deepen understanding of these complex engineering operations.

Evaluation of initial data from students on learning outcomes has shown increased insight by students into principles and practices within process engineering and a broadened understanding of process and chemical engineering plants.

The project developed collaborative relationships with chemical/process engineering departments in Australia, and a number of major industrial companies. It was envisaged that these relationships would support the further development of the immersive virtual reality (VR) environments.

Resources: Two advanced VR environments were developed which include the BP Refinery and Coogee Energy Methanol Plant for undergraduate engineering students.

Other resources include learning activities in areas of process and equipment design principles, key aspects of process operations, systems dynamics and risk management principles for undergraduate students across the curriculum.

Resources that enabled the industry to engage with the general public were also developed as well as resources to provide training and site inductions for new staff and operators.

Building academic staff capacity for using eSimulations in professional education for experience transfer (CG8-771)

Status: Completed, 2010

Institutions: Deakin University (Lead), RMIT University, Charles Sturt University

Project team: Jacob Cybulski (Project Leader), Dale Holt, Stephen Segrave, David O'Brien, Judy Munro, Brian Corbitt, Ross Smith, Martin Dick, Ian Searle, Hossein Zadeh, Pradipta Sarkar, Mike Keppell, Deb Murdoch, Ben Bradley

Keywords: eSimulations, digital resources, knowledge-sharing, academic development

Project website: http://www.deakin.edu.au/itl/insims/altc-project/index.php
ALTC overview and project report: http://www.altc.edu.au/project-building-academic-staff-capacity-using-esimulations-professional-education-experience-transf

Project aim: The project aimed to transfer knowledge and build organisational capacity to develop, deliver and evaluate digital simulations (eSimulations) to enhance professional learning in the Australian higher education sector.

Academic development: A major aspect of the project was the development of staff capacity across the three partner universities.

Findings and outcomes: The project developed seven eSimulations across three universities. Training and ongoing knowledge transfer discussions were also successful across the three universities. The project developed a national and international network of leading scholars and practitioners in eSimulations in higher education.

Student feedback provided anecdotal support for the value of using eSimulations. Students appreciated the learning value of the eSimulation within the broader context of the unit.

Resources: A series of eSimulations covering a range of professions were developed. These eSimulations included business analysis, requirements engineering, project management, interviewing and counselling, domestic violence police response procedures and financial planning.

A student eSimulation evaluation survey instrument was developed.

An edited book titled 'Professional Education Using eSimulations: Benefits of Blended Learning Design' is currently being published.

A guide to designing, developing, using and evaluating eSimulations for professional learning in Australian higher education aims to meet the needs of various audiences involved in designing, producing, evaluating, researching, leading, and managing eSimulation programs.

Several training days, knowledge transfer discussions and numerous publications formed part of the project's dissemination strategy.

Click here to view the DeakinSims page.

Promoting the uptake of re-usable ICT based learning designs, Professor Ron Oliver (2006 ALTC Associate Fellow)

Status: Completed, 2008

Institution: Edith Cowan University

Keywords: Digital resources, learning design, authentic learning, digital repository

Project website: http://aragorn.scca.ecu.edu.au/tsldb/
ALTC overview and project report: http://www.altc.edu.au/altc-associate-fellow-ron-oliver#program-summary

Project aim: To develop reusable and shareable resources that would support teachers' adoption of ICT-based learning designs and ensure that technology added value to the learning setting.

Academic development: The technology-supported learning database (TSLDB) provides access to numerous resources for staff and has been used as a professional development tool.

Findings and outcomes: The main issues regarding this project centred on its ability to entice practitioners to contribute their learning activities. This would create a rich resource, maintain currency and increase return users of the website. The development of an RSS feed would develop a community of practice amongst practitioners through increased connectivity and awareness of new artefacts on the website.

The project exposed participants in professional development programs to diverse models of practice. It also assisted in developing an understanding of the principles of effective learning settings. The TSLDB has enhanced the dissemination of good-practice examples.

The TLSDB has been showcased in a number of forums since the commencement of the project in 2007. This has included numerous presentations and published papers.

Resources: The TSLDB houses 52 activities and aims to promote the mainstream sharing and reuse of learning designs. Plans exist to further develop the database in a variety of ways including the addition of functional elements of the TSLDB. These elements would enable the TSLDB to inform users of additions and updates to the database through the application of RSS feeds and a means for users to join the community of users.

As part of the dissemination academics across the Western Australian universities were invited to a forum in November 2008 which enabled participants to explore the notions of learning design and to explore the designs in the TSLDB.

Raising the profile of diagnostic, formative and summative eAssessments. Providing eAssessment design principles and disciplinary examples for higher education academic staff, Professor Geoffrey Crisp (2009 ALTC Teaching Fellow)

Status: Completed, 2008

Institution: The University of Adelaide

Keywords: Authentic learning, community of practice, assessment, digital literacy

Project website: http://andy.services.adelaide.edu.au/moodle; http://www.transformingassessment.com/
ALTC overview and project report: http://www.altc.edu.au/altc-national-teaching-fellow-geoffrey-crisp#program-summary

Project aim: This fellowship has promoted learning and teaching in Australian higher education by enhancing approaches to eAssessment through the articulation of a design model and the collection of disciplinary examples of interactive eAssessments.

Academic development: Extensive presentations across Australia and New Zealand enabled dissemination, staff development and the finetuning of eAssessment concepts.

Findings and outcomes: The project promoted an understanding of approaches to eAssessment designs, based on the use of diagnostic, formative and summative assessments.

There was an increased awareness of the possibilities for diagnostic and formative assessment and feedback through the use of personal response systems (PRS) and wireless technologies as alternative forms of eAssessment in the classroom.

A community of practice in eAssessment was developed.

The project facilitated changes in approaches to assessment, including the increased use of: helper applications and simulations, role-plays and scenario-based learning coupled to eAssessment, authentic assessments that use digital tools that are relevant to the professional lives of graduates, and improved use of multistructural and relational diagnostic and formative assessment items with appropriate feedback.

Resources: An eAssessment framework to facilitate changes to assessment tasks that enable students to play an active role in assessment activity.

A website containing discipline examples of interactive eAssessments, within a standard learning management system is available under the ALTC project section.

Rethinking assessment in the participatory world – assessment 2.0, Professor Geoffrey Crisp (2011 ALTC National Teaching Fellow)

Status: Completed, 2011

Institution: The University of Adelaide

Keywords: Assessment, e-assessment, virtual environments, Web 2.0

Project Website: http://www.transformingassessment.com

Project aim: To assist teachers and higher education institutions align their learning, teaching and assessment practices through raising awareness of the potential for interactive and authentic e-assessments in tertiary education.

Academic development: With all resources open-source and available to the public tis offers academics the opportunity to initiate self-directed development, with the webinars and e-assessment exemplars great learning tools that can be used by academics. Tracking data has indicated that 11,861 visitors have accessed the site between the 4th of January 2010 to the 12th of October 2011 from around the globe.

Findings and outcomes: The webinar series proved to be an effective way to increase the breadth of topics that could be covered by the fellowship. Webinars also enabled a wider group of participants to interact with the presenters compared to face-to-face sessions.

The fellowship also highlighted how the quiz tool in the open-source system Moodle might be linked to Second Life.

The fellowship explored the use of virtual or remote laboratories and field trips, role-plays and scenario-based activities for e-assessment tasks.

Finally, the fellowship examined the growing use of educational digital games for learning and assessment and why such approaches might become a common format for new learning and assessment spaces in tertiary education.

Resources: The fellowship created a website which provides access to the majority of resources developed including an extensive bibliography of e-assessment resources, Web 2.0 examples, an archive of previous webinars and information about upcoming webinars.

A blog and wiki have also been developed and can be accessed from the project website.

In addition, a series of short videos were constructed around particular Assessment 2.0 examples and a series of webinars have been made available through YouTube.

An Island in Second Life was constructed that demonstrated how assessment tasks may be created in a virtual world.

The fellowship report is also an informative document outlining assessment, types of assessment and examples of interactive e-assessment.

ReMarks PDF – stage 1 (PP7-542)

Status: Completed, 2009

Institutions: University of New England (Lead), Deakin University, Monash University, Open Universities of Australia, The University of Newcastle, University of Southern Queensland

Project team: Stephen Colbran (Project Leader)

Keywords: Assessment, assessment management, electronic marking, feedback, PDF annotations

Project website: http://www.remarkspdf.com/
ALTC overview and project report: http://www.altc.edu.au/project-remarks-pdf-une-2007

Project aim: To create a PDF editor enabling the cross-platform mark-up of student electronic assessment submissions.

Academic development: ReMarks has been trialled with groups at several institutions for delivering feedback and aims to assist academic staff to embrace electronic marking of student assessment. It provides high quality tools that enable markers to explore new types of feedback and to also significantly speed up the marking process.

Findings and outcomes: ReMarks encourages structural change and leadership in the sector by providing resources for training of academic markers, combined with purpose built easy to use software.

Dissemination of the project outcomes has occurred through the establishment of the ReMarks website, a secure ftp site, a Ning social networking site, and via an extensive road show conducted by Stephen Colbran which visited most tertiary institutions in Australia.

Resources: ReMarksPDF is a PDF editor for educators to annotate, collaborate and report on student electronic assessment submissions.

ReMarksXML: an addition to Microsoft Word 2007 and 2010 for Windows for educators to annotate, collaborate and report on student electronic assessment submissions.

Public website includes product information, training videos and exemplars.

The ReMarks PDF – mark up editor stage 2 (PP9-1593)

Status: Completed, 2010

Institutions: University of New England (Lead), Deakin University, Monash University, Open Universities of Australia, The University of Newcastle, University of Southern Queensland

Project Team: Stephen Colbran (Project Leader)

Keywords: Assessment feedback, ePortfolios, eSubmission, learning outcome mapping and tracking, electronic marking

Project website: www.remarkspdf.com, www.remarks.ning.com
ALTC overview and project report: http://www.altc.edu.au/project-remarks-pdf-stage-2-une-2009

Project aim: To further develop the ReMarks PDF and XML marking editors as well as develop an eSubmission and assessment allocation system, tracking and mapping of learning outcomes and business intelligence features.

Academic development: ReMarks encourages structural change and leadership in the sector by providing resources for the training of academic markers, combined with purpose built easy to use software. The software is supported by the developer team and the software designer.

Onsite training for academic staff commenced in March 2009 at Deakin (Burwood campus), UNE in April 2009 and at CDU in June 2010.

Findings and outcomes: Beta testing of ReMarks PDF was conducted with actual student assessment papers at UNE, which revealed changes necessary to improve the software.

The software is now in a state where it can proceed to formal trials and has been released to the sector.

The keystone of ReMarks is the ease with which the software can be implemented across a variety of educational sectors and contexts.

The software has been designed to be multilingual, enabling easy extension of the software in the international context. The software has also been designed to be compliant with disability standards, such as colour blindness and Jaws compliance.

Resources: Further development of the ReMarks PDF and XML marking editors as well as an eSubmission and assessment allocation system, tracking and mapping of learning outcomes and business intelligence features has been undertaken in Stage 2.

The absence of related publications has been due to patent considerations. However, the trials and the collection of data from focus groups and survey instruments should result in a range of publications.

Public website includes product information, training videos and exemplars.

Teaching and assessing meta-attributes in engineering: identifying, developing and disseminating good practice (CG6-23)

Status: Completed, 2009

Institutions: University of Wollongong (Lead), Engineers Australia, RMIT University, The University of Queensland, The University of Sydney

Project team: Anna Carew (Project Leader), Sandrine Therese, Simon Barrie, Alan Bradley, Paul Cooper, John Currie, Roger Hadgraft, Timothy McCarthy, Sharon Nightingale, David Radcliffe

Keywords: Graduate attributes, curriculum renewal, stakeholder engagement, engineering, leadership, heuristics, community of practice

Project website: N/A
ALTC overview and project report: http://www.altc.edu.au/project-teaching-assessing-metaattributes-uow-2006

Project aim: To investigate and address the teaching and assessment of graduate attributes in engineering through processes of leadership development, shared understanding and conducting surveys, focus groups and interviews.

Academic development: The strong focus on building a community of practice promoted staff capacity building through peer-to-peer learning. Leadership development for participants was also supported throughout the life of the project.

Findings and outcomes: The project developed national leadership for embedding graduate attributes through teaching and learning in engineering, and for program-level curriculum redevelopment.

Nine workshops and seminars were delivered with 140 participants focused on graduate attributes or engineering curriculum review in engineering.

The project disseminated problem analysis guidelines, examples and potential solutions to improved teaching and assessment of graduate attributes in engineering.

The project team concluded that academic developers need to concentrate on capacity building at the individual level (i.e. seeding new ideas and supporting engineering academics to try new approaches to teaching soft skills).

There also needs to be a blend of soft and technical skills in engineering courses.

Resources: The project developed two heuristics: a poster on graduate attribute assessment called ‘Engineering graduate capabilities continuum: a continuum of learning outcomes’. The second heuristic focused on ‘Engineering curriculum review: process overview’. It illustrates curriculum review as a process in eight stages, with three ongoing themes.

Many co-authored publications were delivered as a mechanism for engaging academics in thinking through, talking about and reflecting on the means and mechanisms for improved teaching and learning in engineering (See report for listings).

A new enabling technology for learning and teaching quantitative skills (CG6-24)

Status: Completed, 2008

Institution: The University of Queensland

Project team: Peter Adams (Project Leader), Jamie Alcock, Michael Bulmer, Joseph Grotowski, Min-Chun Hong, Michael Jennings, Valda Miller, Mia O'Brien, Victor Scharaschkin

Keywords: Enabling technology, quantitative skills, mathematical principles, assessment, digital repository

Project website: http://smartassignments.virtual.vps-host.net/index.htm
ALTC and project report: http://www.altc.edu.au/project-new-enabling-technology-learning-uq-2006

Project aim: To develop tools and approaches to enhance the quantitative and mathematical skills of students at the lower tertiary and upper secondary level. This is achieved through the creation of a flexible open source software application that generates examples, problems and questions covering fundamental mathematical, statistical and quantitative skills.

Academic development: Whilst there is little technological know-how required to operate this system, the provision of staff instruction or workshops could increase the volume and quality of its use. If effectively utilised it may help staff to meet the increasing time pressures and assist teachers of secondary-level mathematics that may have limited mathematical backgrounds.

Findings and outcomes: The repository was used extensively in one course at The University of Queensland, where it proved effective and illustrated the possible widespread application of the system to the education sector.

It is important to recognise not only the functionality of such resources but also their usability and user-preferences in design.

Resources:Smart Assignments Repository is an online software tool that generates sets of questions and corresponding fully worked solutions that cover a range of mathematical concepts. Questions include significant random variation, not just in numerical constants but also in their algebraic content. This can be used to create an unlimited set of extra practice questions for students and teachers, and can also be used to create personalised assessment items.

Six key applications to be used by students, educators and future contributors of materials:

1. Command Line Approach
2. Edit Settings Module
3. Interactive Application Module
4. Template Repository Application Module
5. Assignment Constructor Module
6. Web Interface Module.

Learning to teach online (LTTO): developing high-quality video and text resources to help educators teach online (CG9-1091)

Status: Completed, 2011

Institutions: The University of New South Wales (Lead), Monash University, The University of Queensland, The University of Sydney

Project team: Mr Simon McIntyre (Project Leader), Mr Rick Bennett

Keywords: Community of practice, digital resources, academic development, online learning

Project website: http://online.cofa.unsw.edu.au/learning-to-teach-online/ltto-episodes?view=video&video=155A
ALTC overview and project report: http://www.altc.edu.au/project-learning-to-teach-online-unsw-2009

Project aim: To generate a collection of digital instructional resources that explore key issues integral to online course development and teaching. These resources are disseminated around the globe through online distribution systems such as iTunes U and YouTube. Through this process the project further aims to create a global online community of practice to enable those using the materials to engage in scholarly discourse, establish a supportive peer network, showcase developing initiatives and provide direct feedback about the resources.

Academic development: The project is centrally focussed on staff development and building the capacity of academics to teach online.

Findings and outcomes: Development of a technical infrastructure to disseminate the episodes including: a website, UNSW TV, iTunes U and YouTube channels.

A social media dissemination strategy resulted in 36 unsolicited national and international blog posts, and 372 Twitter users sharing information about the project across 34 different countries.

Teachers in 117 countries, from a range of disciplines and education sectors, have accessed the episodes over 60,000 times in just eight months.

22 institutions in 6 countries have linked to the project on their own websites as learning and teaching resources.

14 institutions in five countries have embedded the project resources into their own professional development or educational programs.

Resources: The learning to teach online website includes the LTTO Forum to support the community of practice and a suite of 32 video and PDF episodes categorised into context, planning and teaching.

Click here to watch an episode on ‘Conducting effective online discussions’.

Building a network of academics who use, contribute to and disseminate an online, cost-effective histology learning and teaching resource for students in Australia and overseas, Professor Geoffrey Meyer (2009 ALTC Teaching Fellow)

Status: Completed, 2011

Institution: The University of Western Australia

Keywords: Histology, community of practice, digital resources, digital repository

Project website: http://meyershistology.moodle.com.au/
ALTC overview: http://www.altc.edu.au/altc-teaching-fellow-geoffrey-meyer

Project aim: The aim of this fellowship was to build a network of multidisciplinary teachers of histology to further develop and widen access to a web-based and histology learning resource.

Academic development: Instructors were given the ability to add their own histological sections to the database of digitised images as well as customise the learning contents and materials available for specific student cohorts. The fellowship also shared this innovation with other Australian and overseas universities and colleges as well as facilitating a collaborative network of histology educators.

Findings and outcomes: Learning contents/materials were transferred to an online learning management system (Moodle) that enabled secure access for histology students in Australian universities and overseas universities and colleges.

Specific portals were created for individual histology teachers to customise the learning content/materials for their specific cohort of students.

Histology teachers were assigned administrator roles which allowed them to contribute content for use by all teachers and students.

Opportunities were available to reconsider and reconceptualise traditional teaching approaches.

Increasing numbers of histology teachers in overseas universities became collaborative partners and their students accessed the resource.

Resources: Meyer's Histology is an online learning management system that enables secure access to interactive learning and teaching resources to support the teaching and learning of histology. There were 5436 users (students) at the time the final report was completed.

This web-resource includes the Online Interactive Atlas which permits users to interact with over 6000 high resolution images and use the computerised microscope to simulate viewing tissue/organ sections as well as histological sections using virtual microscopy.

Online Learning & Teaching Resources provide access to audio/visual lectures, handouts, power point presentations, laboratory guides and an assessment package to help improve performance in examinations.

To see a working demonstration of this teaching program click on the following link http://www.youtube.com/user/histology2009

An integrated system for online clinical assessment of practical skills (eCAPS) for web-based courses (PP8-893)

Status: Completed, 2010

Institutions: The University of Queensland (Lead), The University of British Columbia (Canada), The University of Melbourne

Project team: Doune Macdonald (Project Leader), Craig Engstrom, Peter Hay

Keywords: Authentic learning, assessment, eAssessment, clinical practice

ALTC overview: http://www.altc.edu.au/project-integrated-system-online-uq-2008

Project aim: To develop, evaluate and expand the possibilities for the online learning programs of clinically-oriented professions through the use of the innovative elearning assessment tool (eCAPS).

Academic development: The *e*CAPS protocol should provide a useful platform for continuing professional development and competency assessment for health fields such as medicine, physiotherapy, and exercise physiology.

Findings and outcomes: There were notable improvements in the performance of the physical examination skills across the various cohorts.

With sufficient internet bandwidth, the video/web-based technologies were relatively simple and easy to use. In addition, the technology did not appear to impede the response quality of the students or the capacity of the expert assessors to make reliable judgements of their performances.

Technology can provide a context for the promotion of quality feedback for students whether their learning context is remote, face-to-face, within problem-based learning or individual in nature.

Online and audiovisual technologies can provide useful learning and assessment opportunities for practical skills when they are developed in a manner that promotes a coherent relationship between subject matter, performance expectations, student demonstrations of practical skills and feedback.

Resources: The project developed web video lectures of clinical examination exemplars by experts in the field of musculoskeletal and sports medicine (including orthopaedic surgeons and sports physicians).

Learner-generated video demonstrations of practical skills were developed by students in response to the sports-injury scenarios developed by field experts. These involved students producing and uploading mock videos of clinically-realistic practical skill-sets (e.g. demonstrating targeted joint examinations).

The project developed online support materials to aid students' engagement in each phase of *e*CAPS. This included a range of instructional videos on the use of digital video cameras, production/compression of videos and guidelines related to uploading the videos to the online repository for assessment and class community viewing.

These resources were managed through an internal repository.

Web 2.0 authoring tools in higher education learning and teaching: new directions for assessment and academic integrity (PP9-1350)

Status: Completed, 2011

Institutions: The University of Melbourne (Lead), Monash University, RMIT University

Project team: Kathleen Gray (Project Leader), Celia Thompson, Jenny Waycott

Keywords: Assessment, authorship, digital literacy, eLearning, social software, communication

Project blog: http://web2assessment.blogspot.com/p/about-this-project.html
ALTC overview: http://www.altc.edu.au/project-web20-authoring-tools-higher-education-melbourne-2009

Project aim: To examine the challenges involved in assessing students' Web 2.0 activities in higher education, and develop resources to support good academic practice when lecturers undertake this form of assessment.

Academic development: A national roundtable provided support to a collaborative review and synthesis of key concepts and issues from the literature. The roundtable also examined new findings about Australian academics' practices and assessment policies of Australian universities.

Findings and outcomes: The data collected in surveys and interviews with key educational stakeholders suggested that practice of Web 2.0 activities in higher education was more limited than the educational commentary would suggest. The discussion paper provides further detail of the survey and interview findings.

A national roundtable involving 30 academics assisted the development of a set of key technology, pedagogy and policy considerations for use by academics in reflecting upon the assessment of student Web 2.0 activities.

The project developed 17 case studies which elicit in-depth information and examples of academic practices involving the assessment of student Web 2.0 authoring in diverse teaching and learning settings.

Focus group discussions provided the opportunity for lecturers to reflect on their own academic practices and assessment.

Resources: The project blog includes access to a draft framework of good practice in the assessment of student Web 2.0 activities as well as a list of publications and resources and other project information.

The publicly available wiki provides access to a suite of online resources designed to support academics who are using or plan to use social web technologies in their teaching, 17 case studies provide descriptions of academics' use of the social web for assessing student learning, checklists and further reading.

Click here to view the project team's recommended reading on their social bookmarking site.

Ongoing Projects

There remain eight ongoing projects and one ongoing fellowship at the time of publication. Thus, the analysis of the possible benefits of these ongoing projects to the sector through the development of resources, tools and research insights is derived predominantly from the brief project overviews outlined on the ALTC websites. This information is subsequently viewed in light of the complete projects, direction of the field and understandings of the project team. The significant limitations in deriving this analysis without access to more detailed project reports are recognised.

Professional staff as leaders in enhancing student engagement: building capacity in emerging technologies through cascade and viral leadership (LE9-1231)

Status: Ongoing, Funded 2009

Institutions: The University of Western Australia (Lead), Edith Cowan University, Murdoch University

Project team: Lisa Cluett (Project Leader), Judy Skene

Keywords: Community of practice, digital literacy, emerging technologies, engagement, generation Y, academic development

Project website: http://www.altc-viral.groupsite.com/
ALTC overview: http://www.altc.edu.au/project-professional-staff-leaders-engagement-uwa-2009

Project aim: The project had three distinct aims: firstly, to develop an ongoing, Western Australian-based network of professional staff leaders who foster student engagement through emerging technologies; secondly, to design, implement and evaluate web-based resources to support this network and to ensure its continuity; and thirdly, to create a new model of leadership for application in the tertiary sector, based on applying the cascade/viral model to building leadership capacity.

Academic development: The project aims to develop staff leadership potential to provide them with the capacity to use the tools that students themselves use to communicate in a manner that models innovative practice in the educational environment.

Findings and outcomes (Intended): A new conceptual model of leadership that will help the tertiary sector move beyond local experiments with emerging technologies to a wider engagement.

A community of leaders in the field of emerging technologies and student engagement across Western Australia was developed.

A comprehensive series of resources was developed that have been tested in different institutions and are transferrable across the sector.

Resources: Project website provides access to project information, communication channels and other relevant information. This includes: the 'ALTC-Viral online community' which is open to anyone interested in the project; the 'ALTC-Viral Network' which is open to any general/professional staff from the project partner institutions; and the 'ALTC-Viral Emerging Technologies course' conducted in 2010 and 2011 for staff at the partner institutions.

The eOSCE: advancing technology to improve students' learning and assessment reliability (PP10-1628)

Status: Ongoing, Funded 2010

Institutions: The University of Newcastle (Lead), The University of Queensland

Project team: Suzanne Snodgrass (Project Leader), Darren Rivett, Samantha Ashby, Trevor Russell, Imelda Burgman, Lynette McLachlan

Keywords: Assessment, OSCE, reliability, student feedback

Project website: In development
ALTC overview: http://www.altc.edu.au/project-eosce-advancing-technology-assessment-reliability-uon-2010

Project aim: To develop and introduce an electronic marking and feedback system utilising personal digital assistants (PDAs) to assess practical skills in the health professions.

The Electronic Objective Structured Clinical Examination (eOSCE) uses specialised software on iPads to record students' performance in practical examinations and provides student feedback to the student immediately by email. It is designed to increase opportunity for individual student feedback following practical examinations and reduce the time-investment for course coordinators in administering OSCEs with large student cohorts.

Academic development: This collaborative project will introduce an innovative mechanism for assessing students' practical skills in the health professions. The 'eOSCE' will provide an alternative to paper-based conventional methods with an electronic marking and feedback system utilising PDAs.

Findings/Outcomes (Intended): The project will evaluate student satisfaction with learning, reliability of assessment, administration efficiency and examiner and course coordinator satisfaction with using the eOSCE for the practical skills assessment of physiotherapy and occupational therapy students.

Data as to the effectiveness, reliability and efficiency of the eOSCE will also be made available.

The project is currently developing educational strategies to administer the eOSCE which will be in the form of interactive workshops for colleagues at participating universities as well as other key health professional educators in 2012.

The project is also developing key networks with stakeholders in academia as well as in clinical education.

Resources: Training materials will be disseminated to improve practical assessment and embed the skills with health professionals.

A project website that showcases the project and its ongoing developments will be developed.

Creating student-focused, web-learning resources to support the development of and provide evidence of occupational therapy students' graduating competencies (PP10-1774)

Status: Ongoing, Funded 2010

Institutions: The University of Newcastle (Lead), La Trobe University, James Cook University, The University of Western Sydney, Charles Sturt University, Deakin University

Project team: Susan Ryan (Project Leader), Carol Hills, Kim Nguyen, Carol Elizabeth McKinstry, Matthew Yau, Michael Curtin, Rosalind Bye, Catherine Studdert

Keywords: Competencies, occupational therapy (OT), digital resources, community of practice

Project website: In development
ALTC overview: http://www.altc.edu.au/project-creating-student-focussed-web-learning-resources-support-development-and-provide-evidence--0

Project aim: To investigate the best models available for OT students to collect evidence that shows their developed competencies throughout their undergraduate education. It also aims to provide tools to assist this competency development.

Academic development: Through involvement in the project, academics will facilitate competency development in practice education so that teaching and practice will be better aligned.

Findings and outcomes (Intended): The project disseminated quarterly newsletters as a formal means of communication with participating universities and the heads of all the Australian schools and the practice education co-ordinators at all the universities.

The project will deliver a range of presentations and publications to a variety of audiences both nationally and internationally throughout 2011 and 2012 to disseminate project outcomes.

Resources: This project will develop a student-focused web-portal to support the development and tracking of professional competencies for OT students across six Australia universities.

The web portal will comprise two parts: firstly, a set of learning tools and multi-media support materials informed by the students, educators and the new national competencies to enable students to continue developing their professional competencies while working in practice settings.

Secondly, the portal will provide a national framework mechanism whereby students can track and record evidence of the professional competencies they have developed throughout their undergraduate program.

A report on the evaluation of the website will be provided to other health science staff and students with a view to expanding the site as an inter-disciplinary resource.

Web blogs and information networks will also be developed.

VirtualPREX: innovative assessment using a 3D virtual world with pre-service teachers (PP10-1775)

Status: Ongoing, Funded 2010

Institutions: The University of New England (Lead), Australian Catholic University, Charles Sturt University, Curtin University, RMIT University, University of Hamburg (Germany)

Project team: Sue Gregory (Project Leader), Yvonne Masters, Barney Dalgarno, Heinz Dreher, Matthew Campbell, Torsten Reiners, Geoffrey Crisp, Vicki Knox

Keywords: eSimulation, assessment, academic development

Project website: http://www.virtualprex.com/
ALTC overview: http://www.altc.edu.au/project-virtualprex-innovativeAssessment-using-3d-virtual-world-pre-service-teachers-2010

Project aim: To evaluate whether 3D virtual practicum experiences can be used to assist pre-service teachers to acquire a better range of skills and confidence before being placed in real life situations.

Academic development: This project will develop staff knowledge, skills and competencies in the design of virtual environments for teacher practicums.

Findings and outcomes (Intended): The project intends to document principles and guidelines for developing and implementing formative assessment in a 3D virtual world based on application of social constructivist pedagogy for learning activities.

The project intends to develop a broad evaluation of the usefulness of Second Life in meeting the project aims for pre-service teachers.

The project will create a digital prototype primary school student and an automated classroom where pre-service teachers can practice their teaching skills by themselves, with other students and/or their academic teacher.

Guidelines and a space for using machinima (in-world video) for self, peer, formative and summative assessment will also be developed.

Assessable tasks for individuals or groups for use by higher educational institutions worldwide will be designed.

In addition, an agreed protocol for sharing, future use and development of VirtualPREX is anticipated.

Resources: VirtualPREX Website includes role-plays in Second Life to enable students to practice their teaching skills prior to live classroom professional experience.

A VirtualPREX wiki for team members.

Virtual world classrooms and school children avatars have been designed for conducting VirtualPREX activities in Second Life.

Click here to view a short video clip about the project and VirtualPREX.

Coordinated inter-professional curriculum renewal for eHealth capability in clinical health professional degrees (PP10-1806)

Status: Ongoing, Funded 2010

Institutions: The University of Melbourne (Lead), Curtin University, The University of Queensland, The University of Western Sydney

Project team: Kathleen Gray (Project Leader), Julie Filarski

Keywords: Curriculum, eHealth, learning design, information technology, communication, curriculum renewal

Project Wiki:
http://clinicalinformaticseducation.pbworks.com/w/page/37009016/Clinical%20Informatics%20Education
ALTC overview: http://www.altc.edu.au/project-coordinated-interprofessional-curriculum-renewal-eHealth-capability-clinical-health-professi

Project aim: To encourage and support program coordinators and directors of all Australian undergraduate and postgraduate coursework programs in all allied health, nursing and medical professions to include eHealth (or 'clinical informatics') curriculum where it is not yet in place, and to engage in collaborative continuing improvement where it is.

Academic development: Initiatives in professional education, training, learning and development are required to build the knowledge and skills the Australian health workforce will need to work in a national eHealth system. In Australia, very few educational providers in the health professions have developed a systematic approach to teach, assess, accredit or audit this aspect of professional education, and such curriculum initiatives are not widely known.

Resources: This project is developing resources for curriculum renewal in health professional degrees during 2011 and 2012.

To view the project's growing collection of peer-reviewed and report literature on clinical informatics education please visit http://www.citeulike.org/group/14766.

Adoption, use and management of open educational resources to enhance teaching and learning in Australia (CG10-1687)

Status: Ongoing, Funded 2010

Institutions: The University of New England (Lead), Massey University (New Zealand), University of Southern Queensland

Project team: Carina Bossu (Project Leader), Brian Simpson, Mark Brown, David Bull

Keywords: Copyright, intellectual property, licensing, open educational resources (OERs), open content

Project website: http://wikiresearcher.org/OER_in_Australia
ALTC overview: http://www.altc.edu.au/project-adoption-use-and-management-open-educational-resources-enhance-teaching-and-learning-austral

Project aim: To develop a "Feasibility Protocol" to enable and facilitate the adoption, use and management of OERs for learning and teaching within higher education (HE) institutions in Australia.

Academic development: Empowerment of staff in the principles of OER philosophy and practicalities through action learning.

Findings and outcomes (Intended): Expand understanding of the OER trend and impacts for Australia.

Enhance institutional understanding of the issues, barriers, opportunities and successes of OERs internationally through further collation of international experience and the analysis of national data.

Inform institutional and government policies and practices for OERs within HE in Australia.

Develop a better understanding of how OERs will enhance teaching and learning, enable and widen participation for key social inclusion targets in higher education, promote lifelong learning and bridge the gap between non-formal, informal and formal learning in Australia.

Resources: A feasibility protocol, containing a set of guiding principles with information on policy development, the description, use and management of OERs, reasons why higher education institutions have adopted OERs, issues and barriers involved with the adopting of OERs, and short case studies with examples from institutions that have adopted OERs (Who has adopted OERs and how have they used and managed them? What are the lessons learned?).

Conference presentations, journal articles, publications, media-based activities such as the project website and communication through targeted professional mailing lists.

Project information is available at their wiki researcher page.

An online writing centre for undergraduate engineering students: a one stop shop (CG10-1713)

Status: Ongoing, Funded 2010

Institutions: The University of Sydney (Lead), The University of New South Wales

Project team: Helen Drury (Project Leader), Rafael Calvo

Keywords: Engineering, online learning, report writing, graduate attributes

ALTC overview: http://www.altc.edu.au/project-online-writing-centre-undergraduate-engineering-students-one-stop-shop-2010

Project aim: To develop a comprehensive and systematic approach to the development of student writing through the deployment of innovative technologies and eLearning tools that facilitate peer feedback and scaffolding as well as enabling students to customise their writing via a semi-automated diagnostic tool.

Academic development: Development of staff competencies, knowledge and skills in the design and development and evaluation of online learning environments.

Findings and outcomes (Intended): The eLearning tools in the online writing centre (OWC) will support the writing process through peer feedback and scaffolding and enable students to customise their writing via a semi-automated diagnostic tool. In this way, the OWC will also support lecturers through the whole curriculum process.

Address ongoing concerns about the discrepancy between engineering students' communication skills and those identified as necessary by Government and professional bodies.

Resources (Intended): Provide a comprehensive and systematic approach to the development of student writing in engineering over the undergraduate years through the deployment of innovative technologies and eLearning tools.

Learning and teaching technical competence in the built environment using serious video game technology (CG10-1691)

Status: Ongoing, Funded 2010

Institution: The University of New South Wales (Lead)

Project team: Sidney Newton (Project Leader), Russell Lowe

Keywords: Assessment, games, learning design, digital literacy, eSimulation

ALTC overview: http://www.altc.edu.au/project-learning-and-teaching-technical-competence-built-environment-using-serious-video-game-techno

Project aim: To use the sophisticated interactive virtual reality simulation environments found in serious video game technologies to enable students to practice and demonstrate their technical skills through actual activities.

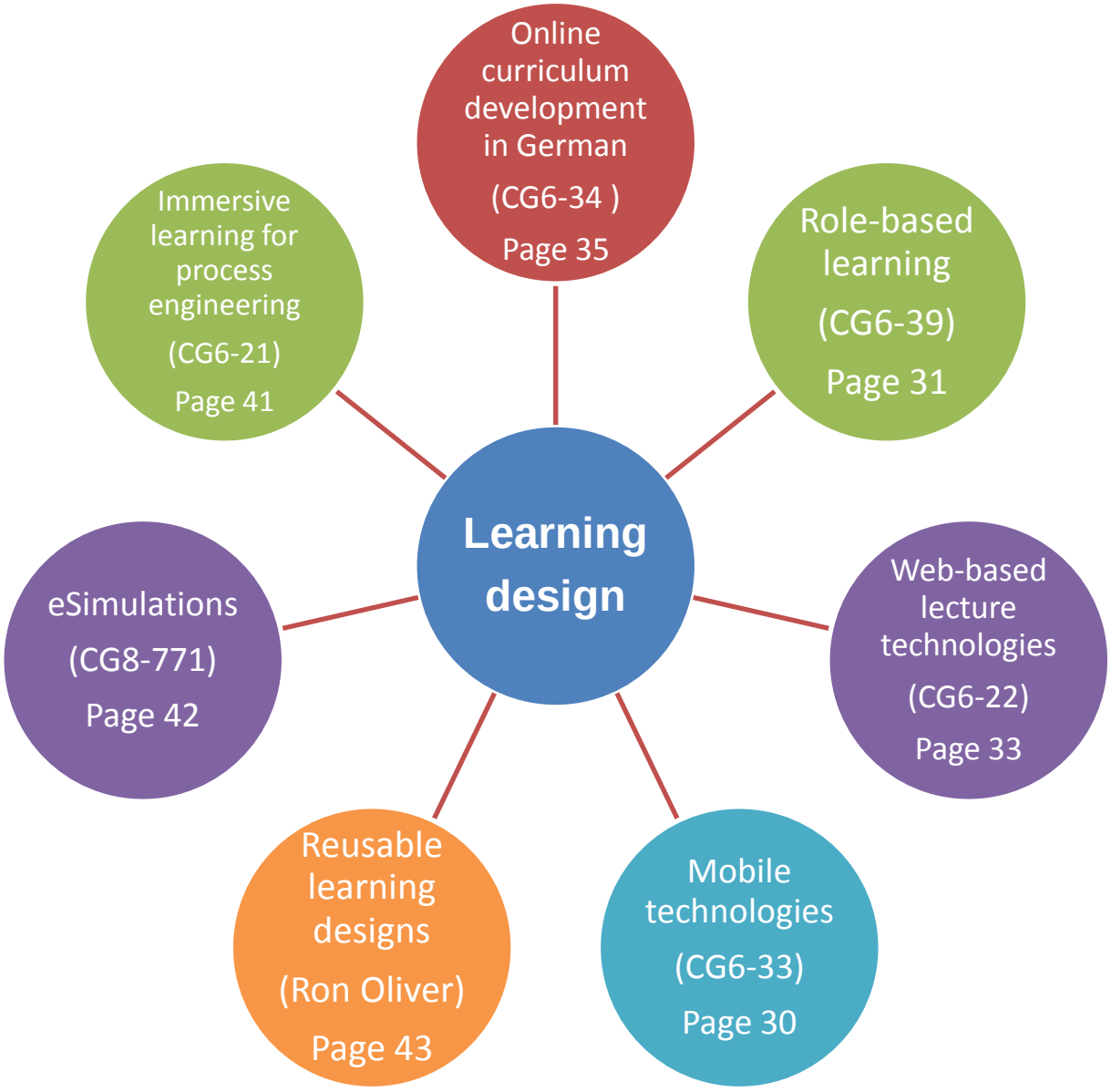
Academic development: Seminars and workshops

Findings and outcomes (Intended): Whilst the project is specific to domestic construction technology, the approach has possible application across all sectors of higher education where technical professional skills are taught and assessed.

Resources (Intended): An interactive virtual reality simulation environment that enables students to practice and demonstrate their technical skills in domestic construction technology through forensic analysis of detailed house models represented in the game.

Appendix A Concept Maps

1. A focus on **learning design** allows academics to model and share good practice in learning and teaching



Definition: "A methodology for enabling teachers/designers to make more informed decisions in how they go about designing learning activities and interventions, which is pedagogically informed and makes effective use of appropriate resources and technologies. This includes the design of resources and individual learning activities right up to curriculum-level design. A key principle is to help make the design process more explicit and shareable. Learning design as an area of research and development includes both gathering empirical evidence to understand the design process, as well as the development of a range of resources, tools and activities" (Conole, forthcoming 2012, p. 8).

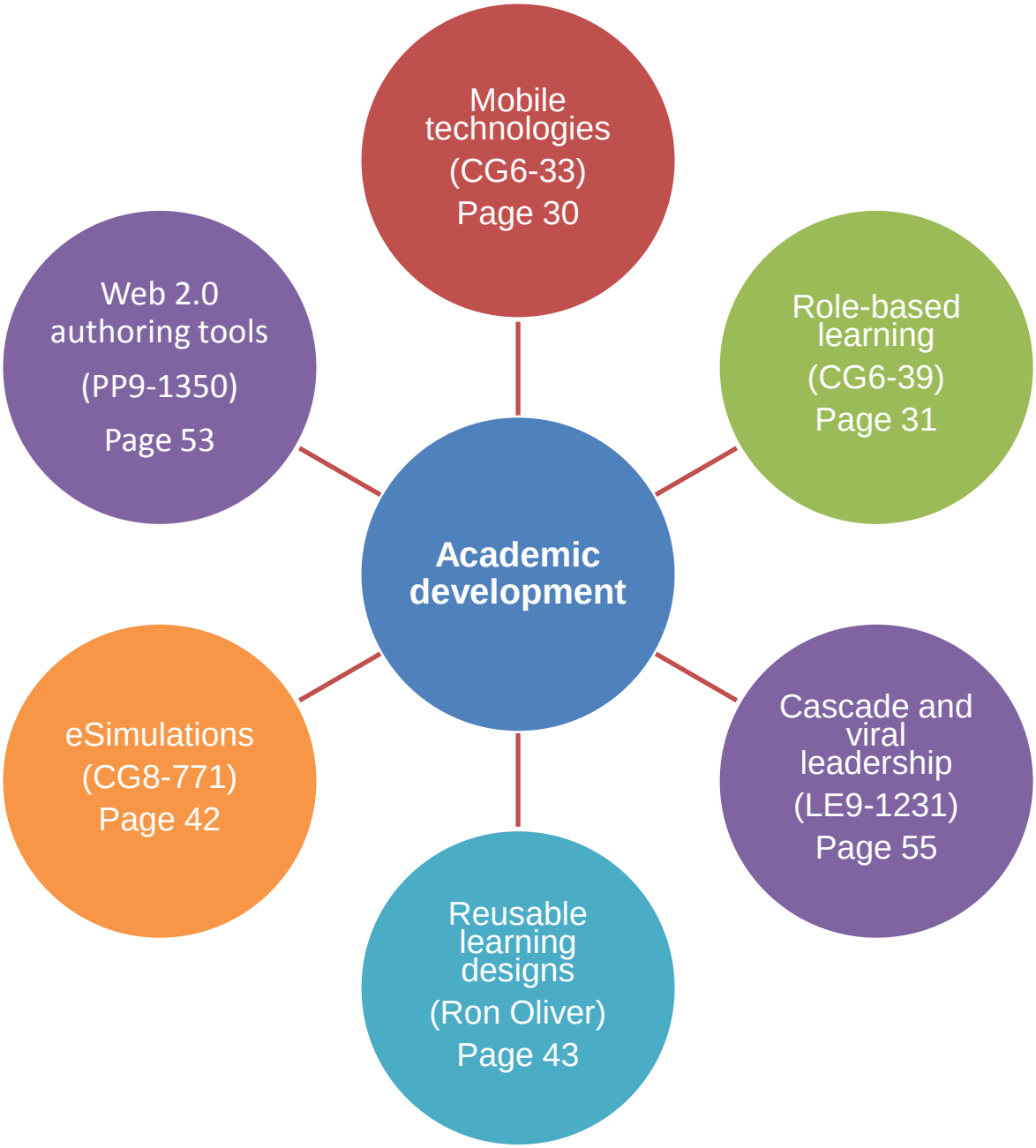
Recommended Reading: Conole, G, 2012, *Designing for learning in an open world,* Springer publications.

2. **Authentic learning** provides a means of engaging students through all aspects of curricula, subjects, activities and assessment

Definition: Authentic learning experiences focus on real world activities that value the application of knowledge to solve real-world problems.

Recommended Reading: Herrington, J, Reeves, TC & Oliver, R 2010, *A guide to authentic eLearning*, Routledge, New York.

3. Successful **academic development** focuses on engaging academics over sustained periods of time using action learning cycles and the provision of leadership development opportunities



Definition: Academic development "is used to refer to the developmental activities informed by the discipline of teaching and learning in higher education. This discipline is underpinned by research into university teaching and learning" (Fraser 2005, p. 5).

Recommended Reading: Ling, P & Council of Australian Directors of Academic Development (CADAD) 2009, *Development of Academics and Higher Education Futures.*

4. **Engaging teaching** approaches are key to student learning

Definition: Krause (2005a) suggested that student "engagement refers to the time, energy and resources students devote to activities designed to enhance learning at university. These activities typically range from a simple measure of time spent on campus or studying, to in- and out-of-class learning experiences that connect students to their peers in educationally purposeful and meaningful ways" (p. 3).

Recommended Reading: 'Enhancing student engagement in the first year; 10 strategies for success', adapted from Krause, K 2005b, *Engaged, inert or otherwise occupied? Deconstructing the 21st century undergraduate student,* keynote paper at James Cook University Symposium: sharing scholarship in learning and teaching – engaging students, September 2005.

5. **Technology-enhanced assessment** provides flexible approaches for academics to provide feedback to students

Definition: James, McInnis and Devlin (2002) suggested a number of reasons for the use of technology to support assessment including "to diversify assessment tasks, broaden the range of skills assessed and to provide students with more timely and informative feedback on their progress" (p. 23).

Recommended Reading: Boud, D & Associates 2010, *Assessment 2020: seven propositions for assessment reform in higher education*, *ALTC,* Sydney**.**

6. **Integrating technology-enhanced learning** and teaching strategies across curriculum, subjects, activities and assessment results in major benefits to the discipline

Definition: The Technological Pedagogical Content Knowledge (TPCK) framework provides a mechanism for the integration of technology-enhancing learning related to technology, pedagogy and content and the teachers knowledge (Harris, Mishra & Koehler, 2007).

Recommended Reading: Harris, JB, Mishra, P & Koehler, MJ 2007, Teachers' technological pedagogical content knowledge: curriculum-based technology integration reframed.

7. Knowledge and resource sharing are central to a vibrant **community of practice**

Definition: A community of practice could be defined as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger, McDermott, Snyder, 2002, p. 4).

Recommended Reading: Wenger, E 2002, *Communities of Practice; learning, meaning, and identity*, Cambridge University Press, Cambridge.

8. Academics require sophisticated **online teaching strategies** to effectively teach in technology-enhanced higher education environments

Definition: "Online learning, as a subset of all distance education, has always been concerned with provision of access to educational experience that is, at the least, more flexible in time and in space than campus-based education" (Anderson, 2008a, p.53).

Recommended Reading: Anderson, T (ed.) 2008c, *The theory and practice of online learning*, 2nd edn, Athabasca University Press.

9. Academics need a knowledge of **multi-literacies** to teach effectively in contemporary technology-enhanced higher education

Definition: Literacy for both academics and students in the digital age has now become multi-faceted, and its diversified nature means that global citizens require a range of skills to effectively communicate and interact in the modern world.

Recommended Reading: Pullen, DL, Gitsaki, C & Baguley, M 2010, *Technoliteracy, discourse, and social practice; frameworks and applications in the digital age*, IGI Global Hershey, PA.

10. Exemplar projects focussed on multiple outcomes across curricula integration, sustainable initiatives, academic development and community engagement

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Index

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