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DESIGNING FOR EFFECTIVE LEARNING

An academic integrity approach to learning and assessment design

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Abstract

In this paper, we discuss the role of the educator in terms of designing a learning environment for the student which encourages the student to develop their own academic integrity. In such an environment, there is no need for the student to resort to plagiarism, as the learning and assessment tasks are not conducive to cheating, being unique and challenging for each student, regardless of the number of students enrolled in the particular course. We consider the learning design approach to assessment in the context of high-level vocational education. Educational resources are designed to support work-based knowledge and personal development capabilities. Educators assess to provide for professions, work contexts and individual learning needs. The major focus of this paper is discussion of the design of learning approaches and assessment tasks that disenable plagiarism and cheating, and promote problem-solving skills, academic integrity and creativity.

Keywords

academic integrity, assessment design, blended learning, educational product, work-based assessment

Introduction

Recently the term ‘academic integrity’ has been used to apply to processes dealing with student academic misconduct and plagiarism. In this context it refers to honesty and encouraging students to submit work which is entirely their own, or correctly referencing other work. The punitive processes of academic misconduct and plagiarism have been addressed as academic integrity in an attempt to foster, engender, teach and reinforce positive learning experiences. However, historically the term has had a wider, more general meaning and been applied to signify wholeness or completeness. It came to be used to refer to soundness of moral principle, uprightness, honesty or sincerity (Nillsen, 2005). In this broader generalisation of the term, we consider the role of the educator in terms of designing a learning environment for the student which encourages the student to develop their own academic integrity.

In an ideal educational environment, there is no need for the student to resort to plagiarism. In order to complete any assessment task, certain skill sets are required. To satisfy this need, students are equipped with relevant referencing and report writing instructional material. Each assessment task also requires the provision of an explicit set of expectations for student behaviour in relation to the work.

Shared values are created by the provision of information relating to plagiarism and cheating, by workshops and communication between staff and students, in the first instance. All of the web-based or hard copy resources available to students to inform them about referencing and report writing are imperatives in the current climate. Workshops and time spent by staff explaining what academic integrity is, and what skills students need to work within the rules, are also essential.

The challenge is how to create and implement learning and assessment tasks that are not more or less conducive to cheating. Tasks that require a unique response from each student and present an academic challenge are ideal. Solution tasks created by students exhibit individual creativity, problem-solving, academic integrity and communication development. In this paper we argue that, even when there are a large number of students with diverse professional disciplines, it is possible to create one problem that enables many solutions. When the student cohort belongs to a niche discipline, and class time permits, it is possible to prevent academic integrity breaches by individually questioning students about their work. This system also enables diverse solutions. It is also possible to allow students to enter their own work into Turnitin (Barrie, Berger, Lipscomb, Storm, & Briand, 1996), a plagiarism detection software system, to identify plagiarism and correct their work prior to submission. Each of these approaches is supporting learning rather than the punitive systems used after identification of academic integrity breaches. However, it is recognised that constraints imposed by the environment like the IT infrastructure in place, academic work load and the actual number of students can impact on the reality of the implementation of assessment modes.

The learning and teaching environment described in this paper is in Information Communication Technology (ICT), in particular in computer science and business and information technology programs. However, we believe the design principles can be validly applied to any disciplinary area within tertiary institutions. Technology may be employed in the first instance to inform students and finally to check on their compliance with academic integrity rules. The aim is to create a positive constructivist learning environment. However, the use of technology can enable a variety of assessment styles and still provide an environment which reduces academic integrity incidents.

Assessment design

The design of assessment tasks requires an understanding of the environment in which the interaction between academic and student will happen. We consider the learning design approach from a pragmatic stance which includes both academic and student feedback, reasons for educators to take various approaches to delivery and assessment, and considerations that universities, as global providers of educational products, endorse.

A major focus of this paper is a discussion of various assessment tasks designed to disenable plagiarism and cheating. In an earlier paper, Zobel & Hamilton (2002) recommend several strategies for managing plagiarism. Included in this mix of strategies is the need for design of new assignments, as well as running the plagiarism detection software over assignment submissions to check for copies. In this paper we deal with a more holistic and in-depth approach to assessment design.

We recommend the use of case-based internal assessment which demands creativity in problem-solving, a task that has a required skill-base and a unique answer. There are several assessment types we discuss and present various solutions for minimising academic integrity incidents:

- Simple computer code-based solution, in which case, there is software which can be run to detect similar submissions.

- Questioning of students about their solution or application. Students may be required to display and describe their code which enables staff to establish its authenticity among other things.

- Case study assessments where the solution, interface and justification are always different. The problem provided to students may enable a myriad of solutions that must then be communicated digitally, orally and in hard copy.

- Work-integrated learning which must by its very nature be different for each student, whether they themselves have negotiated the work-based project or not.

- Traditional research papers may be submitted to Turnitin by students, and they may be required to evaluate various forms of digitally transmitted information.

Designing a problem in context, which embeds the skill base, requires assessment of real practice. Our students are often required to build interfaces, models, systems or applications to solve these real problems. Components of these tasks can be assessed by the staff member checking and discussing the product with the student. Although this style of assessment is effective in determining the originality of work completed and engaging students in creative learning, the implementation can be prohibitively expensive in terms of staff time.

The result is a mix of assessment tasks within each course and program. We present Table 1 as an illustration of various assessment tasks which may be prescribed for students enrolled in a postgraduate program for ICT. The assessment outcomes have a vocational orientation. Many of the assessment tasks, irrespective of delivery mode, involve context-based case studies, which enable a common theme to be developed throughout the program. Problems are designed and students create unique solutions.

Table 1: Assessment tasks in a postgraduate program

Communication		**Subject 1**	**Sub 2**	**Sub 3**	**Sub 4**	**Sub 5**	**Sub 6**
Written	C Practical ass 40%	2 Submis'n A Group 30% B Submis'n 1 35% C Submis'n 2 - 35%	2 Assign A Group Present'n 50% B Research paper Ass 2 50%	C Academic paper 50% C Group Build & document a system 50%	B Ass 1 - 25% B Ass 2 - 20% C Ass 3 - 15%	B Usability Inspect'n 10% B Heuristic Evaluat'n cognitive walk thru 15% B Research paper 25%	B Research report 15% B Business plan 10% C Group Case study web site 25%
Lab Folder							
Verbal						B Issue Present'n 10%	
Presentn				C Academic paper 50%		B Issue Present'n 10%	C Group Case study web site 25%
Group		Submis'n 1 -30%	B Ass 1 Group Present'n 50% 2 Research paper Ass 2 50%	C Group Build & document a System 50%		B Heuristic Evaluat'n cognitive walk thru 15% 2 Research Paper 25%	C Group Case study web site 25%
Digital				C Build & document a system 50%	B Ass 1 - 25% B Ass 2 - 20%	B Usability inspect'n 10%, B Heuristic Evaluat'n	C Group Case study web site 25%

					B Ass 3 - 15%	cognitive walk thru 15%, B Research paper 25%	
Interper-sonal Skills		Submis'n 1 - 30%		C Group Build & document a system 50%			
Individ & Group	Exam 60%				Exam 40%	Exam 40%	Exam 50%

In Table 1, the letters are identifying a level of difficulty depth and breadth analysis and synthesis loosely based on Bloom's taxonomy, where:

- A represents — Acquisition knowledge, theory and skills
- B represents — Application of knowledge, theory and skills
- C represents — Devise and implement solutions to broad and complex problems.

The vast range of alternative modes of assessment is tightly aligned with the particular subject being taught and the expected use of the knowledge in real terms. As a direct consequence diversity of assessment tasks is normal and the management of tasks students complete across programs and courses is complex. The infrastructure built around the delivery of courses and programs is designed to reinforce the expectations that students behave according to the university values with respect to academic integrity. Universal use of packages like Turnitin by staff and students provides an effective supportive infrastructure for an environment that requires and teaches practice that demonstrates academic integrity.

The courses presented in Table 1 are typical of the courses discussed in Beckett, Brown, Hamilton and Richardson (2004) and deal with ICT. The assessment task itself supports the staff-student interaction and a teaching and learning environment designed to assist students in operating effectively within their chosen professional environment, which includes expected ethical behaviour, and processes are in place to punish misconduct.

Modelling is a crucial knowledge component in ICT. The design of a teaching and learning environment that enables modelling in context ensures that students learn to apply their knowledge appropriately and requires staff to operate as mentors. 'Learning in context also makes it clear why (and how) modelling and mentoring are crucial. Mentors who evidence moral purpose, display emotional intelligence, and foster caring relationships and norms of reciprocity for knowledge sharing, show the way' (Fullan, 2001, p. 132).

The part of a course that entails the application of knowledge in a real world context is an important part of all learning completed, and should be included in the course map as the generic educational components. Designed outcomes for a course become deliverables by virtue of the use of generic capabilities. The ability to solve problems, to build models and to communicate solutions can be mapped as educational components (Richardson & Guss, 2002). Academics have responded to increasing numbers of students in courses and the inherent cultural and discipline-based diversity by creatively designing assessments. Staff as mentors, students and industry representatives, in some instances cooperatively design the assessments tasks and mode of delivery.

Undergraduate students can start unpaid periods in the workforce completing supervised tasks, which can become paid employment later in their program, mentored by industry and academics. Graduate and undergraduate students can complete industry based projects mentored by academics and work-based supervisors. Later on in this paper, we report on this experience and the processes in place to validate this real experience. An industry representative's agreement that the student's work has been satisfactory is often most valuable in assessing the application of skills and more generic communication and problem-based learning in teams. The potential for plagiarism to occur must now be considered alongside traditional assessment constraints. This situation results in an increase in complexity in the design process at both a course and a program level.

Student centred learning

A student centred model of education indicates a need for the interaction between academic and student to be the primary focus of the interaction. The application of learning in context and the transfer of skills require the provision of real life case studies as the context to assessment practice or experiential learning environments. Student volume however, dictates the requirement that not all assessment tasks can be delivered on an individual basis within the university or in industry, with supportive mentoring relationships. Assessment tasks designed to be delivered to large diverse cohorts of students cannot be supported by individual interaction time. This is not to say that a carefully designed and constructed business problem cannot be utilised as an assessment task by a large number of students. However, the task must include criteria that enable quick decision making on the part of the academic marker and still enable criteria that demand thought and individual demonstration of creativity and problem solving on the part of each student.

It then becomes even more important that the assessment tasks, if not provided in a real work environment, in fact mirror the complexity and problem solution orientation of the reality. This requires the design of assessment and learning practices that enable creativity and original solutions. A by-product of this design is an increase in the difficulty for students to breach academic integrity requirements. The following excerpt from an assessment task illustrates a problem-based orientation for assignment completion.

> Basket Case is a manufacturing company that makes baskets from cane and plastic. They make a large number of different sized baskets of different configurations. (For example, cane baskets have handles and decorative bows of different types. The handles, bows and lids are products in their own right. Plastic baskets have different colours and different shaped holes. Cane baskets are all the same shape but in different sizes, whereas plastic baskets have different shapes and sizes.)

Now based on analysis the company has decided to market using the Web. Initially a system is to be built in Excel to calculate costs and charges on a weekly basis.

The assessment task contains embedded skill requirements and can be supported by further work in a variety of interactive environments (for example, a Basket Case ethical issues workshop activity). Whether the assessment or learning experience requires an applications package skill level or the development of generic skills is irrelevant to the task having a single solution and therefore reducing creativity and increasing the potential for plagiarism.

Educational product and information communications technology

Business systems and processes that enable flexible delivery of educational products which respond to all stakeholders in the environment are necessary. Fast responses to the marketplace are required at the strategic, operational, program and course level to enable continuous changes in product, development and re-packaging. With respect to assessment, the actual technology has impacted on standard delivery modes and demanded learning by academics to effectively utilise appropriate technologies within the assessment domain, and by students to interact with the technology, as well as the knowledge and application of professional skills in context.

Prior to the implementation of packages such as Turnitin, designed to support the development of student academic integrity, a range of technologies have been adopted in the environment. Some technologies that have impacted on the delivery of assessment are:

- Digital storage (disks, memory sticks)
- Online drop boxes
- Email
- Internet.

The delivery or dissemination of information has felt the impact of technology and required addressing by learning and changes in work-practice by the academics. Assignments are delivered on the Web and students hand in work tasks using online drop boxes or email. Student-staff interactions around assessment have also changed in some cases. Students may build a web site and demonstrate the result according to a set of pre-determined criteria to a staff member or peer. The assessment criteria would have been modified to support the value of the student product and the interaction. Digital interaction by way of the interface could be assessed as distinct from verbal or written communication.

Educational organisations have become global corporations providing a diverse group of products and services using a myriad of delivery models. The continuous change of the teaching and learning product to keep pace with the marketplace and the increase in diversity and numbers of students have to be considered, alongside the ICT mechanisms that effect the teacher-student interaction. This situation has resulted in changed learning experiences and assessment practices that enable flexibility, in terms of time and mode, and an increased dependence on facilities available online. The impact of ICT at an individual work practice level has been an increased ease of access to digital information and an associated increase in opportunity to plagiarise.

Institutions have responded to the situation by providing students and staff with policies, incident reporting guidelines and information that clearly define plagiarism and conversely the institutional expectations relating to assessable tasks. Student workshops (Hamilton, Walker, & Tahahoghi, 2004) and web-based information services are provided to explain and contextualise incidents of plagiarism and correct referencing processes. The latter student services illustrate a shift towards the integration of institutional expectations into the curriculum.

Software applications such as Turnitin (Barrie et al., 1996) have been purchased to first support staff in the identification of plagiarism in assessable work and secondly to enable students to check their own referencing in tasks prior to submission. Over time business systems and processes have been developed to enable staff to utilise the software and the associated activities are gradually becoming part of standard practice.

Work integrated learning

Despite valid bodies of work describing knowledge content, in-depth understandings of teaching practices and students' reactions to them and an increasing array of technology and time-driven delivery choices, it is always difficult to think about courses in a holistic or innovative way. This is made more complex by the positioning of curriculum in the real business environment. RMIT's Programs are strongly focused on real-world business issues and many of them involve an industry component where students can apply their skills from the course work to provide real-world solutions.

At an individual work-practice level, people are required to apply skills acquired to assist them in their work. 'By having the freedom and capacity to think about issues differently, and work differently, opportunities will emerge in different ways and at different times' (Bainbridge, 2000, p. 49).

Real outcomes in terms of capable graduates drive change in the curriculum and assessment practices. The participative process enables the opportunity for:

> individuals and groups to define and re-define roles in a collaborative manner in connection with the tasks facing the organisation as a whole. They created innovative, team-based organisations having more in common with an amoeba than a machine…. In the process of organising, a lot of choices have to be made, and that effective organisation depends on achieving a balance or compatibility between strategy, structure, technology, the commitments and needs of people, and the external environment (Morgon, 1998, p. 49).

'Learning in the corporate setting not only relates to individual competence development but also to a demonstration of business impact and a contribution to the strategic ambitions of the company' (Collis, Margaryan, & Amory, 2005, p. 12).

In the case of a first year end-user computing course designed for delivery to a large, diverse cohort of students, business cases provide an abstract layer that links all resource components and modes of delivery in a manner that supports problem-solving based learning. The resources provide a skill base, conceptual knowledge and assessment tools stored using a variety of technologies that are chosen on the basis of the level of staff-student interaction required in the delivery. This encourages interaction, flexible delivery and an improvement in the students' ability to apply skills in business contexts. By allowing the technology to impact on the subject design, the effectiveness of traditional methods of knowledge dissemination improved. Without the context or business cases to support activities that sensibly bind the knowledge learnt to real outcomes, learning can be fragmented. A view of the huge volume of resources created to support the learning can also add to the sense of fragmentation.

Real work based practice mentored by academics and work placed supervisors negates the possibility of plagiarism if the assessment tasks are designed appropriately. The same implications can be applied to project based student/industry linkages.

Learning design

Creativity

'While well-prepared lectures surely have a place, teaching, at its best, means not only transmitting knowledge, but transforming and extending it as well' (Boyer, 1990, p. 24).

In a traditional environment the academic expert designs and delivers a course of work. They are also responsible for enabling students to integrate learning and apply it in a creative manner. This process is tightly bound by human interaction and communication skills.

The focus of the teaching and learning experience and the associated assessment of reasonable outcome cannot be an abstraction of skills or knowledge. Assessment tasks aimed at developing skills required for the application in a real environment should not allow a single, clear answer despite the initial provision of clearly defined objectives and outcomes.

> The communication and acquisition of knowledge, while an important part of education, cannot be its sole major object. There must also be the object of learning about the worry and uncertainty that accompany work and creative activity; that is to say, of learning how to work and how to learn, and of expanding one's capacity to use knowledge creatively in problem solving. I shall refer to this activity by the phrase creative application. … real life problems are open ended in the sense of not having correct answers but only answers that my be shown by subsequent experience to have been better or worse … (Jaques, 1976, p. 150).

Project work designed to ensure creative applications of knowledge:

> should stimulate students to want to learn, should help to get them intellectually under way, to open their minds to be receptive to use new knowledge and to new perceptions, should give them the experience of what it is like to work for data and to solve problems. Existing knowledge is constantly being made redundant as new knowledge is gained. Our students must learn how to go about revising this knowledge, adapting to change (Jaques, 1976, p. 158).

The pragmatic issue for universities is the provision of the singular and small group interactions required to support the creation of relationships between academics, industry mentors and students. This interaction underpins creative problem-solving and the transfer of skills to real environments. At a time when technological advances and globalisation have caused massive increases in student numbers, a shift towards vocationally-orientated higher education demands more emphasis on academic-student, industry-student and student-student interactions.

> This suggests a change of emphasis for universities. True teaching and learning are about more than information. Education is based on mentoring, internalisation, identification, role modelling, guidance and group activity. In these processes, physical proximity plays an important role. Thus, the strength of the future physical university lies less in pure information and more in a college and community. Less in wholesale lecture, and more in individual tutorial (Noam, 1995, p. 4).

Problem solving

The delivery of a single unit of work into a wide range of teaching and learning environments has necessitated the creation of course resources suitable for flexible delivery modes and media, and reusable learning objects. These diverse learning environments are characterised by varying group size, professional interests and geographical location. The Web and CD-ROM technologies have been particularly useful in the provision of learning objects. To properly leverage these delivery media, the student experience requires the transmission of knowledge and an environment that puts problem solving in context. The actual resources are enriched and individualised by the problem solving focus provided by the business context case studies.

Knowledge and capability

The underpinning description of the mode of knowledge production fundamental to the role of universities has altered. The new mode of production entails complex problem solving skills required by the application of technology in a business context. The use of the word application sets another dimension to the current implications of context, that of human usage of the technology as human capital. This change has been caused by the exponential growth in education and research (not yet recognised by relevant changes to organisational structures), globalisation, the creation of rapid transport systems, and communication technologies. These have resulted in an explosion in the standard configurations of skills and knowledge production. 'The outcome is a web whose nodes are now strung out across the globe and whose connectivity grows daily' (Gibbons, Limoges, Nowotny, Schwartzman, Scott, & Trow, 1994, p. 5).

The new mode of knowledge production has emerged as the numbers and diversity of student groups has increased and the number of knowledge producers and globalisation has increased the demand for specialist knowledge. Universities have recognised the change and responded by altering the proportions of different types of staff recruited, re-defining processes and roles to require collaborative cross-disciplinary work and emphasising the creation of strategic alliances. All of the strategic objectives are intended to add a layer of connections within the current structure that mimic communities of practice.

The increased complexity for universities required by the addition of a new mode of research, the adoption of communication tools and cross-disciplinary research has caused a disconnection between the old mode of knowledge production and the new. The adoption of new technology and massive growth in student numbers and delivery modes has caused the fragmentation of skills and knowledge production rather than the layering of the new mode of production on the old. The complexity of the task has caused processes to be adopted that ignore the old modes of knowledge production and de-emphasise the traditional niches.

This in turn has caused recognition of the need to change the design of course resources, delivery modes and programs to focus on the connections between the old and new and deliver education bound by a broad set of outcomes to meet the needs of a diverse group of students. The driver for learning is the requirement to utilise skill sets to solve problems rather than the skills themselves.

The division of content and its application in context into knowledge and generic capabilities provides the nature of re-design of educational resources. However, discussion of educational systems designed for delivery of educational material ignores the interaction between people and information systems required to apply technology to solve problems in context. In fact the application of knowledge in context operationalises the generic skill component of the learning and prevents further fragmentation of the learning.

Generic skills and knowledge transfer

The conceptual base necessary to provide a basis for students' understanding of end-user computing in a business context is to be delivered in a traditional lecture format. The content is traditionally delivered using PowerPoint slides and enriched through business context case studies. As the delivery options have been broadened to include resources from CD-ROM and the Web, the focus in the lecture theatre has shifted. Time can be spent interacting with the students as they are expected to complete exercises aimed at ensuring an understanding of conceptual material covered.

The lectures explain concepts and terminology. The case studies are used to provide real life problems and opportunities to which end-user applications software could provide optional solutions. Demonstrations use the case studies to illustrate the solutions to problems posed during lectures. The solutions described also cover all the skills required to obtain a higher grading in the assessment tasks for the unit. The tying of the examples provided in demonstrations to real-life problems and assessment tasks provides an abstract linking of the different components of the unit. Fragmentation of content and learning can be addressed by the focus on problem solving in context embedded in all resources designed to be delivered in a range of environments.

The division of content and its application in context into knowledge and generic capabilities provides the nature of re-design of educational resources. However, discussion of educational systems designed for delivery of educational material generally ignores the interaction between people and the information systems required in the application of technology to solve problems in a business context.

> Conceptions of generic skill have become important in defining the attributes required at work, and in talking about the desired outcomes of education … There is no standardised system of generic skills … But most include interpersonal relations ('interpersonal skills'), written and oral communications, problem solving, analytical thinking, teamwork; and often self-organisation, information management, flexibility and responsiveness, the capacity to take initiatives, sometimes critical thinking … Key Competencies are … collecting, analysing and organising ideas and information; expressing ideas and information; planning and organising activities, working with others and in teams; using mathematical ideas and techniques; solving problems and using technology (Marginson, 1994, p. 8).

To implement IT-based solutions business processes need to be created to describe the interaction. Change in the design process is therefore required to divide resources into generic and knowledge capabilities, and ensure the accurate descriptions of the human technology interaction as business processes within the information systems.

> The ultimate aim is not to test whether theory, when applied to practice, is a good predictor of events. This interrelation between theory and practice is more complex and dynamic: is it possible to create a practical and effective intervention for an existing problem or intended change in the real worlds? The innovative challenge is usually quite substantial, otherwise the research would not be initiated at all. Interaction with practitioners is needed to gradually clarify both the problem at stake and the characteristics of its potential solution. An iterative process of 'successive approximation' or 'evolutionary prototyping' of the 'ideal' intervention is desirable. Direct application of theory is not sufficient to solve those complicated problems(Van den Akker, 1999, p. 9).

The resources are divided for digital storage and diverse delivery modes, for example, PowerPoint for lectures, Microsoft FrontPage for demonstrations. Application of the tools in context operates as the glue that enables integration of generic capabilities and knowledge.

The case studies derived from real-life experiences are fundamental to the teaching and assessment. Threads of reality tie the work completed in a workshop to that disseminated in a lecture and the assessment requires the student to practice the skills and knowledge taught within a case study mirroring a microcosm of real business problems.

Woodhouse (2002) suggests that traditional 'assessment parameters can penalise the student that writes an unorthodox essay … However, it is essential that the sharing of new ideas and good practice does not become prescriptive'(p. 10).

Adaptability, flexibility, communication and the ability to utilise knowledge across a range of perspectives assist in the application of skills at work. Students are also assisted by cooperative education programs and dedicated teachers who have research capacity and practice and who adopt the world-view of the employer when organising learning experiences.

A new framework that utilises the concept of generic capability will ensure that a focus is retained on a broad set of activities required to activate learning by connecting the context to the knowledge to enable outcomes. The rationale for proposed alterations in the focus, technology usage and content of end-user computing resources are supported by Marginson (1994).

> The abilities most valued in industrial, commercial and professional life as well in the public and social administration are the transferable intellectual and personal skills. These include the ability to analyse complex issues, to identify the core of a problem and the means of solving it, to synthesise and integrate disparate elements, to clarify values, to make effective use of numerical and other information, to work cooperatively and constructively with others, and, above all perhaps, to communicate clearly, both orally and in writing. A higher education system which provides its students with these skills is serving society well (Marginson, 1994, p. 238).

These support a capabilities framework for curriculum design and trends identified for future areas of research, emphasis and innovation in business. The application of skills in context supports the learning required to produce capable graduates and enables the individual focus on personal development required to engender success. A focus on the individual solution created and the communication of that solution in a variety of ways minimises the amount of prescription in the assessed task and prevents the opportunity to produce work that is copied from the Internet or peers.

Also, the values of academic integrity such as honesty, fair judgment and industrious work ethic are in themselves generic skills to be considered and applied in workplaces, and students who are able to recognise, discuss and apply such skills to workplace scenarios are highly regarded in the workforce.

Problem-based assessment tasks

Alongside the changes in publications has been a gradual improvement to online delivery mechanisms that has enabled the creation of online training packages. These online packages can be organised to mimic help features within applications packages. At a time when the workplace is focused on productive work practice that requires increased technology usage, the training is becoming divorced from the context. Again there is a sense of fragmentation.

A lack of experience of work practice for undergraduate students is the norm within their chosen professional domain. The number of students and the diversity of the group requiring end user computing skills have increased dramatically. These observations also point to the need for a review of the design and usage of educational resources in the area.

Historically as new technological advances have been made, basic terminology and skills have been included in course resources. These include both software applications that have become integrated into the workplace as vital tools and concepts, and terminology. As well as learning the new technologies, the concepts of 'good' and 'bad' use of the technologies and acceptable or poor workplace practices also need to be considered. For example, the point-of-sale software can count the number of transactions carried out by the cashier every minute, or the number of phone calls answered by the telephonist every hour, but what is the purpose of these figures?

At the conclusion of chapters, books often include descriptions of business case studies to contextualise the knowledge. Several attempts have been made to sensibly integrate the context or case studies throughout lectures, demonstrations and workshops in the Business Computing learning objects as well as the separate description of the case studies that contextualise the knowledge. This did not, however, focus on the connections between the knowledge and context. People, solving real problems that require the use of the knowledge and skills, create the connections. There is also the problem that end-of-chapter descriptions tend to focus on the particular chapter alone, not the overall case. The assessment attempts to connect theoretical and skill information by required applications to solve a business problem, with emphasis on particular aspects.

We need to use the assessment to integrate all of the skills and concepts taught using various standard business communication tools. At an introductory level the context needs to be soft systems and work processes. Some publishing systems provide a system that enables course developers to choose knowledge content or learning objects and to modify existing resources digitally. The systems currently in place, however, do not recognise the change in the mode of knowledge production systematically. The focus is on the knowledge and not the creation of knowledge by way of desired outcomes in context. It would not be difficult to create a system that forced a focus on the application of skills in context to create the learning environment. The proposed change to the systematic creation of courses would have the added benefit of integrating knowledge components by forcing an interaction with them by way of a proposed outcome.

At the current time texts on the traditional systems concepts describe terminology, tools, concepts, and sometimes, disconnected case studies. In some circumstances the case studies describe technology, organisations, people or problems. These provide descriptions in context rather than a framework that connects the context to the theory by active learning.

Often ethical issues are considered as a chapter at the end of a text, almost like an afterthought or footnote, instead of being integrated throughout the book in an overall academic integral framework. A further advantage of practical case-based assessment is that the tasks assigned to each student must vary, and hence assessment cannot become predictable and easy for the student to plagiarise or cheat.

> Success in formal teaching and learning has depended, in large measure, on the acquisition of certain routinised patterns of thinking and behaving … By re-enacting such pedagogical habits, we make a culture of teaching and learning that parallels a predictable and regular social world (McWilliam, 2005, p. 3).

By recognising that our world is neither predictable nor regular, and allowing assessment to follow the course of various businesses operating in this irregular world, we are much less likely to fall into the 'deadly habits' discussed by McWilliam (2005) which make learning boring and contribute to 'unlearning'. One relatively simple assessment task for courses early in the program is to assess models created online in the presence of the academic. Though simple, it can be a useful deterrent for plagiarist activities.

The text *Computing for business success* (Richardson, Beiers, Bruno, Deng, & Henschke, 2005) contains the required systems and theoretical knowledge that underpin the process used to apply technologically supported solutions in context. The problem solving framework empowers end-users to design models that integrate productivity tools in context. The models created are aligned with work practice by case study examples. The resources in this case have been designed to support creative problem solving, however the learning environment to implement the intent is also required. Staff could create their own solution to a problem and provide it to the students or students could be given similar learning tasks and be required to provide their own variant of the solution within prescribed boundaries. The second option would reduce the opportunity to plagiarise. The extent of collaborative work completed and assistance provided must be ascertained and built into the subject design by an academic that has experiential knowledge of the group.

Conclusion

People need to comfortably interact in an environment that demands the use of varied technologies and real problems. In this paper, we have recommended that the assessment completed by students should require them to solve posed problems relating to real-world business cases. Assessment needs to integrate all of the skills and concepts taught, including the ethical considerations. The students can be required to build models using the applications software packages and skills taught, and consider the impact of their software in the workplace. This type of assessment does not lend itself to plagiarism.

The assessment can be designed and mapped across both the knowledge and generic capability components of the course and entire program. Attention also needs to be paid to the level or depth of learning required by the group of students in question. Case studies can be used to perform this task and also incorporated throughout the course materials to enhance integration of course resources. The part of a course that entails the application of knowledge in a real world context is an important part of all learning completed, and can be included in the course map as the generic educational components.

The continuous improvement cycle implemented to update resources for an end-user course and to adopt new technologies to enable mixed-mode delivery has had several unexpected results. The traditional instructional design process has been complicated by the addition of a need to choose technologies suitable for delivery of particular learning experiences. Particular attention has to be paid to the design of assessment tools and case studies to enable the abstract integration of knowledge content. It has become possible to design knowledge for reuse.

References

Bainbridge, V., Foerster, S., Pasteur, K., Pimbert, M., Pratt, G., & Arroyo, I. Y. (2000). *Transforming bureaucracies: Institutionalising participation and people centred processes in natural resource management – An annotated bibliography.* London: International Institute for Environment and Development.

Barrie, J., Berger, S., Lipscomb, M., Storm, C., & Briand, M. (1996). Turnitin, from www.turnitin.com

Beckett, P., Brown, A., Hamilton, M., & Richardson, J. (2004). *A case for rearticulating areas of information technology to provide a masters program in information and communication technologies*. Paper presented at the International Conference on Computers in Education 2004 (ICCE2004), Melbourne, Australia.

Boyer, E. (1990). *Scholarship reconsidered: Priorities of the professoriate*. Princeton, New Jersey: The Carnegie Foundation for the Advancement of Teaching.

Collis, B., Margaryan, A., & Amory, M. (2005). Multiple perspectives on blended learning design. *Journal of Learning Design, 1*(1), 12–21.

Fullan, M. (2001). *Leading in a culture of change*. San Francisco: Jossey-Bass.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: the dynamics of science and research in contemporary societies*. London: Sage.

Hamilton, M. Walker., C & Tahahoghi, S. (2004). *Educating students about plagiarism avoidance: A computer science perspective*. Paper presented at the International Conference on Computers in Education (ICCE2004), Melbourne, Australia.

Jaques, E. (1976). Learning for uncertainty, emotions and behaviour. *Monograph Series of the Chicago Institute for Psychoanalysis, 9*, 149–169.

Marginson, S. (1994). *Transfer of skills and knowledge: The key to improving the relationship between education and work (Vol. 1)*. Sydney: Adult Literacy and Basic Skills Action Coalition.

McWilliam, E. (2005). Unlearning pedagogy. *Journal of Learning Design, 1*(1), 1–11.

Morgon, G. (1998). *Images of organisation*. San Francisco: Berrett-Koehler Publishers, Sage Publications.

Nillsen, R. (2005). The concept of integrity in teaching and learning. *Journal of University Teaching Learning and Practice, 2*(3b), 85–93. Retrieved (n.d.), from http://jutlp.uow.edu.au

Noam, E.M. (1995, October 13). Electronics and the dim future of the university. *Science, 270*, 247–249.

Richardson, J., Beiers, H., Bruno, V., Deng, H., & Henschke, K. (2005). *Computing for business success* (2nd ed.). Australia: Pearson Education.

Richardson, J., & Guss, S. (2002). *In search of a complete metaphor for scaffolding the user of on-line course materials*. Paper presented at the Australasian Computer-Human Interaction (OZCHI) Conference, Fremantle, Australia.

Van den Akker, J. (1999). *Principles and methods of development research*. Dordrecht, The Netherlands: Kluwer Academic Publishers.

Woodhouse, D. (2002). *Quality: Making a difference*. Paper presented at the Higher Education Research and Development Society of Australasia (HERDSDA), Perth, Australia.

Zobel, J., & Hamilton, M. (2002). Managing student plagiarism in large academic departments. *Australian Universities Review, 45*(2), 23–30.