

Overview

Today's students are technology savvy and use to their worlds being filled with interactive and engaging music, movies, computer games and online social environments. Educational materials deemed acceptable in the past now fail to engage students who are more attuned to high quality 3D entertainment software, e.g. computer games and online virtual environments. These students demand more from their educational experiences than flat pages of content, un-interactive videos and text based communication software. The importance of embracing the next generation of web technologies is now paramount. More students than ever before are part of the latest generation of which the Internet, simulation and games are an essential part. I am fortunate enough to be in a unique situation where I am daily immersed and engaged with online web technologies and 3D computer games and simulations through my teaching and research and therefore not only able to teach the creation and use of these technologies but I can apply them in my teaching.

My teaching ethos is to provide students with inclusive learning experiences which help develop their critical thinking and practice skills and to compel them to apply these skills beyond the basic course requirements. I believe all students should have the same opportunities to learn and have access to communications with peers and teachers and learning materials. Furthermore, it is my conviction that students who are exposed to emerging technologies and encouraged to critically analyse their own and others skills in authentic real-world contexts are more prepared for life-long learning.

Peer and student assessments of my commitments to learning and teaching from both staff and students (elaborated throughout this document) and 2 Departmental Excellence in Teaching Awards for 2004 & 2005 indicate I have been successful in motivating and inspiring students and in promoting new and successful methods of applying emerging technologies to enhance the student learning journey.

1 APPROACHES TO TEACHING THAT INFLUENCE, MOTIVATE AND INSPIRE STUDENTS TO LEARN

Motivating and inspiring students. While educational establishments tend to disregard students attitudes and ideas on the issue of emerging technologies, as an educator in the information technology domain, I embrace this enthusiasm and leverage it to guide students towards the construction of new knowledge through critical thinking processes about technology they are familiar with and for which they have a passion. I have found game programming students to be particularly enthusiastic about their chosen domain. I believe this stems from their engagement in computer games before they come to university. This means students are able to actively participate in class discussions on different types of games, functionality of games and game design. They already know what they like and what they don't like. My role is therefore as a facilitator to guide them toward a deeper understanding of the technology and provide challenging, meaningful and interactive instructional activities. While I can provide an academic breakdown of game mechanics the students themselves are much more valuable sources of information. They have certainly played more games than I have. As such I establish a two way mentoring role where students are encouraged and free to share their experiences and knowledge with myself and their peers and I provide supervision for greater and more complex understanding of the subject matter. Experience and my students have told me my visible enthusiasm motivates and inspires them to put effort into their studies above and beyond their course requirements. I attain immense satisfaction and delight from facilitating my students' learning journey and watching their academic development and enthusiasm for completing their studies. Students comment:

Penny enjoyed the topics that she was teaching and because of her enjoyment of the subject, she was able to express and explain concepts and ideas very clearly (Computer Graphics, Multimedia 2004); Penny has inspired us by showing what we can achieve through the application of the knowledge we have acquired. This is often in the form of example programs that she has written. These are simple to understand but are also impressive (CG¹ & CGP² 2007).

Student responses to the statement 'Dr de Byl taught the subject matter in a way in which helped me understand it' received an average score of 4.22 (FOS 3.99, USQ 3.96)³. To the statement 'Dr de Byl tried to make the course interesting' students responded with an average score of 4.48 (FOS 4.01, USQ 4.02).

¹ Computer Graphics

² Computer Games Programming

³ All teaching evaluation data presented throughout this document have been calculated over the 7 student evaluations USQ has conducted from 2003 to 2006, which canvassed the opinions of over 80 students. There was no data available for S2, 2003 and S1, 2004 due to my being on ADL and

Provision of authentic/realistic learning context. There is compelling evidence that students learn more successfully through engaging in authentic activities rather than passively receiving knowledge. To this end I provide my students with authentic leaning experiences to inspire and provide a deeper understanding of real-world problems and to give them a sense of being able to contribute to a larger international community of practice. Thus, my approaches to teaching and learning include:

International Community Engagement and Contribution: Realising they are part of a larger community of practice and understanding they can contribute knowledge to this community assist in engaging and integrating students into real-world contexts in their chosen domain. One of the projects in Computer Games Programming is to join the international game developers' forum for an open source 3D game engine (<http://irrlicht.sourceforge.net/>) which currently has 7567 members. For their assessment, students are asked to pick a question from the forum and write sample game code which demonstrates their answers through practical use. Evaluation of their solutions is peer-based where they are asked to review each others solutions for useability, clarity and effectiveness (see Attachments 1 & 2). Students quickly appreciate the importance and value of being part of such a community while learning the relevance of critical evaluation. When asked on their thoughts on this type of teaching approach, students answer:

After working in the engineering field for the last 30 years it is rewarding to see a lecturer have so much influence in the successful development of a students potential that will have an immediate impact on the workplace (GC & CGP 2006)

Industry Standard Software Development Tools and Practices: Software development in industry is more often than not achieved in team environments. Coordinating electronic resources and sharing programming code is a particularly challenging task for any project manager. An industry standard for maintaining a coherent backup and a single version of programming code is *Subversion*. As my games students do work in teams consisting of mixtures of internals and externals, Subversion is not only a fantastic tool for keeping track of coding efforts but it is also accessible via the Internet. This allows externals to interact and contribute on an equal footing for group assignments. To support teams in the setup of Subversion they are provided with a step-by-step tutorial for setting up a code repository on Google Code. Thus usefulness of Subversion in the teamwork is evident in the student comment:

For several of the assessment items we have been asked to form groups with our fellow students. I have been part of a group of four where I was the sole external student. Through the use of these electronic tools I have been able to participate with my fellow students unhindered by distance. (CGP 2007)⁴

Serious Games; Alternatives to Traditional Lectures: Games-Based Learning (GBL or Serious Games) addresses many educational issues including student engagement, immersion and authentic professionalism. Computer games provide educators with a means of student engagement by supplying action based discovery experiences. The medium produces high, sustained levels of engagement and a deeper understanding of subject matter. In Computer Games Programming I use several classroom based games as replacements for traditional lectures. These include *CSC3418 The Game* which I developed and programmed as a series of 3D game levels each representing a module from the course, *GameEngineopoly* which I developed as a classroom activity to teach the students about the structures of game engine programming code and *Jeopardy* (see Attachment 3) which I developed as an online exam revision tool. Each time the student loads Jeopardy they receive a game board with 30 questions randomly selected out of 400 on course content. An external evaluator has said: *"I have seen several quiz-type games on the web, and this is by far the best one I have found to date."* - Dr Lyn Creedy, Teaching and Learning Centre, University of New England.

These games (see Attachment 4) have been enjoyed by all students. In the 3 semesters the Game Programming course has run lecture attendance has been consistently high with 100% retainment of students in the course who have attended. Jeopardy has also proven to be successful. In 2005, when the game was first released, for Computer Graphics web statistics showed 28,380 questions accessed (46 students enrolled) and in Computer Games Programming 2747 questions (14 students enrolled). Students have appreciated these alternative learning and teaching activities and commented:

[Penny] created a simple Jeopardy game with a public tally of points on the website, which kept us talking about how everyone was going, and trying to get the 9,000 points needed for perfection. This motivation to

do well in the game ended up with myself (and I don't doubt many others) being much more prepared for the final exam (CG & CGP 2005); While most lecturers are content in sticking to traditional presentation slides each week, Penny has gone outside the box to include group workshops in class, which encourage teamwork amongst students, and arouse their critical thinking (CG & CGP 2006)

Graduate attributes and linkages with practice. One of the aims of my courses is to consider graduate attributes. The ways I address each of these is evident in the preceding sections and include a) **discipline expertise** by introducing students to state of the art in these fields through the inclusion of topics in my course which relate directly to my research domain of serious games and artificial intelligence; b) **professional practice** by exposing students to authentic industry tools and their use in teamwork environments thus making their transition into the workplace seamless; students in Computer Graphics are required to write up their assignments as research papers and insist they follow journal guidelines for the formatting of their documents (see Attachment 5); c) **global citizenship** via the students' interacting in group work with the diverse student cohort within each of my courses and developing links to international communities of practice; in 2007 there was a team with 2 Australian (1 internal and 1 external), 1 French and 1 Malaysian students, d) **scholarship** through the students' application of computer graphics and computer games to a variety of domains, for example, my students are required to program a serious game application that will teach the user about a specific field giving them the opportunity to apply their knowledge and skills to other areas; and, e) **lifelong learning** by imparting students with research, critical thinking skills and exposure to new online learning practices; furthermore, my students are encouraged to establish their own standards and to judge their progress. To this end I provide the students with assessment items that require critiquing of others and their own work through peer assessment and group assignments (discussed further in Section 3). Insisting on embedding these attributes into the qualities of my students gives me confidence that they will be ready for the real world and successful in their chosen careers. Furthermore while being adamant they demonstrate they have obtained specific knowledge in my areas of expertise I also give them the flexibility to be creative and to add their own touches to their assessment items.

The evaluation statement "*Dr de Byl's assessment tasks allowed me to demonstrate what I had learnt*" received an average score of 4.21 (FOS 3.86, USQ 3.92). The fact that my students' excel beyond the basic course requirements is evident in comments I have received such as:

The major assessment for Computer Games Programming is a team based game project, putting into practice the tutorial exercises which provides specific aims and objectives and encourages new ideas in the development of the game (CG & CGP 2006).

Creative approaches to explaining difficult technical concepts. Computer Graphics and Computer Games programming contain many mathematical and programmatic concepts which students find difficult to understand. To explain these concepts clearly to students I have developed a number of creative classroom activities. In order to demonstrate the concept of dead reckoning (a method for predicting the location of moving objects in multi-user game environments) I provide a grid on the whiteboard and the known location of an object at discrete times. Students, in groups, are asked to predict the location of the object between the known times based on its speed and trajectory. In their groups, the students discuss where they think the objects are based by guessing, straight lines or curved trajectories. Each group plots their solution of the path of the object on the board over which I then project the actual path. We then discuss which group came up with the most viable prediction and how this can be programmed into a game. A more novel exercise I use to explain network protocols for ensuring data is received in the same order it has been sent across a communications channel is to divide students into teams and have half the team send a message to the other half and for the second half to check against their protocol that the message received is the same one sent. The messages are encoded as rows of coloured M&Ms and I act as the communications conduit. During transport several of the M&Ms (unknown to the students) are taken out of the message (eaten) and the receivers must determine if the message has arrived intact and which M&Ms are missing.

Activities such as these engage the students and explain key and difficult concepts in a fun way. The evaluation statement "*Dr de Byl was able to explain concepts clearly*" received an average score of 4.09 (FOS 4.06, USQ 4.05). Typical student comments in response to these novel teaching techniques include:

Penny's style of teaching (using games, multimedia, etc.) makes the subject much more interesting than it already is. It helped me to achieve high HD's in both courses.(CG & CGP 2005); Penny has thought of a way to make the course material both fun and instructive at the same time (CGP 2006).

2 DEVELOPMENT OF CURRICULA AND RESOURCES THAT REFLECT A COMMAND OF THE FIELD

Curricula Development: I have a command of the field of computer graphics and computer games programming and this is evident in my national and international standing as a researcher, consultant, editor

and writer. Since completing my PhD on 2002 I have published 7 papers in top international journals (e.g. Turkish Online Journal of Distance Education, International Journal on Distance Learning Technologies & Education Technology and Society), 2 peer reviewed books with top U.S. publisher of computer game development books, Charles River Media, 3 book chapters (the most recent on a new design method for serious games) and over 15 conference papers. I have also been successful in winning a number of internal USQ grants, a 2007 Carrick Competitive Grant for \$215,000 and a 2007 Queensland Smart State Award for my Advanced Learning and Immersive Virtual Environment (ALIVE) project. My international standing is further evidenced by invitations (and acceptances) to act as an editor for The Open Education Journal, a working party member on the International Game Developer Association's Artificial Intelligence Standards Project and a consultant on the Federation of American Scientists Virtual Environments for Education Project. I am an active member of the Web3D Consortium and currently working in collaboration with several international games engine developers to further the work of the ALIVE project. Furthermore, in 2002, I received the Department of Mathematics and Computing (USQ) Head of Department Award for Excellence in Research.

Students benefit greatly from lecturers who are actively involved in their disciplines. I am fortunate enough to manage the ALIVE project and as such have been able to keep up-to-date with the latest developments in the games programming and serious games fields. As such I have daily practical experience working in a team environment developing computer graphics and computer game applications. The range of professional and research experience which I have allows me to bring a depth of knowledge into the curriculum which greatly enhances my teaching and learning materials. Both of my teaching areas of Computer Graphics and Computer Games Programming relate directly to my research and professional expertise.

The second year course **Computer Graphics** focuses on the mathematics and algorithms behind the dynamic creation of 2D and 3D images on a computer screen. As part of this course I introduce students to research being conducted by the ALIVE team such as new models of procedural terrain generation, fractal algorithms and particle systems. A feature of the course is development of fractal terrains, vegetation and fly-through 3D environments which is derived from my experience working as the manager of the ALIVE project, creating educational games and my research.

Computer Games Programming, also taught in second year, introduces students to game programming using the object orientated programming language C++ and OpenGL (the open graphics library) through the creation of a Serious Game in a teamwork environment using the latest industry software development techniques. This course includes a majority of real-world techniques and stems from my experience as an industry programmer and with the ALIVE project. In this course I like to expose students to the day to day issues I have faced in game development projects and illustrate the differences between theoretically ideal procedures and processes and a more realistic view including, for example, deadlines and compatibility issues with 3rd party software applications.

My knowledge into the 'state of the art' in the areas of computer graphics and computer games research and industry needs also allows me to develop an authentic curriculum which integrates relevant learning objects with realistic and relevant assessment tasks. This approach to developing coherent and well organised learning and teaching materials is confirmed by student feedback. The evaluation statement "Dr de Byl seemed well prepared for each session" received an average score of 4.22 (FOS 4.25, SCI 4.23). Typical student comments in response to my command of the field being reflected in my teaching include:

The topics covered in class are pretty extensive, but Penny always find a way to put each topic in a real-life context, reassuring students that what they are learning will be useful if they were to choose game programming as a career. (CGP 2006).

Program Development: In 2004 I developed the curriculum for a new major in the B.I.T. called Games and Creative Technologies (first offering in 2006). The major was introduced to meet the needs of the higher education marketplace with high interest from USQ's international partners. The major also takes advantage of new courses offered in the Faculty of Arts which teach students about game design and animation techniques using the latest industry recommended tools. The inclusion of the Arts courses means our B.I.T. students are exposed not only to the technical programming side of games but also to the creative side. In 2005, before the launch of the games major, the first offering of the Computer Games Programming course attracted 16 students (6 EXT + 10 ONC) without promotion. This course has experienced 23 enrolments (7 EXT + 16 ONC) and 19 enrolments (9 EXT + 10 ONC) in 2006 and 2007 respectively. Furthermore, the QTAC first preferences for this major in 2008, are 6 ONC + 1 EXT + 5 FC = 12 out of a total of 32 preferences for the Sciences BIT (which has 6 majors in all). The preferences for this major are even far greater than that for all Business Faculty BIT preferences which in total are 7. These figures further emphasise my knowledge of the games programming field and the preferences of students enrolling in a BIT.

Resource Development: Being passionate about software development in general I have a keen interest in the application of emerging technologies being applied to benefit education. As such I have initiated the following projects at USQ:

Classmate: In 1998 I began development of an online system to manage the electronic submission and marking of student assignments. This system, called Classmate, has been used in the Department of Mathematics and Computing since 2000. It dramatically reduces the turn around time of assignment marking (from 3 weeks to 4 days) and reduces erroneous data entry (Baillie-de Byl 2004). In 2002/2003 the DVC Research and Enterprise, Malcolm McKay and the DVC Academic and Global Learning Services, Jim Taylor supported the development with \$10,000. This work led to an invitation to join a working party to develop a USQ wide solution for electronic assignment submission (EAS) and I co-authored a 2005 Strategic Development Fund application, which secured the EAS project \$79,000. Peer evaluations and comments about the Classmate system have included:

After [Penny's] demonstration, it was agreed by the project team to apply for funding to develop a USQ system based on the functionality displayed within Penny's system (Debbie Rhodes, Project Manager, EAS 2006); It [Classmate] is also very efficient in the way it supports the electronic administration of assignment distribution to markers, student feedback return, and recording of marks. The EAS team benefited much from Classmate when defining the functionality required for this system (Charmaine Ryan, Associate Dean, Faculty of Business, 2006).

Moodle: In 2005 I founded the Faculty of Sciences Moodle Pilot Project with the approval of Professor Jim Taylor. The objective of this project was to evaluate Moodle through real usage as a potential replacement LMS for WebCT. From 2005 to 2007 I acted as the Moodle Project manager, coordinated its use within the Department of Mathematics and Computing and during this time ran two training sessions for department staff and one workshop for interested university staff on the creation and setup of Moodle courses. Recommendations I presented to the USQ LMS Working Group resulted in the upcoming university wide rollout of the Moodle system.

ALIVE: In 2005 I co-founded the Advanced Learning and Immersive Virtual Environment (ALIVE) Research and Development Laboratory with money obtained from the VC's Strategic Development Fund (\$59,000). The objective of this project is to exploring game-based and online Web3D pedagogies. In 2006, the project secured an additional \$100,000 from the VC's Strategic Development Fund. In 2007 I secured \$215,000 from the Carrick Institute to examine how such technologies engage students and how educators can best apply them. From my research in this project I have filed one patent application, published a paper in a high impact journal (*The Turkish Online Journal of Distance Education*) and a peer reviewed book chapter. I recently received this unsolicited email commenting on the ALIVE project's work:

"Just wanted to say how impressed we are with the work that AliveX3D is doing, and how pleased we are that you are finding our software useful." (Jay Weber, CTO, Media Machines)

The ALIVE team have recently been invited by Professor Jim Taylor to become a part of the USQ's newly founded Learning Futures Innovation Institute.

3 APPROACHES TO ASSESSMENT AND FEEDBACK THAT FOSTER INDEPENDENT LEARNING

At universities the majority of assessment is based on traditional essay and problem type examinations. However these cannot adequately assess critical thinking, creativity and reflection (Elton and Johnson, 2002). For this reason I implement peer assessment and practical development work which is constructive, provides students with authentic learning experiences and real-world relevant assessment promoting deep learning and critical skill development. Students are exposed to my assessment methods in the following ways.

Encouraging application of knowledge and freedom of expression: Assessment must have a two-fold outcome; it should assess content and prepare learners for future learning. In order to foster independent learning abilities in my students I am constantly challenging them to work to their best potential through showing them what is visually possible within the realm of computer graphics, guiding them through activities that demonstrate the basics of techniques and then asking them to select and apply the appropriate techniques to produce an assessment item. For example, in Computer Graphics I have written several tutorials which demonstrate techniques for texturing, shadowing, lighting and other visual special effects. Each of these is learned as a separate activity as they are all in their own right very complex mathematical and algorithmic problems. For one assessment item the students are asked to select a real-world high quality image and reproduce it using computer code. This requires the students to combine most of the previously mentioned methods. I have found that students consistently excel in this assignment, put a great deal of effort into their work and are proud of the outcome. In my experience students value the chance to demonstrate what they have learned as well as being given the freedom to *flaunt* their new found abilities

(see Attachment 6). Evidence that I foster independent learning in my students is demonstrated in student comments such as:

Despite having very clear expectations in the assignments, tutorials and exams, Penny still had open parts of those questions, which made it able for me to do extra parts of the assignments and tutorials that (although not exactly marked) let me do extra things like Environment Mapping on assignment 2 (CSC3406), height-based Texturing on assignment 3 (CSC3406) and 3d modelling in CSC3418 (CG & CGP 2005); [Penny] always encouraged self-discovery and provided guidance when I would stray from the objective (Masters Student 2006); The reason I'm writing to you is to say an official thank you for guiding me throughout my research projects. It's been one of the pleasurable and memorable working with you (Masters Student 2007).

Assessment transparency and quality feedback. Through student interaction I have come to understand that students who have upfront knowledge about the learning objectives of a course and how they will be marked perform better in their studies than those who do not. This observation is also backed by educational research (Frederikson & White, 2004). Therefore, from the outset I endeavour to make clear to the students the expected outcomes from their learning activities, how they will be expected to demonstrate their learning and the criteria by which I will assess their work. To this end I provide students with assessment activities and marking criteria at the beginning of each semester. Each assessment item outlines the projects the students are to undertake, the due date and the marking criteria which include a breakdown of the marks which will be allocated for each. In addition, lectures, workshops and activities are strongly linked with each assessment item such that the exercises undertaken by students in the computer laboratory sessions form part of their summative project work. For example, in Computer Graphics, the laboratory sessions from week to week build upon the previous weeks. One week the students construct a 3D scene, the next they texture it, the next they add shadows and reflections etc; until finally they have created constructed an interactive fly-through 3D virtual environment.

The evaluation statement “*Dr de Byl’s criteria used to assess student work were clear*” received an average score of 4.21 (FOS 3.86, USQ 3.92). It is evident students appreciate this structured and open approach to assessment with comments such as:

In Penny’s courses the assignments were solely based on the chapters before them, and the exam was based on the study book. The Jeopardy game she has created (explained above) has helped immensely with this. This meant that assignment 1 (2-d paint program) was based on the tutorials before them, assignment 2 (1st 3-d program) was based on that initial 3-d knowledge of the tutorials between assignment 1 and 2, and assignment 3 (3-d terrain) was based on the tutorials portending to the tutorials on random terrain and tree generation (CG 2005).

There is overwhelming evidence that the quality of feedback given to students has a substantial impact on their quality of learning (Black & Wiliam 1998). Through the use of Classmate, I am able to produce rapid turn-around times and provide considerable feedback which is appreciated by my students and evident in comments such as:

Penny always gave constructive feedback that helped one to achieve their best. She gives a play-by-play feedback sheet, with a comment at the end that tells you what you’ve done right and what you’ve done wrong. One thing that she did to help me was to let me know that I was doing a good job, not just telling you when you stuff something up. Another major point is that she nearly always finished marking assignments in 3-5 days, which was extremely helpful especially when you can get your marks back before you start the next assignment or exam (CG 2005).

In a survey of 27 students whom had experienced the Classmate system first hand, their responses to the question “How would you rate the feedback timing?” resulted in Very Acceptable 46%, Acceptable 46%, Barely Acceptable 8% and Disappointing/Very Disappointing 0% (Baillie-de Byl 2004).

Peer revision and critical analysis. By coupling the principles of constructivism in learning and alignment in teaching (Biggs 1999) and Boud’s sustainable assessment models (Boud 1999) I require students to assess their own level of ability in selecting assignment foci and to critique their level of knowledge against that of their peers through peer assessment and group assignments. For example, in Computer Graphics students are required to select a real-world image which they must reproduce as accurately as possible. This requires them to assess their current skill level, determine what skills they need to acquire to complete the assignment and to perform further research to find the appropriate knowledge beyond their textbook and study guides. In semester 1, 2005 when students found that they needed to learn how to make an object shiny, one student began researching environment mapping (which was far beyond the requirements for the course) and the quest for being able to program this method into the assignment became infectious to the point that I was requested to hold a tutorial on this technique. The Computer Games Programming assignment (outlined in Section 1) gives students the chance to find a forum problem they believe will match their skill level or which they have analysed as being achievable and then to come up with a working version of a solution.

Students are required to present their solution such that their fellow students can apply the solution to their own work. Assessment for this item is peer reviewed where students must assess their fellow students' work based on questions such as: *Evaluate this question based on how well the solution helps YOU understand the issue from the original Irrlicht forum posting. e.g will you be able to confidently use this solution in your own code?*

4 RESPECT AND SUPPORT FOR THE DEVELOPMENT OF STUDENTS AS INDIVIDUALS

I provide support for my students in the forms of well-presented course materials with clear learning objectives, an open-door policy, out-of-hours tutorials, new learning spaces, flexibility in content delivery and innovative, inclusive assessment.

Availability and Support. I have an open-door policy and invite students to bring their laptops into my office and work through issues they are having with their projects. I also make myself available out of hours with online chat sessions and extra face-to-face tutorial classes. In the words of the students themselves:

Penny has always been easy to contact to answer questions. Not only does she answer questions promptly and clearly but she has provided such tools as message forums to allow us to share this information (CG 2007); Penny conducted, in her own time, "newbie" classes for those who wanted to reinforce, revise and seek further clarification of some of the concepts that were discussed in the particular week's lecture (Foundation Programming 2004).); I have observed that fellow students have not hesitated in approaching Penny for guidance when experiencing problems or issues in their studies, and I would say that this is in no small part due to Penny's friendly and open nature, and her enthusiasm for the subject matter (Foundation Programming 2004). And from a peer (Professor Mark Toleman 2006): Her rapport with the students is evident (her office was next to mine some years ago) and she clearly has empathy for their problems and situation.

The evaluation statement "*Dr de Byl was available for consultation*" received an average score of 4.23 (FOS 4.01, USQ 4.01). Furthermore, the statement "*Dr de Byl made opportunities to ask questions*" received an average score of 4.39 (FOS 4.15, USQ 4.20).

Student Learning Spaces. Computer Graphics and Computer Games Programming are very visual and creative domains. As such, I endeavour to establish learning spaces that will foster the students' enthusiasm for the courses. For example, in lectures we often move the desks into round table settings and in 2005 I was able to obtain \$20,000 from the Faculty of Sciences budget to set up a Games Development Lab for students enrolled in the B.I.T. Games Major. The motivation for this was two-fold. First, to get the best from graphics and games programming the students need access to high-end computers and second, to create a learning space which would facilitate the team work in my courses which mostly takes place around a computer. The idea of a non-traditional computing laboratory where students could meet and work on their applications together was appealing. With the funds I was able to purchase five computers with specifications far beyond those in any other labs on campus and a sofa to give the room a casual atmosphere. The laboratory has 24/7 access and I am aware of groups who have used the space for "*all nighters*" and meet in there regularly. A student has commented:

Facilities made available to students internally include a computer lab with 24-hour access, equipped a number of high-performance computers, a large work area and whiteboard that my own team found very useful as we planned and developed our game. With these resources at our disposal I believe we achieved much more with our project than we would otherwise have done (CGP 2007).

Flexible and Inclusive Content Delivery. I have always had a passion for technology and particularly the Internet. I am also aware of the nature of the diverse student cohort, their requirements for accessing content and manifesting an inclusive learning environment. By applying technology to the delivery of my teaching and learning materials I have been able to bridge the gap between internal and external students. For example, I supply my materials in print, CDROM and online formats, I provide numerous online communication tools for students to use such as forums, wikis and synchronous chatrooms and supply extensive and exhaustive step-by-step tutorials and videos for students to access online and also via CDROM. Furthermore, I am very aware of the isolation external students experience when studying and to alleviate this I encourage team work in which internal and external students work together in project groups (see reference 4).

5 SCHOLARLY ACTIVITIES THAT HAVE INFLUENCED AND ENHANCED LEARNING AND TEACHING

Research in education. I have 5 learning and teaching related publications including 1 book chapter, 3 journal papers and 1 conference paper (see CV for details). In addition I have written two textbooks. One examining the programming of characters in computer games which came runner up in the US Game Industry Frontline Awards category for development tools, and another on artificial intelligence. I have also

been successful in obtaining several USQ internal competitive grants for learning and teaching purposes totalling \$159,000. Furthermore, I was the lead applicant of a successful 2007 Carrick Institute competitive grant worth \$215,000 aimed at examining the integration of Web3D technologies with existing eLearning content. This project aims to increase knowledge about the usability, usefulness and effectiveness of 3D immersive web based environments (Web3D technologies) within the higher education sector which is becoming populated by diverse groups of students who will be increasingly familiar with emerging interactive 3D technologies. Web3D has the advantage over all other 3D virtual environments in that it operates seamlessly with existing infrastructure for web access commonly used in the home and by universities throughout Australia.

Establishing Communities of Practice and Online Exchanges. As part of the Carrick project I have established the Web3D Exchange (<http://www.web3dexchange.org>) website which documents the 3D eLearning projects our research group is working on as well as acting as a information exchange for the larger educational community. In addition, the ALIVE project has its own website at (<http://www.alivex3d.org/>) at which we have 90 registered members who actively download beta releases of our software and share research publications and ideas. Through this work I have established links with the games industry, the Web3D consortium and the Federation of American Scientists (FAS). In addition I am an international consultant for the FAS's current project on Virtual Worlds and their use in education. The director of the FAS emailed:

Your Alive X3D project looks terrific—you've certainly identified some of the key issues plaguing existing platforms and tools and perhaps we can add an entry that shows off its capabilities? I think you have a lot of experience working across curricular areas and could offer some great insights (Michelle Roper 2007)

Community Engagement. Since joining USQ in 1999 I have been actively involved in community engagement activities including school visit seminars and on-campus ICT enrichment days. For example, I've run games programming workshops for school students between years 6 and 12 when they have visited USQ. Feedback from the 2006 Girls in ICT experience day had 39 out of 47 girls rated my workshop as the activity (out of 4) they most enjoyed.

In October 2007 I presented my research and development in the ALIVE project at Toowoomba High School at the Science and Technology Forum day and have been invited by the President of the Queensland Society for Information Technology Education (QSITE) to present a stream on games in learning at the 2008 QSITE conference. In addition, I have been working in cooperation with IT teachers at Harristown High School to adjust the technical requirements of our ALIVE tools so they comply with Education Queensland computing infrastructure such that primary and secondary school students can access our applications.

Professional Development. Professional development activities which enhance my teaching and learning methods include:

- USQ's Learning Spaces Summit (Oct 2007)
- Discussions with visiting academic Geoff Crisp, Associate Fellow of the Carrick Institute (Oct 2007)
- Carrick Institutes Project Management Workshop (Aug 2007)
- Seminar by Dr Allan Goody, Senior Lecturer, Centre for Advancement of Teaching and Learning (July 2007)
- USQ Postgraduate Research Supervision Training (2003)
- Member of Australasian Society for Computers in Learning in Tertiary Education (ASCILITE)
- Member of Web3D Consortium
- Member of International Game Developers Association and Games in Teaching Chapter

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